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CARPENTRY AND BUILDING

VOL. XXX.—1908.

NEW YORK:
DAVID WILLIAMS COMPANY,
14-16 PARK PLACE

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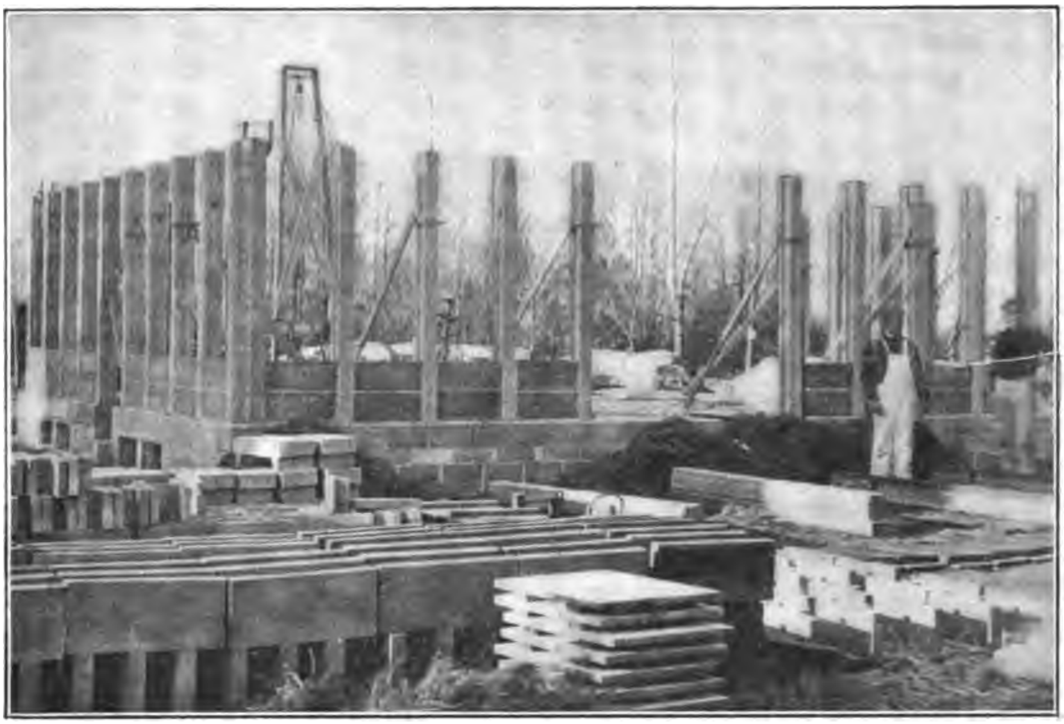
Carpentry and Building

New York, January, 1908.

Dwelling of Cement Block Construction.

THE rapid multiplication of concrete and cement block houses in the recent past has been the means of developing in connection therewith a number of unique features, both as regards arrangement and construction, and in the dwelling which we have this month selected as the basis of our half-tone supplemental plates there has been successfully introduced a form of concrete wall which is somewhat out of the ordinary. The house, which occupies a plot of ground measuring 100 x 175 ft., has a frontage of 34 ft. 4 in. and a depth of 28 ft. 10 in., setting back 30 ft. from the front line. The appearance of the finished structure is clearly indicated in the exterior view on one of the half-tone plates, while the other two views represent interiors, one showing the staircase hall, as viewed from the library, while the other is looking into the dining room. The large half-tone view presented on this page shows the house during its early construction, with the cement blocks or slabs piled in the foreground. The small half-tone on the second page is a view in the parlor. The exterior of the building is smooth finished, with panel effect, but for the purpose of rendering the elevations here presented more picturesque the engravings have been prepared as shown.



View Showing Appearance of House in its Early Stage of Construction.

A Dwelling of Cement Block Construction.—W. O. Steele, Architect.

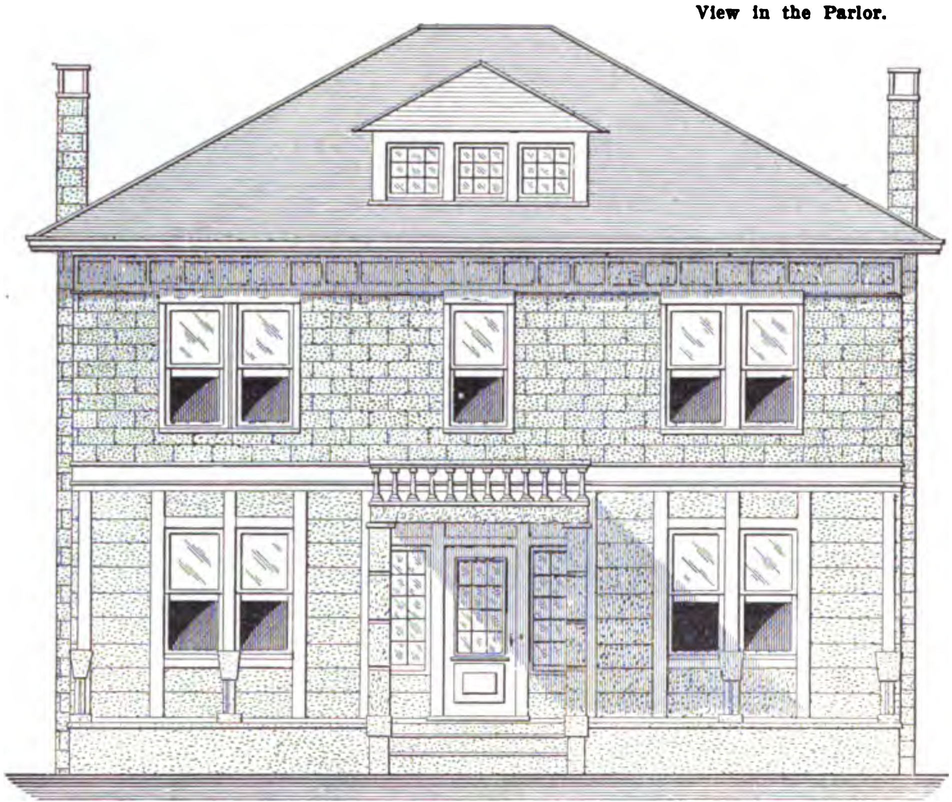
The first-floor construction of the house is of solid concrete, while the second story walls are double, being formed of two sets of slabs, with an intervening air space. A cement porch 9 ft. wide extends across the entire building, that portion in front of the doorway being roofed over. Cement balustrades are placed at each end of the porch, as well as on its roof, all as clearly shown in the half-tone supplemental plate and in the elevations. The absence of wood in the construction of the house is notable, as the material is used only for the floor joists, flooring, studding, stairways and rafters.

The process of construction is interesting. With the exception of the cement, the materials used throughout are local sand and gravel dug from the cellar, where it was found in all grades of fineness, from coarse gravel to clean silica sand. The molds for the various cement blocks, slabs, columns and shapes were made on the ground. The cement used was the "Lehigh" brand, and the total amount required was 195 bbl. No broken stone was used in the construction of the house—clean gravel dug from the cellar being used in its place throughout.

The footings under the main walls are 18 in. wide by 10 in. deep, 1 part cement, 3 parts sand and 5 parts clean gravel. Under the cement columns and supports in the center of the building footings 18 in. square and 12 in. deep of material of the same composition are used. The foundation walls are built of hollow blocks 12 x 12 x 18 in., with a core 5 x 14 in., and are composed of a mixture of 1 part cement to 5 parts mixed sand and gravel, laid in mortar made up of one-half cement and one-half lime. The center ends of the floor joists are supported on sectional beams resting on the tops of these posts, the beams being of 1 to 5 cement reinforced with ⅜-in. round rods, five in each piece. The chimneys followed along in the general construction work. They are supported on footings 8 in. deeper than the main wall, but put in at the same time. The outside dimensions of the chimney are 18 x 30 in., it being built of slabs 4 in. thick and 8 in. high and running the full breadth of the chimney. This has a terra cotta flue lining and is topped out in the usual manner.

The first story walls are built up of concrete columns 9 ft. long and set on the foundations 3 ft. apart, center to center, the house and rooms all being multiples of 3 ft. in their general dimensions, between which concrete slabs are set, except in the case of doorways and windows. These concrete columns are one of the unique features in the construction of the house. They are molded with the complete inside and outside finish. They measure 6½ x 8½ in., and are 9 ft. long, reinforced with five ½-in. rods, the material used being mixed 1 to 5. The outside faces of the columns are plain in all cases, the inside faces conforming with the exterior design of the rooms, those in the parlor and dining room being fluted, while those in the library and hall have beaded corners. The kitchen columns are plain both inside and outside. The faces inside and outside are 6 in. wide, while the centers are 7 in. wide, and have grooves formed to receive the exterior slabs and interior panels. The columns next to the windows are recessed to receive 7/8 x 5 in. wooden window stiles, held in position by lead expansion bolts. Near the top of the stiles a pocket is recessed in the column to receive Pullman spring sash balances, the use of which obviated runways in the column for sash weights. Higher up are two pockets to receive the ends of the brackets supporting the heads, shown in the details presented herewith. The doorways are formed by these columns in the same manner, except that no recesses for balances are required. The columns are secured at the tops with 1/2 x 1 in. tie rods fastened into cast iron plates, which are molded into the heads of the columns. The spaces between the columns, except where the doors and windows occur, are filled with slabs, which measure 2 x 11 3/4 x 29 3/4 in., reinforced with five strips of band iron, the material being mixed 3 to 1. In the window openings two of these slabs were set at the bottom only. The lintels are 6 x 10 x 35 1/2 in., slabs of the same mixture of material with 5/8-in. round and flat band iron for reinforcement. They connect the columns at the top, forming the joint at the center of each column and forms a recess over same to receive the second-story joists. Slabs, 3 x 8 in. of 1 to 3 concrete reinforced with expanded metal and panels which are especially designed according to the finish of the various rooms. These vary from 2 in. up to 3 1/2 in. in thickness, and are of concrete of the same mixture as the baseboard sections, but reinforced with 1/4-in. rods. These panels extend up to the cornice. An air space between the outer and interior portions in these sections of the building varies from 3 to 5 in., according to the location. The cornice slabs are 6 in. deep, 2 1/2 in. wide at the bottom and 5 1/2 in. wide at the top. They

View in the Parlor.



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

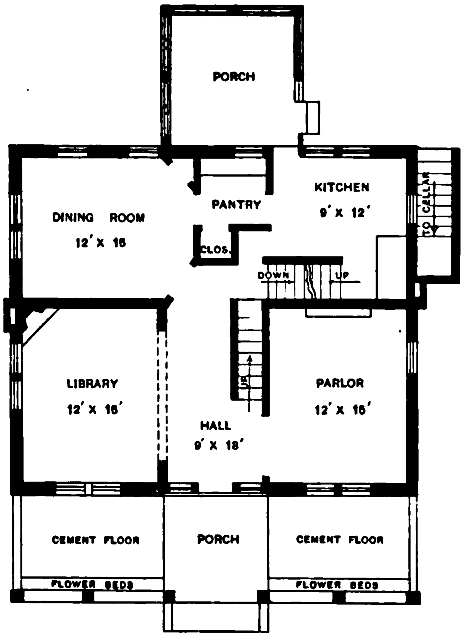
A Dwelling of Cement Block Construction.

x 35 1/2 in., of one to three mixture reinforced with expanded metal, are laid over the top of the lintels, and form the base for the second-story slabs. The exterior faces of these slabs have molded on them an O. G. molding, to make a finish or parting between the first and second stories of the building. The application of these columns, lintels, &c., is shown more clearly in the half-tone engraving of the house in course of construction. Columns are shown in course of erection, while others are shown on the boards. The lintels and other blocks used in the construction of the house are also shown.

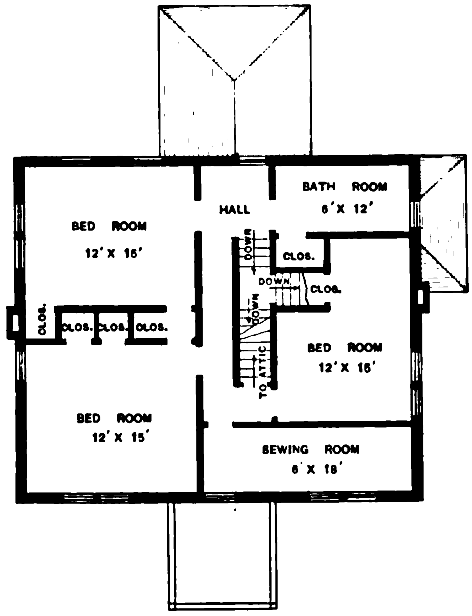
The interior portions between the cement columns of the first floor, except where windows or doorways occur, are filled as follows: The baseboard section, 3 x 9 x 39 3/4 have a molded face to conform to the inside finish and are reinforced with 1/4-in. round rods. This interior work was all pointed up even and finished to a smooth surface, effacing all joints, plaster Paris and lime being used, put on with a brush and troweled smooth. The window openings were finished with the same baseboard slabs, and a section of panel of sufficient size to come to the same hight as the outside walls. On these two walls the window sills were set. These were of concrete, proportions 1 to 3, reinforced with three 5/8-in. rods, being 8 1/2 x 6 x 4 in. and 29 3/4 in. long. The window and door heads were set with cast iron brackets shown in the details, special width slabs being used for the outside opening, while narrow slabs and the cornice slabs are used for the interiors. The heads and sills carry the interior finish molded as a part of them, and the absence of wood trim, except stiles, heads and stops, is to be noted.

The first story partitions are constructed the same as the outside walls. The columns, however, are 6½ in. square, and the spaces are filled with baseboard slabs and panels, the different sides of the columns, baseboard slabs and panels being molded with finished faces, conforming with the finish of the respective rooms and halls. The only sections of the first story partitions not finished as above described are those sections in the parlor, where the mantel is located, and which is only partially filled with the regular panel, the remainder of the space being occupied by the mantel, which is made up of reinforced members molded to size and finish.

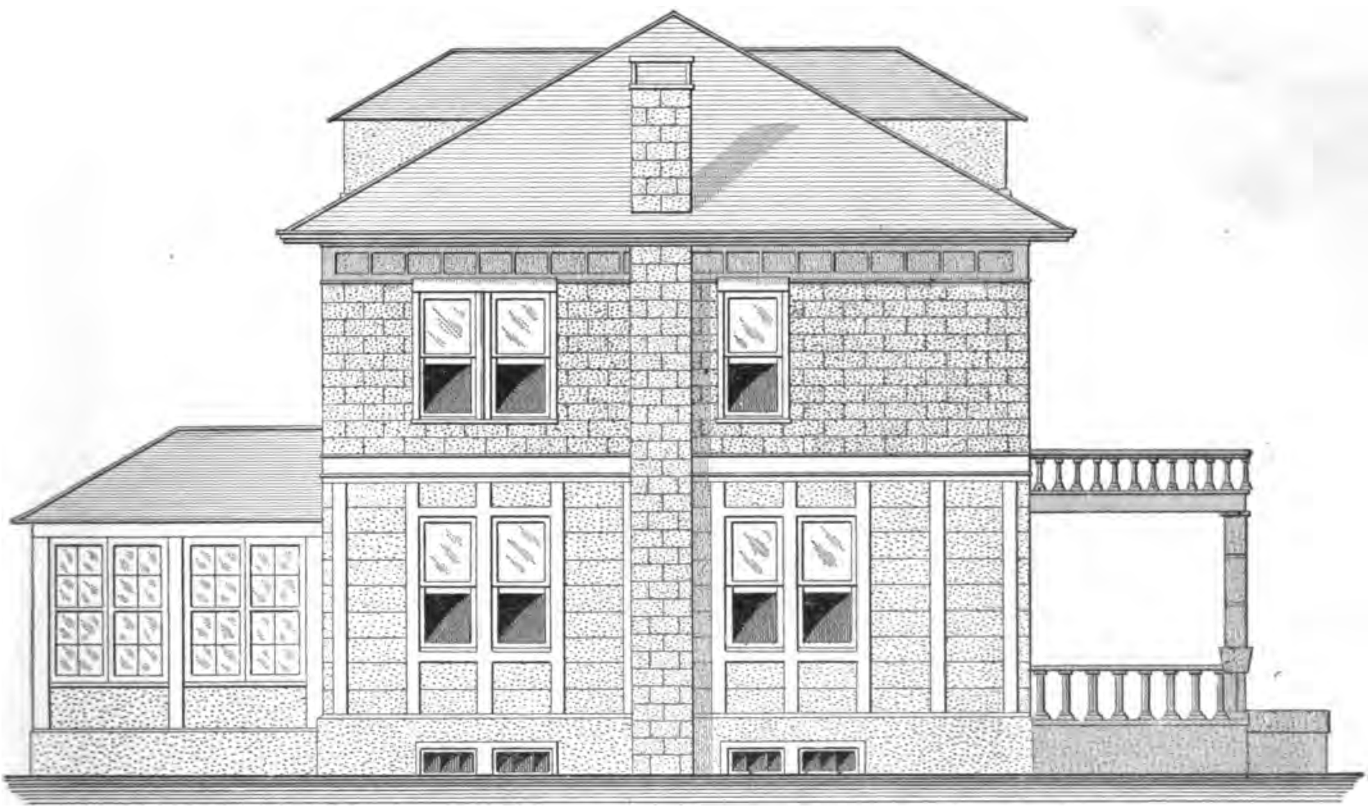
The partition columns, previously mentioned, are supported on the concrete headers as shown in the accompanying details, and which are in turn supported by the columns and footings in the cellar, so that the partitions of this floor are entirely independent of the floor joists or the floors themselves. The doorway between the parlor and reception hall has a sliding door made of three thicknesses of ⅛-in. asbestos and cement lumber, made by the Keasby-Mattison Company, Ambler, Pa. It measures 5 ft. 6 in. and 7 ft., and slides on a special track on adjustable brass rollers, sliding into space specially provided between the partitions.



First Floor.



Second Floor.

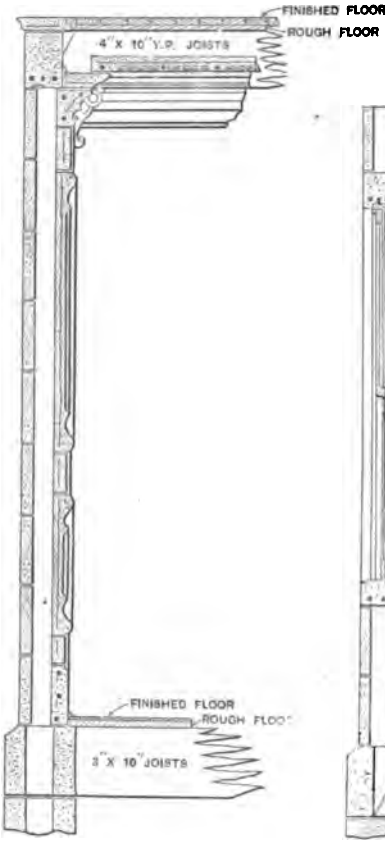


Side (Left) Elevation.

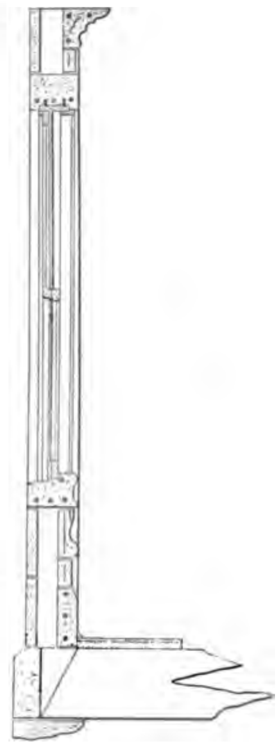
A Dwelling of Cement Block Construction—Floor Plans — Scale 1-16 In. to the Foot.—Elevation.—Scale ⅛ In. to the Foot.

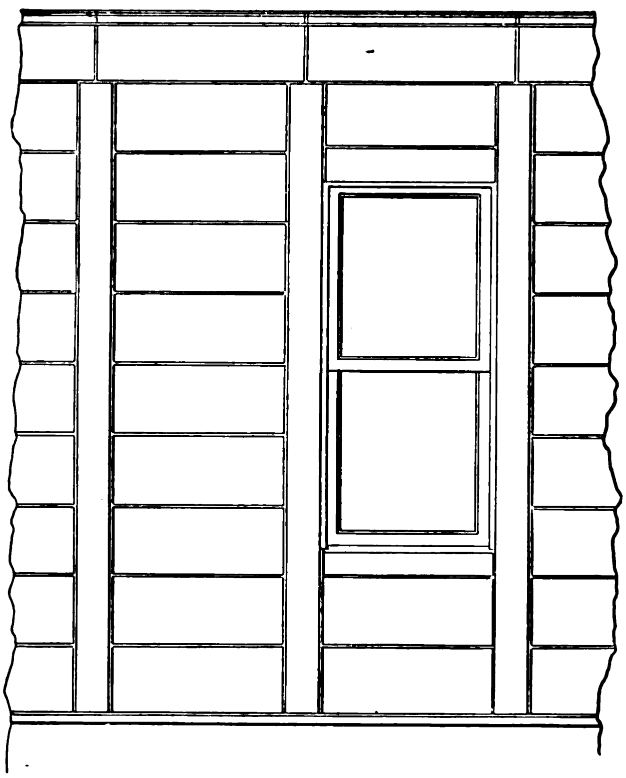
The second story walls are made up of concrete blocks 2 x 8 x 18 in. and 4 x 8 x 18 in., made in proportions of 1 to 3, tied together with a special block so formed as to avoid any direct section of cement from outside to inside, and practically making two walls with an air space between them. The window openings were left in the block walls and frames made of concrete, the sill being reinforced with three ⅝-in. rods, the sides being made up of four members with molded faces with a recess on one side for wooden window stile and lead expansion bolts with which to fasten them to the cement. The window heads are of reinforced concrete, and are set on top of the side frame pieces, the heads having recesses for Pullman sash balances. These frame pieces are all molded complete, inside and outside, with no wood trim. The walls were all pointed smooth on the inside and finished in panels with U. S. fiber plaster board, the cornice members being molded to shape and size and reinforced with expanded metal. The partitions in the second story are made of 2 x 4 in. hemlock studding on 18-in. centers, finished in fiber plaster board in panels, no lath and plaster being used in any portion of the house. The cellar, which extends under the entire house, is divided into a number of separate apartments comprising a laundry, cellar kitchen, vegetable cellar, &c. The floors, with the exception of the vegetable cellar, are all cemented and have cement partitions, this being readily nailed to a 2 x 6 in. hemlock plate, bolted to the cement wall. The extended portions carry reinforced cement blocks, held between the girders, one end resting on the outer wall of the house. They are also secured to the joist themselves by wrought iron brackets, and carry the reinforced concrete gutter extending around the entire house, as shown in the cornice detail, to which is attached galvanized iron rain conductors on each four sides of the house.

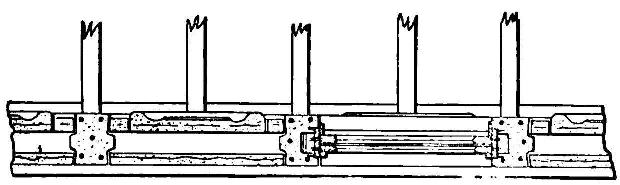
The rafters are hemlock, 2 x 6 in., with 2 x 8 in.

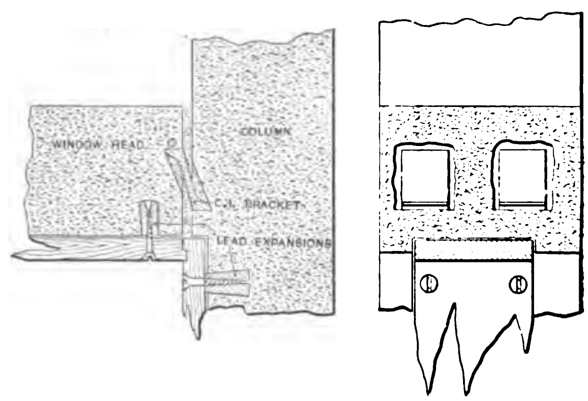


Vertical Section Through Panel.


Vertical Section Through Window.


Partial Elevation, Showing Panel and Window.


Horizontal Section Through Panel and Window.



Sections Showing Method of Securing Window Heads.

Miscellaneous Constructive Details of a Dwelling of Cement Block Construction.

permissible by the number of columns for the support of the upper floor partitions, &c.

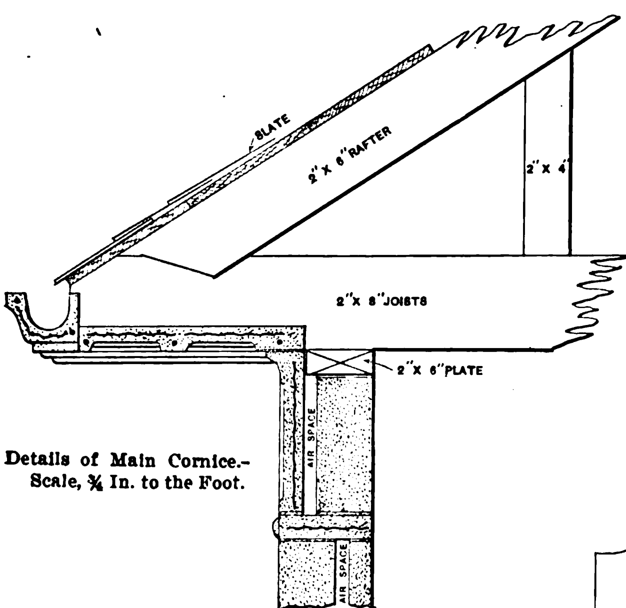
The first story joists are 3 x 10 in. hemlock, laid 18-in. on centers. The ends enter the outside foundation walls in spaces made in the blocks. The second-floor joists are 4 x 10 in. planed long leaf Georgia pine on 8-ft centers, chamfered on the lower edges. These joists are bored on the under side near the ends, and set down over dowels in cast iron plates, secured in the heads of the columns in the outer walls, as shown in the details.

The third story joists are 2 x 8 in. hemlock, laid 18 in. between centers. These are planed, stained and finished in natural wood. These joists extend out over the walls of the house and support the horizontal cornice members, roof rafters and concrete gutters. They are king rafters, while the rafters for the dormer windows are 2 x 4 in. yellow pine. The rafters are covered with ⅞-in. yellow pine boards, which are in turn covered with slater's felt and the best quality Chapman slate, the flashings and gutters being of 16-oz. copper. The floors in the first and second stories are double. On the first floor a ⅞-in. yellow pine floor was laid on the joists; on the top of this a ⅜-in. birch floor was laid, which was scraped, waxed and polished. The rough floor of the second story is also of ⅞-in. yellow pine, covered with ¾-in. finishing floor of the same material, planed and varnished. In the third story the ordinary ⅞-in. yellow pine flooring is used.

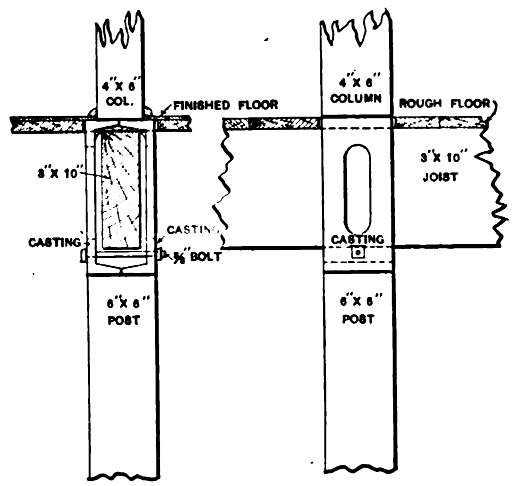
The first floor ceiling is formed of molded concrete plates made in 1 to 3 proportions and reinforced with rods and expanded metal. These are in different styles, to conform with the finish of the rooms. They are held between the joists by steel brackets, screwed to the joists and finished with concrete moldings, reinforced with ⅜-in. rods, and have screw holes with special plate reinforcement to screw them to the joists. The second story ceilings are of asbestos fiber pulp board, nailed to the joist and finished in panels with U. S. fiber plaster board. The main stairway balustrade is of molded concrete, 1 to 3, in sections, reinforced with rods and held securely with expansion bolts. The stairway is on the usual hemlock horses, secured to the cement blocks by means of expansion bolts, the stairs being of selected yellow pine, the tread being 1¼ in. in thickness. The second story stairway is of the usual type, the horses also being held to the concrete walls by means of heavy expansion bolts, the risers and treads being of yellow pine. The interior

All the exterior blocks, slabs, columns, window sills, heads, &c., are finished with "Medusa" water proofing compound, preserving the natural cement finish.

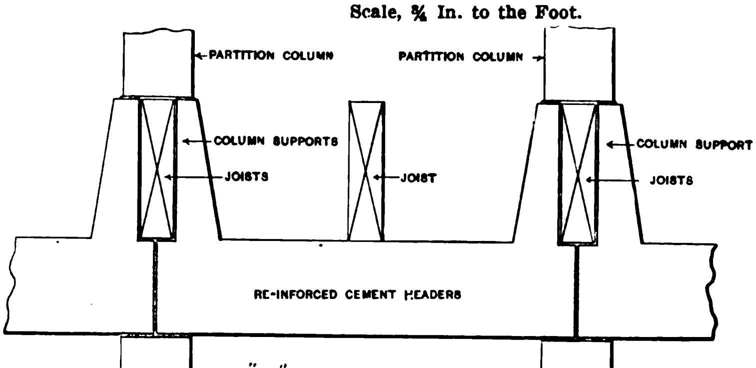
The windows throughout the house, except in the dormers and the small Dutch windows at each side of the doorway, are of the usual two-sash type, and have American double thick window glass, 24 x 24 in. in size on the first floor and 20 x 24 in. on the second floor. The dormer windows, front and back, have three sashes 24 x 24 in. in size, set with small panes of glass. The front door is oak, finished after the Dutch type, the upper section carrying small windows in heavy mullions. On each side of the door are narrow Dutch windows to conform with those in the upper portion of the doorway, having heavy mullions and small window panes. Porches are located at the front and back of the house. The walls of the front porch are solid concrete in proportions,

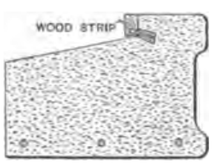


Details of Main Cornice.—Scale, ⅜ In. to the Foot.



Detail Showing How Floor Joist Are Carried in the Columns.—Scale, ⅜ In. to the Foot.





Section Through Window Sill.

Detail Showing Support for Center Partition and Ends of Floor Joist.—Scale, ⅜ In. to the Foot.

Miscellaneous Constructive Details of a Dwelling of Cement Block Construction.

finish of the different rooms varies. The woodwork, which comprises in the main the doors and window sashes, are scraped, stained and waxed, to suit the general finish of the respective rooms. The parlor floor is finished in its natural color. The library and hall floors are stained a dark mahogany, while the dining room floor is finished in Flemish oak. The first floor walls are finished with alabastine, the parlor in two shades of old rose with ivory white (oil paint) for the columns, cornice, mantel, baseboards, joist, &c. The hall and library walls are finished in three shades of moss green, trimmed with dark mahogany brown (oil paint); the dining room in three shades, red and cream yellow with black trim (dead flat oil paint).

The ornamental panel scheme of these rooms is best to be observed by referring to the accompanying half-tone plates. The second story walls and ceiling are finished with Roman flat oil wall paint, trimmed with regular oil paint. The bathroom is finished in white enamel, with a sea green frieze and ceiling.

1—3—5, which is used up to the coping, the latter being of a 1 to 3 mixture. The floor is of the regulation concrete walk mixture and laid in the same manner. It has a pitch of ½ in. in 7½ ft. Flower beds are located on both sides of the covered porch. The balusters at the ends of the porch and on the porch roof are all of molded cement, 1 to 3, while the porch steps are of cement of the usual composition. The porch columns of the covered portion, which measures 9 x 9 ft., are of reinforced concrete, and the roof is made of reinforced concrete slabs laid in cement in flanges of T iron, the whole covered with a layer of 1 to 1 cement. The back porch is inclosed and is 12 x 12 ft. in size, and has a solid concrete wall and floor, molded cement posts, panels and lintels all reinforced with recesses for window stiles and heads. The roof is made of concrete slabs, laid on reinforced cement rafters.

The house is heated with a warm air system and return flues. The furnace is of a built-up square type, with sheet metal drum, the firebox being 16 x 22 in., fitted with a Mershon patent shaking grate. The furnace foundations are of concrete, and the firebox is lined with firebrick. Fresh air is supplied from one of the east cellar windows, while return flues connect from the library and hall, so that the air can be recirculated if desired.

An open fireplace, 7 ft. high, 24 in. wide, is built in one corner of the library. This is built up of molded cement slabs reinforced with expanded metal and lined with firebrick and intended for service in moderate weather.

Water is supplied to the house from a driven well 63 ft. deep, located about 6 ft. from the house, through a 3-in. wrought iron pipe. This pipe extends through a conduit, so as to be readily accessible for any needed repairs, and enters the house at the cellar floor. The general supply is pumped by hand against air pressure, forcing the water into a tank, from which the various parts of the house are supplied. For drinking purposes a "pitcher pump," having a ½-in. supply pipe which extends 30 ft. into the well, is provided, insuring cold water at any time.

Open plumbing is used throughout the house. In the bathroom there is a Colonial white enameled tub 5 ft. long, with nickel plated mixing spigots; a Cyclo closet with low down tank, and a one-piece white enameled lavatory with nickel plated bids, all manufactured by the Standard Sanitary Mfg. Company. All water and gas piping is galvanized iron. The soil pipe is the usual cast iron pipe, extending to a 6-in. terra cotta pipe just outside of the cellar wall, which extends to the cesspool, which is located 100 ft. from the house. The vent from the closet drain extends up through the attic, and just under the rafters enters the chimney, in which a special flue for this purpose was provided. The cesspool is made of wedge shaped concrete blocks, laid loose, and has an arched top with vent.

In the kitchen there is a Novelty range, on a reinforced concrete slab, a 50-gal. galvanized iron boiler connected to the water back supplying hot water. The sink is of Alberine stone, and is 24 x 40 in. in size with high back. In the laundry and the cellar there are two Alberine washtrays with brass fittings; supplied with both hot and cold water.

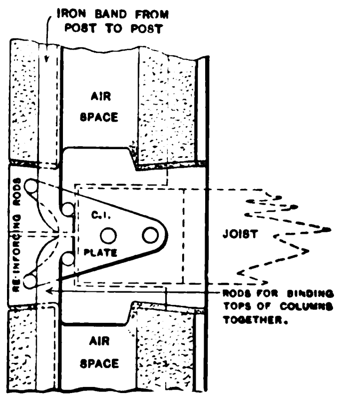
A dumbwaiter 18 x 20 in. extends from the cellar to the second floor, extending through the kitchen and having an outlet into the hall.

The hardware throughout the house is of the antique bronze sand finish, and is of the standard Corbin & Sargent design.

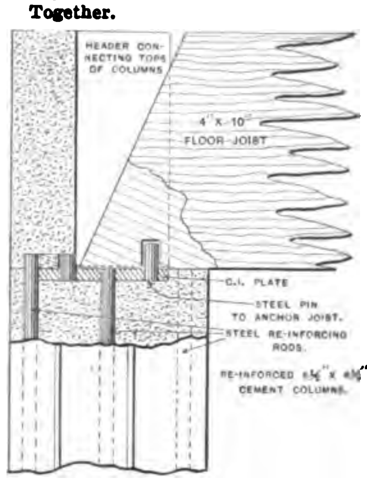
Cement walks, 4 ft. wide, of the regulation type are laid on the two sides of the house which face the streets, while a walk 4 x 24 ft. connects the porch with the walk. An outside cellarway 3 ft. wide and 12 ft. long is also provided at one side of the house. This has concrete walls and steps and is covered for protection from the weather. As we have already stated, many unique features of cement construction have been employed in the construction of the house here described, but as it has been completed and occupied for several years, the test of both summer and winter weather has been carefully observed, and it is said by the occupants that the house has been perfectly dry in all kinds of weather, even more so than the neighboring frame house, which was occupied by the same parties during the building of the cement house. There was no difficulty in heating during the winter, and the house was readily kept at any desired temperature.

The dwelling here shown is located at Grenloch, N. J., and was designed by W. O. Steele of Lebanon, Pa.

Elevation and Section of Front Door and Side Windows.—Scale, ⅜ In. to the Foot.



Detail Showing Method of Securing Tops of Columns and Floor Joists Together.



Vertical Section Through Top of Column and Floor Joist.—Scale, 1½ In. to the Foot.

Miscellaneous Details of a Dwelling of Cement Block Construction.

The story is going the rounds that Joseph M. Huston, the architect of the magnificent Pennsylvania Capitol at Harrisburg, was asked not long ago to draw up plans and estimates for a church in a Western town.

Mr. Huston complied. His plans were beautiful. The cost of the building was $75,000.

The committee in the West wrote that they liked the plans very much. But the price, they said, was too high. Couldn't Mr. Huston let them have a church like that for $10,000?

Mr. Huston wrote back:

"Say $2.50 more, gentlemen, and let me throw you in a nice spire."

CONVENTION AMERICAN INSTITUTE OF ARCHITECTS.

THE forty-first annual convention of the American Institute of Architects, which was held in Fullerton Hall in the Art Institute, Chicago, on November 18, 19 and 20, was not only replete with interest for the large number of delegates and members in attendance, but was also productive of important results. The first session was held on the evening of Monday, the 18th, President Frank Miles Day being in the chair. The members were welcomed by George Miller, representative of the Mayor of the city, and his remarks were followed by the president's annual address, which was received with marked attention and much enthusiasm.

The address was in effect a statement of reasons for the existence of the American Institute of Architects, the principles for which it stands, and the ends for which it strives. The president referred to the more harmonious relations between architects which the institute has promoted, and to the greatly improved status of the architect in the community. He referred to the interest of the institute in the American schools of architecture, and pointed out that its co-operation with these schools gives promise of a means of comparison of their work that will be most useful.

After the president had concluded his address Charles S. Hutchinson, president of the Art Institute, made a few remarks touching upon the development of architecture, pointing out that in creating the World's Columbian Exposition, Chicago presented not only to the West, but to the world an object lesson in architecture whose influence can scarcely be overrated.

The names of a number of candidates for membership were then presented, including those for corresponding and honorary membership, after which the meeting adjourned.

Tuesday's Sessions.

The second session opened at 10 o'clock on Tuesday morning, when the members listened to the report of the Board of Directors, which was read by Acting Assistant Secretary J. L. Mauran. The report showed that the institute has now 803 members, consisting of 328 Fellows and 475 Associates, also 62 Honorary Members and 82 Corresponding Members. Reference was made to the various chapters of the institute, to its finances and other matters of interest to the organization. This report was followed by that of the House and Library Committee and by that of the Committee on Applied Art and Science. There were also reports of a number of special committees, including that on Signing Buildings and using Institute Initials. This committee recommended among othen things that the members "adopt the custom of placing their names with the Institute Initials upon their buildings, leaving to the individual member to select his best work in design and execution to be signed and bearing in mind that this privilege, which, if sparingly and judiciously used, will be a credit to the institute and will do much toward raising the standard of the practice of architecture in this country." The committee further suggested that in its opinion the use of the institute initials "A. A. I. A.," and "F. A. I. A." by the members upon their cards and in the signing of buildings and plans was eminently proper, tending to the wider recognition of the institute.

William S. Eames reported verbally for the Committee on International Congress of Architects, he being followed by the chairman of the Committee on Metric System, and then in turn by the report of the Committee on the Relations of Architects to the Contracting System, of which Cass Gilbert was chairman.

The afternoon session was taken up with the report of the Committee upon Building Laws, in which it was suggested that in the establishment of a Standard Building Code, which may be published by the American Institute of Architects as the basis for building laws throughout the country, the Code issued by the National Association of Fire Underwriters be used as the basis of its work. Co-operation was suggested, and the formation was urged of a joint committee representative of several organizations interested in good buildings. It was recommended that a committee be appointed by the president to confer with a similar committee from the National Board of Fire Underwriters and from the National Association of Builders, and to formulate in conjunction with them a Standard Building Code, which may be urged for adoption throughout the country in the name of the three societies.

The report of delegates was the next order of business, which brought out more or less discussion.

Schedule of Charges.

One of the important matters of the afternoon session was the report of the Committee on Revision of Schedule of Charges, from which we quote as follows:

The changes which the committee recommends for adoption affect the first four paragraphs of the schedule, and consist:

1. In separating residential work from the general group and increasing the rate to 10 per cent. on the first $20,000 of cost, 8 per cent. on the second $10,000, and 6 per cent. upon the remainder of cost in excess of $30,000. Thus, on a residence costing $30,000, the charge is 9 1-3 per cent.; costing $50,000, 8 per cent.; costing $100,000, 7 per cent.

2. In fixing the minimum charge on all new works costing less than $10,000 at 10 per cent., and further in stating that such a charge, together with the 10 per cent. stated as minimum for landscape architecture, furniture, monuments, decorative and cabinet work is in many instances not remunerative, and it is usual and proper to charge a special fee in excess thereof.

In connection with the report of the Committee on the Registration of Architects, it was pointed out that the licensing of architects is already an established fact in the States of Illinois, New Jersey and California, and that the laws are being enforced in these States. The committee recommended that the question of the advisability of the examination and registration of architects be left to the Chapters of the Institute and those persons outside of their number who would be most interested in the safe construction of buildings. It was further recommended that a standing Committee on State Registration of Architects be appointed, whose duty it shall be to keep informed on all such laws or proposed legislation, to give advice to Chapters so requesting and to report from time to time to the Institute.

The Tuesday evening session opened with First Vice-President W. B. Mundie in the chair. The time was occupied with the reading of a paper by Dr. Allerton S. Cushman of the Department of Agriculture, Washington, entitled "The Corrosion of Steel." This was followed by a paper on "The Tetrahedral Principle in Construction," by F. W. Baldwin, the paper being illustrated by a number of models and lantern slides. This system was shown to consist of members composed of units, triangular in shape and formed of rods screwed into corner plates.

Election of Officers.

The first business of Wednesday's session was the report of the judge and tellers of election, showing the following officers to have been elected for the ensuing year:

President, Cass Gilbert.

First Vice-President, John M. Donaldson.

Second Vice-President, William A. Boring.

Secretary and Treasurer, Glenn Brown.

Directors, Frank Miles Day, R. Clipston Sturgis, George Cary.

Auditor, James G. Hill.

Fellows, Howard Van Doren Shaw, Herbert D. Hale, Benjamin S. Hubbell, Albert Kelsey, C. L. W. Eidlitz, H. V. B. Magonigle, Claude Bragdon.

Following the report of the Committee on Proposed Bureau of Fine Arts by S. B. P. Trowbridge, chairman, a resolution was adopted authorizing the report of the committee to be printed apart from the proceedings of the Institute and the committee be continued. A resolution was also adopted that the Board of Directors be instructed to pursue by the appointment of a committee or otherwise "such a course as will tend to promote a better understanding on the part of the public of the nature and scope of an architect's services and of the aims of the Institute and of the profession in general."

Papers were then read by A. O. Elzner dealing with the "Artistic Treatment of Concrete," and by C. Howard Walker on the "Artistic Expression of Steel and Concrete," which are printed at the end of this report.

Report of Committee on Schedule of Charges.

Numerous resolutions were then considered, after which the members took up the report of the special Committee on the Revision of Schedule of Charges. This is of such wide interest that we publish the following copious extracts:

The architect's professional services consist of the necessary preliminary conference and in the preparation of studies, working drawings, specifications, large scale and full size detail drawings, and in the general direction and supervision of the work, for which, except as hereinafter mentioned, the minimum charge, based upon the total cost of the work to the owner, is as follows:

On the first $10,000 of cost, or any part thereof ....10 per cent.
On the second $10,000 of cost, or any part thereof .... 7 per cent.
On the next $30,000 of cost, or any part thereof .... 6 per cent.
On any balance of cost .... 5 per cent.

As residential work usually requires a greater amount of service on the part of the architect than is required for buildings of other character, it is usual and proper to make the charge for such work at a higher rate than for ordinary work.

For landscape architecture and for furniture, monuments, decorative and cabinet work, alterations to existing buildings, the minimum charge is 10 per cent. In many instances this is not remunerative, and it is usual and proper to charge a special fee in excess thereof.

Where an operation is conducted under more than one contract, a special fee is charged in addition to the above schedule.

Consultation fees for professional advice are to be paid in proportion to the importance of the questions involved and services rendered.

Where the same set of drawings and specifications is used for more than one building erected at one time under one contract, the usual charge is made for the first building, and a modified charge for the repetitions; but this basis of charge does not apply to recurrent parts in a single building, for which the full commission is charged on the total cost.

None of the charges above enumerated covers alterations and additions to contracts, drawings and specifications, nor professional or legal services incidental to negotiations for site, disputed party walls, right of light, measurement of work, or failure of contractors. When such services become necessary, they shall be charged for according to the time and trouble involved.

Where heating, ventilating, mechanical, structural, electrical and sanitary problems in a building are of such a nature as to require the assistance of a specialist, the owner is to pay for such assistance. Chemical and mechanical tests, when required, are to be paid for by the owner.

Necessary traveling expenses are to be paid by the owner.

Drawings and specifications, as instruments of service, are the property of the architect.

The architect's payments are due as his work progresses in the following order: Upon completion of the preliminary studies, one-fifth of the entire fee; upon completion of working drawings and specifications, two-fifths; the remaining two-fifths being due from time to time in proportion to the amount of work done by the architect in his office and at the building.

Until an actual estimate is received, the charges are based upon the proposed cost of the work, and payments are received as installments of the entire fee, which is based upon the cost to the owner of the building or other work, when completed, including all fixtures necessary to render it fit for occupation. The architect is entitled to extra compensation for furniture or other articles purchased under his direction.

If any material or work used in the construction of the building be already upon the ground or come into the owner's possession, its value is to be added to the sum actually expended upon the building before the architect's commission is computed.

In case of the abandonment or suspension of the work, the basis of settlement is as follows: Preliminary studies, a fee in accordance with the character and magnitude of the work; preliminary studies, working drawings and specifications, three-fifths of the fee for complete services.

The supervision of an architect (as distinguished from the continuous personal superintendence which may be secured by the employment of a clerk of the works) means such inspection by the architect, or his deputy, of work in studios and shops, or of a building or other work in process of erection, completion or alteration, as he finds necessary to ascertain whether it is being executed in general conformity with his drawings and specifications or directions. He is to act in constructive emergencies, to order necessary changes and to define the true intent and meaning of the drawings and specifications, and he has authority to stop the progress of the work and order its removal when not in accordance with them.

On buildings where the constant services of a superintendent are required, a clerk of the work shall be employed by the architect at the owner's expense.

A special vote of appreciation and thanks was tendered to various committees for their "arduous and efficient services" and retiring President Frank Miles Day was presented with a gavel suitably inscribed. After brief discussion on other matters the convention adjourned.

ARTISTIC EXPRESSION OF STEEL AND CONCRETE.

BY C. HOWARD WALKER.

THE artistic use of steel and reinforced concrete is considered a new problem in architectural design. Is reinforced concrete new in the elemental factors of structure and to what extent? Its main factors are vertical supports and horizontal loads (in which it resembles Greek structure), both of which are reduced in cross sections to areas less than in any other construction. It has no structural arch, though it has curved trusses or beams, in which it does not resemble Roman structure. It has continuous vertical factors with the horizontal factors inserted between (in which it resembles much of Gothic structure), and it has horizontal planes in its floors, which appear on the façade, in which it is in no way unusual. What are the differences, apart from the areas of its cross sections, between it and other structures?

First, it is made up as far as its vertical factors are concerned of slender piers; second, as far as its horizontal factors are concerned, by beams of great possible span; and both piers and beams are each homogeneous, not built up of separate blocks, as in stone or brick work, and, therefore, corbels are inconsistent. A reinforced concrete structure is therefore a pier and beam structure of slender supports and long spans, its intercolumniation being much greater than in any previous type of building, and from our constant association with shorter spans the beams seem weak.

The openings between the piers are unusually large, the whole structure appearing to be slight and undeveloped. Up to this point the choice of treatment seems to be merely as to whether the continuous vertical supports shall be announced, or the successive planes of the floors. The decision as to which of the two methods of expression shall be adopted depends entirely upon the location of the building and upon the proportion of its hight to its width. Isolated buildings of great hight may well be treated with long vertical lines, but if it is associated with other buildings in the same block, as is ordinarily the case, the building requires a horizontal treatment, and its assertion of vertical lines is overwhelmed by the length of the base line of the block. Also the vertical lines are ineffective in shadow, since they can have but slight projection, and are merely surface indications of interior structure and not buttresses. Horizontal lines, on the contrary, always produce shadows. In most cases, therefore, the treatment of reinforced concrete buildings by horizontal lines announcing their floors is better in relative proportion to adjacent buildings, and affords stronger evidence of purpose than does the exaggeration of the verticals.

Treatment of Lintels.

The apparent weakness of the long lintel has been mentioned. This can be modified in several ways, either by crowning the center, which is of little value in long spans, and is inconsistent with the concealed structure, or by arching the lower line of the lintel, or by bracketing at the piers. The cornice is capable of any treatment which does not suggest stone corbels or modillions. The next problem is that of the necessary filling treatment of spaces between factors of main structure and of the openings between the piers and the successive floors. This is manifestly a screen only, whether of plain surface or of fenestration. It supports nothing. As its structure is unimportant and can be done in many ways there is no reason that it should be announced than that the palm of a man's hand should announce the bones beneath. The suggestions for this secondary treatment of curtain walls between main structural factors may either be derived from minor structure or may be surface ornament only. If from minor structure it is probable that it will evolve into a system of slightly recessed vertical panels. As the vertical factors in the structure are usually more in number than the horizontal ones, and as these factors are slender, the stiles of such paneling should be narrow. If, on the other hand, the surfaces are not to announce the minor structure they may either be plain or have surface ornament in the form of all-over patterns, low relief, mosaic or aggraffito, care being required only that the scale of the pattern or relief shall not be so great that it cannot be apparently readily carried by a thin wall. The basis of the structure being concealed and protected metal all important structural parts of the building can readily be announced in the openings by grilles or delicate metal fenestration. Excellent opportunity and great latitude in design are possible, therefore, in the subdivisions of the openings, either in cast or wrought metal, such detail being an admirable contrast to the other type of ornament of the concrete. The main surface of a reinforced concrete building is of concrete, a material which is homogeneous, has no joints and is actually a thin skin to the structure, but sufficiently thick to cover and disguise the joints of the structure. It has, moreover, been more frequently used as a surface than any other material, and when finished with stucco, as with the Egyptians and Greeks, it presented a surface which admitted of equally the most vigorous and the most delicate polychromy. Concrete surfaces also permit the insertion of fragments of other material—marbles, metal or glass or tiles—embedded in it in patterns. Entire veneer of these, however, which entirely concealed the concrete, seem unsufficiently supported, unless they have their own independent system of apparent structure.

The Placing of Ornamental Detail.

Ornament in architecture accents the component parts, either of the structure or of the composition of the façade. That which accents the component parts of the structure either accents the joints or indicates the interstices of structure. The accenting of joints is usually performed by moldings or by concentrated spots, such as rosettes and capitals. The indication of filling of interstices, such as tympana, spandrils, panels, &c., any of which could be removed without jeopardizing the structure, is usually by ornamental patterns. The position of ornament in reinforced concrete is not different from that of any articulated structure, but there are larger interstices—that is, larger surfaces of nonsupporting wall, therefore, it is not inconsistent that these surfaces, if ornamental at all, should be more generally ornamented than in stone buildings. The general effect of reinforced concrete structure is that of lightness, of delicacy. Its moldings and ornament should correspond in character. The chief problem is to prevent an effect that is trivial and that lacks stability. Wrought metal grilles and balconies, elaborate fenestration, polychromy and surface modeling (both focused) all afford opportunities for the embellishment of a system of structure which is devoid of large piers, deep reveals and heavy shadows. A reinforced building is very apt to express itself tolerably well if none of the architectural detail applied to it is in imitation of stone, brick or wood forms, if its metal ornament is wrought, and its concrete ornament plastic, or mosaic, or painting.

The introduction of color into concrete structures is worthy of careful consideration. Any general tinting of the concrete is naturally light in tone, but apart from the insertion or incrustation of other colored materials, whether mosaic or glass, marbles, or clay glazed or unglazed products, presents an opportunity for interesting design. The concrete surface, however, being without joints and giving no indication of thickness does not seem capable of carrying large blocks of material imbedded in it, and colored designs are best, of assembled small factors. The main contention of this paper is that the æsthetic treatment of steel and concrete is not one that necessitates strange and bizarre forms or detail, but one that recognizes lack of shadow and delicacy of proportion of structure to areas.

ARTISTIC TREATMENT OF CONCRETE.

BY A. O. ELZNER.

THE great antiquity of concrete as a building material would justify a search for early examples of its use in architectural expression. But apparently this remarkable material, which, after all, is only just beginning to reveal its ultimate possibilities, was used by the ancients only for the baser purposes of piling up masses of masonry, or at best, as a backing for stone and marble facings. The first suggestion of its fitness for artistic expression came when the builders of the Renaissance undertook to construct their architectural features of cement mortar. There is undoubtedly a great fascination in being able to mold a thoroughly plastic material as cement mortar into any desirable form, or even to shape it by hand before it sets up hard, and so produce creditable work of decorative sculpture. In fact, this is being done rather extensively even at the present day. But one invariably suffers a genuine shock upon discovering that a thing is not what it seems, and that beautiful, stately colonnades or arcades and porticoes, well designed and in style, are not built of stone, as one naturally expects to find them, but that it is all sham; that we are looking at a thin veneer of cement mortar, which, at best, is but a temporary device, a sort of makeshift, calculated to mislead and deceive. It would be difficult to estimate the power or extent of Ruskin's influence in bringing about a restoration of truthfulness in design. While it cannot be said to have extensively affected immediate and tangible results, it did set men to thinking, and it is only in recent years, within the present generation in fact, that this subtle influence is gradually asserting itself, and naturally bringing about a renewal of real artistic inspiration. It is hard to depart from beaten paths, and men as a rule will not and cannot, until some genius boldly cuts a new way. It is hard to give up the old familiar forms that have become a veritable architectural alphabet, which seems to most of us entirely sufficient for the expression of our ideals. And now that we have entered upon an era of concrete construction, and that, too, with a suddenness and determination that is thoroughly and typically American, we cannot reasonably expect designers to throw aside all tradition and make a new style. That will take time. Nevertheless, they are gradually coming to recognize in concrete a material that will afford abundant opportunity for originality and individuality, and, accordingly bold excursions have been made into the new field with creditable results. Concrete as it is used in the superstructures, being the only kind which we are considering, is based upon the use of a small aggregate, about 1 in. and less in size, and mixed wet so as to make a solid, dense mass; this produces a soft, plastic material which should be mixed by machine to produce the best results. This, on the other hand, cannot be economically done unless large quantities can be used without serious interruption; it follows naturally that such a structure is more or less perfectly monolithic in character, and at once this feature becomes the dominant note of the structure. Monolithic is freedom of joints or even semblance of joints; this idea should be expressed in our concrete designs, and it should be the dominant characteristic. To accomplish this successfully we should endeavor to treat wall surfaces in masses as large as possible. They need not necessarily be kept entirely plain, although this would depend upon the nature of the design.

Treating Large Surfaces.

In cottage work and small buildings generally, such large plain surfaces are perfectly delightful, especially when given a rough finish. This can be accomplished in various ways. First of all the concrete may be left just as it comes from the molds. In this case the aggregate should be quite small, not over ½ in., and the mix should have the minimum allowance of water, making what is called a dry mix. In doing this, however, there is great danger of the wall not being waterproof, so that if possible such a mix should be used directly against the forms and the balance of the wall made of wetter, richer mix and of fair thickness that will prove sufficient to be waterproof; or else this rich concrete may be used throughout and the forms removed before the final set, and the skin of the concrete removed with water and a good stiff wire brush, or with acid. But with all such treatments there is always the danger, as first indicated, of having a damp wall, especially where it is not very thick, as is apt to be the case with reinforced concrete. Practical consideration, however, must finally govern. Under such conditions it is, therefore, advisable to plaster the concrete wall with a good coat of waterproof mortar and give this a rough finish by the various methods at hand, such as brooming or floating with a rough carpet covered float, or strippling, or pebble dashing, or spatter dashing, all of which methods are commonly understood. The fresh mortar thus applied may be modeled by hand, producing some simple ornamental design, naturally in low relief. Advocates of polychromatic architecture, too, have here splendid opportunities of using tile or faiense, which may be applied to the surface with telling effect, provided that it is used sparingly and entirely as a subordinate, so as to emphasize the character of the concrete and enhance its beauty and effectiveness. In large massive work the surface may be broken by raised or sunken work, such as panels or ornaments, cast directly in the concrete by applying reverse molds on the inner surface of the form work. Cornices and band courses or other simple architectural features may be fashioned in a similar manner. Although in such work, if small members are used, the concrete should be mixed quite wet, or else a rich mortar should be first deposited against the forms before the concrete is poured in; this would avoid the danger of honeycombing on the finished surface and the necessary patching resulting therefrom. Such mortar should be mixed with some waterproof compounds to prevent blotching or staining. A recently introduced waterproofing material is a liquid solution of iron, which is applied to exposed concrete surfaces and soon oxidizes, turning to a beautiful spotted nut-brown, the familiar color of old iron rust. Such a treatment would be charming if applied to a picturesque cottage; in fact, it might be used to good effect upon large wall surfaces in more pretentious work. In any event, it could be safely done and with perfect propriety from an artistic standpoint. However, it is not our purpose nor our province here to exhaust the subject of the proper or possible treatment of wall surfaces nor to attempt to prescribe any definite or final formulæ or principles of design. We can only hint at them now, for they must finally be left to the slow but certain process of evolution.

The Practical vs. Theoretical.

To summarize them, our subject of the "Artistic Expression of Concrete" presents to us two phases, the practical and the theoretical; the former just passing from its infancy to its childhood period, if such an expression may be permitted, and the latter being as yet in a decidedly nebulous condition. If we are to proceed on the assumption that a distinct individuality of style can ever be imparted to concrete construction, and this seems to be the substance of this discussion, then, in reviewing the practice of this new art, we must agree that the designers have proceeded too hastily, with too much lack of consideration, and that they are not doing justice to themselves or to the material in clinging too closely to the architectural forms that have been evolved by centuries of gravity construction. On the other hand, in considering the theory we cannot but feel much sympathy for such designers, for they are hard pressed by the extreme revolutionary character of our new material. Concrete being structurally serviceable only in its reinforced form, implies practically monolithic construction, and its economical use compels the economical design of its members and the consequent use of high unit stresses, many times in excess of those in brick and stone masonry. It is primarily an emergency proposition, and while we are not wont to credit engineers with much artistic instinct, we must admit that they are doing much toward guiding designers to the path which will eventually lead them to a true concrete style. This is especially the case in bridge work. Hitherto they have struggled in vain to produce anything artistic in the design of steel bridges; but now they are revelling in our new material and beautiful designs in concrete bridges are quite common. It seems strange that we have been so very slow in this country to take up concrete for the construction of our houses.

Concrete for Houses.

We certainly have not wanted for precedents. In fact, years ago, before concrete was scarcely thought of, Messrs. Carrere & Hastings, as you all know, constructed numerous buildings in St. Augustine, Fla., in which they used concrete made of the local coquina rock, very white and beautiful, notably among those was the Ponce de Leon, a beautiful design in Spanish style. It is not altogether unlikely that the boldness of this departure, together with the practical difficulty of construction, and possibly the unusual delicacy of the details in this work, were the cause deterring architects from following such a lead. For, after all, simplicity of treatment is the real secret of the successful concrete design, and we may gain hope from the cement and plaster work, which is being executed rather extensively in all parts of the country. In fact, much of this work might just as well have been executed in solid concrete. The style is generally good and is finding favor with concrete designers, who are eagerly adopting it in much of the new residence and miscellaneous work, to which this is so admirably adapted, and it appears to be the natural solution of this phase of our problem, and we easily recognize its influence in the best examples of recent solid concrete work. Nevertheless, it is highly probable that our concrete architecture will carry with it for some time to come the practice of design in all current styles, or no style at all, and that if we would ever expect it to assume a really artistic expression it will be found only in isolated examples, produced now and then by some genius with the divine spark, as is the case with all true works of art.

CONSTRUCTION AND COFFERING OF DOMES OR CUPOLAS.

BY C. J. MCCARTHY.

THE word "dome," derived from the Latin *domus*, a house, is employed to signify the exterior form of a vaulted roof springing from a polygonal, circular or elliptical plan. Domes are frequently used to cover vaults, the concave ceilings of which are termed cupolas from their resemblance to an inverted cup. Sometimes the dome or exterior surface coincides in form with the cupola which it covers, but in constructions in carpentry the dome frequently does not indicate the internal form of the vault.

Domes in carpentry are composed of a certain number of ribs placed vertically in planes, which in spherical domes would if prolonged pass through the vertical axis of the dome. When the surface of the dome is a surface of revolution all the ribs have the same exterior contour or profile. In domes on polygonal plans the angle ribs at the intersections of the sides alone are in planes, which pass through the axis. The ribs generally spring from a wall plate or curb forming a ring laid on the walls which support the dome, and this ring should be made sufficiently strong to resist the lateral thrusts of the ribs so the walls may have to support the downward pressure or weight only of the dome.

The central point in the curved surface of a dome is called its pole or center. The imaginary straight line drawn from the pole to the base is its axis. When the hight of a dome is greater than the radius of its base it is said to be *surmounted;* when less, *surbased*. When there is an aperture at the pole of a dome it is called its eye.

We will commence with an oblong surbased dome on a rectangular plan. Referring to Fig. 1 of the diagrams the plan marked No. 1 shows the mode of placing the ribs, while No. 2 represents a section across the shortest diameter of the plan. No. 3 being a section on the line of its longest diameter. The curve of the rib E *n e n* F, and all of the ribs parallel to it is found by dividing the segment C *n e n* D of No. 2 into a number of equal parts, and drawing lines from the divisions to meet the diagonal A B of No. 1 in the points *i, j, k, o, p,* &c., and from those points drawing lines parallel to C D, cutting E F and produced indefinitely; then transferring the hights of the ordinates on C D, as *a* 1, *b* 2, *c* 3, &c., to the corresponding ordinates on E F.

The curve of the diagonal ribs A *v* B is also found in the manner above described, as the lines show. The position of the purlins *n m n* and their projections on the plan are found by drawing lines from their sections at *n e n* to meet the diagonal A B *l m*.

Referring now to Fig. 2 the plan and section of a hemispherical dome are shown by Nos. 1 and 2, respectively. In Nos. 1 and 2 of Fig. 3 are shown the section and plan of a dome which is half of a prolate spheroid on a circular plan. The corresponding parts in these plans and sections are connected by dotted lines, and so plainly indicate the construction that no detailed description would appear to be necessary.

In Fig. 4 is shown the manner of obtaining the curve of the rib, which is elliptical in profile. Let H I represent the major axis, G D half the minor axis and E F the foci, to obtain which take D as a center, with half the major axis as a radius, describe an arc cutting the base line in E and F. Mark off at random on the base line the points 1, 2, 3, 4, 5 between E and G; then with F as a center and with radii I, 1, 2, 3, 4 and 5, describe the arcs 10, 9, 8, 7, 6. Then with E as a center and with radii H, 1, 2, 3, 4, 5, describe the arcs 11, 12, 13, 14, 15 and 16. A line drawn through the points of intersection of these arcs gives the curve of the rib.

This diagram also shows the manner of dividing the vault into panels. Describe the semicircle A *a b b' a'* B, which represents the half plan, and within it draw the triangle *a c a'*, representing the panel, and *b c b'*, representing the rib, as divided from the plan. Now from the points *a, b, a', b'*, draw lines perpendicular to the chord *a a'*, meeting the base line H E G F I in *c, x, x, c,* and erect the triangles *c* D *c* and *x* D *x*. Having fixed the hight of the bottom rail, as *m*, draw the line *d u m*, cutting the triangle *c* D *c* in *d* and *u*. Bisect the angle *d u* D and draw the diagonal line *u e*. From *e* draw the line *e f n*, cutting the profile of the vault in *n*, which point is the hight of the first panel.

Again bisect the angle *e f* D, and draw the diagonal *f g*. From *g* draw the line *g h o*, cutting the profile of the vault in *o*, which point is the hight of the first mullion or horizontal rib. By proceeding in this manner and bisecting all the angles as they are formed by drawing

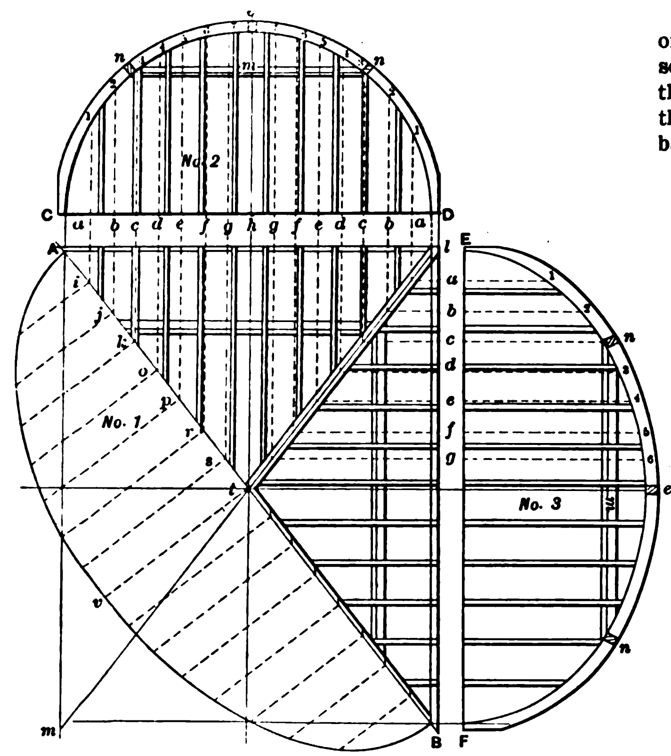


Fig. 1.—An Oblong Surbased Dome on a Rectangular Plan.

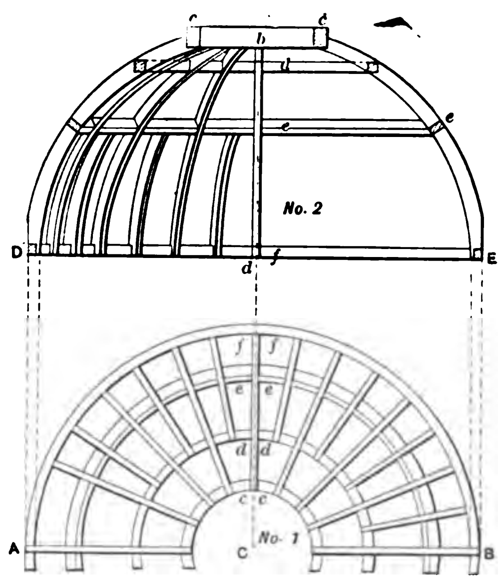


Fig. 2.—Plan and Section of a Hemispherical Dome.

Construction and Coffering of Domes or Cupolas.

the horizontal lines, the hights of the remaining panels and mullions may readily be found.

To determine the lines forming the sides of the mullions draw lines from the foci E and F through the points *m, n, o, p, r, s, t,* successively, as shown by the dotted lines, forming the angles 9*m y*, W *n v*, &c., on the exterior profile of the vault. Bisect these angles, and through

between which is equal to the ribs between the panels. Produce the side of the cone C D of the section No. 2 so as to cut the perpendicular line *b'* F in the point *e'*. Now from *e'* as a center describe two circles, *c d* and *f g*, equal in size to the circles *b b'* and *a a'* of the plan No. 1. Through the center *e'* draw the line B *e'* perpendicular to the side of the cone C D and cutting the axis C E produced in B. Draw also B *f*, B *g*, B *c* and B *d*.

Next, to find the hight of the first horizontal rib in the section No. 2, proceed as follows: Through the point D draw a line as *o* D *l* parallel to B *g* cutting the produced axis in *o*. Now with F on the line *b'* F as a center describe the circle *k l*, making it equal to *f g*, cutting the side of the cone in *h*, which is the hight of the first horizontal division. Through the point *h* last found draw the line *n h o* parallel to B *d*. From the center G on the line *b'* F describe the circle *m n* equal in size to *b b'* and having *n o* for its tangent. Join *m o*, and the point where this line cuts the side of the cone is the hight of the first panel. Proceed in this manner with all the circles shown above in the diagram and marked F G until all the required divisions are made.

Our next step will be to describe the manner of dividing a Gothic vault. A portion of the plan of the vault is indicated in that portion marked No. 1 in Fig. 7, the point C being on the line of the axis produced. The width of the panel is indicated by *a a'*, while *b b'* represents the width of the rib between the panels. From the center *d* are drawn the circles *e e'* and *f f'* touching the lines C *a*,

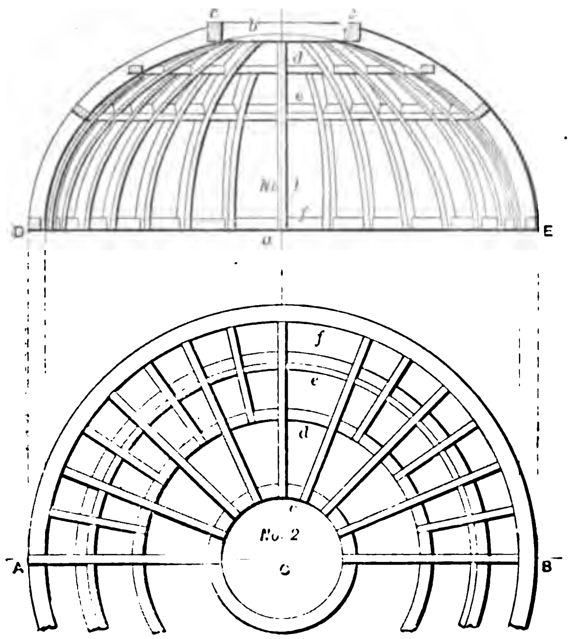


Fig. 3.—Section and Plan of a Dome Which Is Half of a Prolate Spheroid on a Circular Plan.

their points *m, n, o, p,* &c., draw lines cutting the vertical axis in G 9' *z*, &c. These lines give the sections of the mullions or horizontal ribs.

The next phase of the subject which we will consider is a surbased dome upon an octagonal plan. In Fig. 5 the position of the ribs is shown on the plan view marked No. 1, also the manner of finding the curve of the angle ribs. In No. 2 is presented a section taken on the line A B of the plan. On the plan the rib standing over C G is drawn at G, 1, 2, 3, 4, *c* and divided into equal parts, from which ordinates are drawn to the chord line and produced to the line of the angle rib H I. From the points *h, i, k, l,* in which these intersect H I, the seat of the angle rib ordinates are drawn, and the hights F *c*, *d* 4, *e* 3, &c., being transferred to them, give the points through which the curve of the angle rib is to be traced.

Next in order is the manner of dividing conical, spherical and other domes into panels and mullions. Referring to Fig. 6, the portion marked No. 1 represents a part of the plan of a conical vault, while No. 2 represents a portion of a vertical section through its axis. Having divided the plan into a number of panels and ribs suitable to the designs, the hights of the panels and mullions or horizontal ribs between them are found as follows:

On A *e* of the plan or No. 1, draw the circle *b b'*, making it tangent to the generating circle of the vault and also to the lines A *b*, A *b'*. Through its center draw the line *b'* F perpendicular to A E. Also draw the small circle *a a'* tangent to the lines A *a* and A *a'*, the width

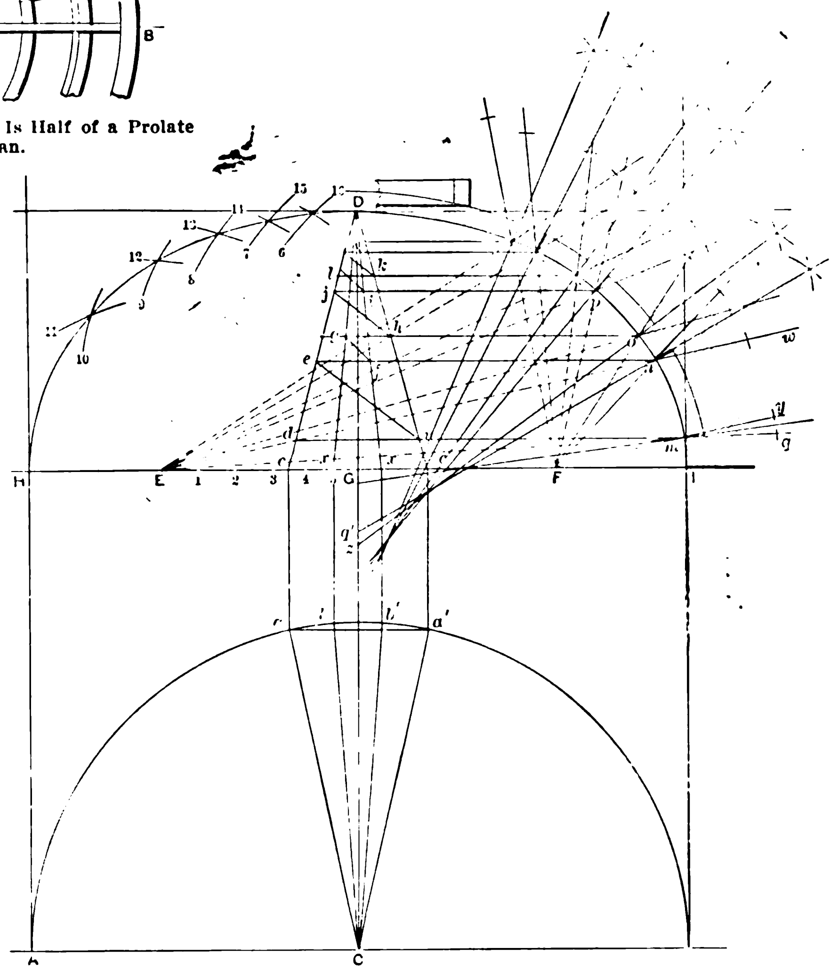


Fig. 4.—Manner of Obtaining the Curve of the Rib Which Is Elliptical in Profile.

Construction and Coffering of Domes or Cupolas.

C *b*, C *b'* and C *a'* produced. On the line drawn through *d* perpendicular to C *d* the centers of the other circles are found. Having determined the commencement of the divisions, as at C in No. 2, describe from that point as a center the circle *d d*, equal in size to the circle *f f'* of No. 1. Now through *c* of No. 2 draw a line *c b* to the point from which the arc forming the side of the vault is described cutting the axis in *c*. Through *c* from the circumference of the circle *d d* the tangents *c d* and *c d* are drawn producing them beyond the center *b*, and between which describe the smaller circle *g g*. Now through the point *f* where the line *b c d* cuts the arc of the vault and which gives the hight of the first division draw *g f e*. From D as a center describe the circle *e e* equal in size to *e e'* of No. 1 and touching the line *g f e*. Through its center draw the line D *b* to the center of the arc of the vault cutting the axis in *c*. Through *c* draw the tangents *c e* and *c e*, producing them to a point beyond *b*. Now from *b* as a center describe between them the circle *h h'*. It will readily be seen by inspection of the diagram how the tangents determine the position of the circles D' D'' D''', C' C'' C''' on the vertical line C *d*, and how by their intersection with the profile of the vaults the hights of the divisions are found.

To determine the hights of the divisions of a spherical vault, we proceed in the following manner: Referring to Fig. 8 of the diagrams No. 1 represents a portion of the plan of a spherical vault one-half, showing the paneling and the other the mode of framing. In order to accomplish what is desired we produce the meridian lines *d b*

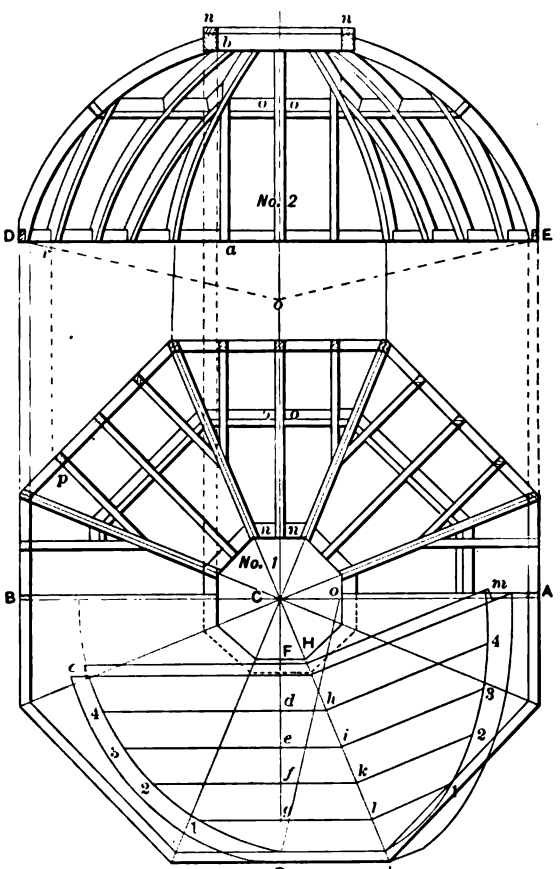


Fig. 5.—Showing the Position of the Ribs and the Manner of Finding Their Curves in a Surbased Dome Upon an Octagonal Plan.

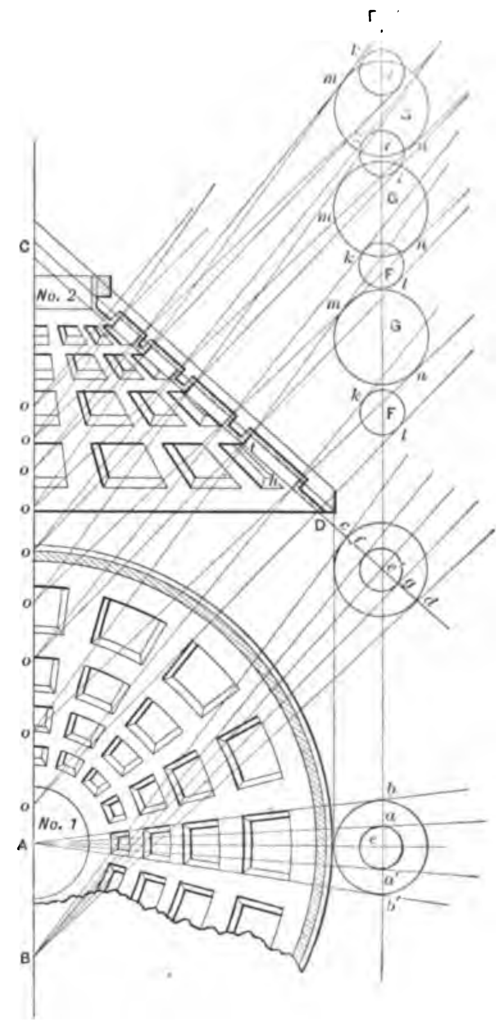


Fig. 6.—Partial Plan of a Conical Vault and Vertical Section Through Its Axis.

Construction and Coffering of Domes or Cupolas.

and *d b'*, representing the width of the panels, and draw the circle *b b'* touching the generating circle in G, and the lines *d b* and *d b'* in *b b'*. Draw also the lines *d c* and *d c'* representing the width of the rib between the panels. Describe the circle H through the center of which at *a* draw the line *a b'* indefinitely and perpendicular to *b a*. Now having fixed the first horizontal division on the profile of the vault, No. 2, we draw through it the lines E *m m*, also the circle H touching it in *m* and the larger circle G touching it in *n*, and being equal respectively to the lesser and greater circles in No. 1. Then draw the second line E *m n* tangent to the circle G and describe the circle H' touching this line in *n*. So proceed drawing the tangents and the circles H and G alternately and the intersections of the tangent with the profile of the vault determines the hights of the divisions.

(*To be continued.*)

Damp Cellars and Their Prevention.

Dampness is the chief enemy of mankind. Where there is dampness there is decay, where there is decay there is disease, where there is disease there is death. Eliminate dampness and fully one-half of the ills that flesh is heir to disappear. Those who have or are told that they have the germs of disease go to sections of the country where there is little or no rain and water is at a premium, while low lying, ill drained, swampy regions are the abodes of fever, ague, rheumatism and consumption.

Foul odors in houses that have been kept closed for a time are invariably due to dampness. The odor is not dampness but the evidence of dampness, and the most common place for a dampness to accumulate is in cellars and basements. To be damp, it does not follow that water must collect in sufficient quantity to form pools and small streams in those parts of the building constructed below the surface of the ground. Moisture is continually coming through and the warmth of the rooms above creates a draft that draws the cellar air—impregnated with odors—up into the house, producing that damp, unaired smell that is not only very unpleasant but injurious to the health of the occupants of the building.

One often hears that "good drainage" is the one thing needful, but while good natural and artificial drainage are by no means to be despised, indeed, they are essential to the welfare of human beings, they do not counteract the natural tendency of moisture that is in the ground, even in what is called "dry" ground, to find its way into openings whether they be cellars, basements, caves, mines or mausoleums.

Much thought and careful study and experimentation have been given to the subject of excluding dampness, from the antediluvian time when the patriarch Noah pitched the ark within and without to the present day, and many methods have been placed on the market. Some of them have merit, while others do not stand investigation either theoretically or practically. Some give good results when under ideal conditions, but fail when placed in the hands of men not having special skill and expert knowledge.

Acting on the principle that an ounce of prevention is worth a pound of cure, the time to dampproof a building is while it is being erected, says G. W. Kirwan in a recent issue of *Waterproofing*. There is nothing difficult or complicated about using a good material to exclude moisture from buildings. It is contrary to reason to apply any kind of preparation to the inside of a cellar wall and expect the house to be dry. The moisture will still be in the walls, and if the dampproofing preparation is able to keep it from coming through vertically it will travel horizontally, rising directly into the first floor, so that the last state of the house will be worse than the first.

The preparation should be applied on the footings as soon as they have been completed and the walls built on top of it; this prevents moisture rising by capillary attraction. After the walls are built and have become dry the preparation should be applied on the outside surface and carried well above the grade level, special attention being paid to having a good bond between that which has been applied over the footings and on the walls. Then the space between the walls and excavation should be filled in with earth, care and precautions being taken not to injure the dampproofing material. On the cellar floors the dampproofing should be applied between two layers of concrete, the same care being taken to unite the floor damp course with that over the footings, as with that on the outside wall. It is, of course, important to see that the concrete immediately on top of the damp course on the floor does not puncture the latter; if there are holes in the waterproofing it is certain that moisture will find its way through. Therefore, a safety coat of cement mortar should always be used on top of the damp course, and the concrete upon which the waterproofing is placed should be tamped down as smooth as possible.

If the dampproofing be carried out in the above manner it will be seen that the basement has been converted into a waterproof pan, and an absolutely dry cellar will be obtained. This scheme will be found of great practical value for builders and house owners generally, especially in the suburban and rural districts, where houses are often so located as to have damp cellars.

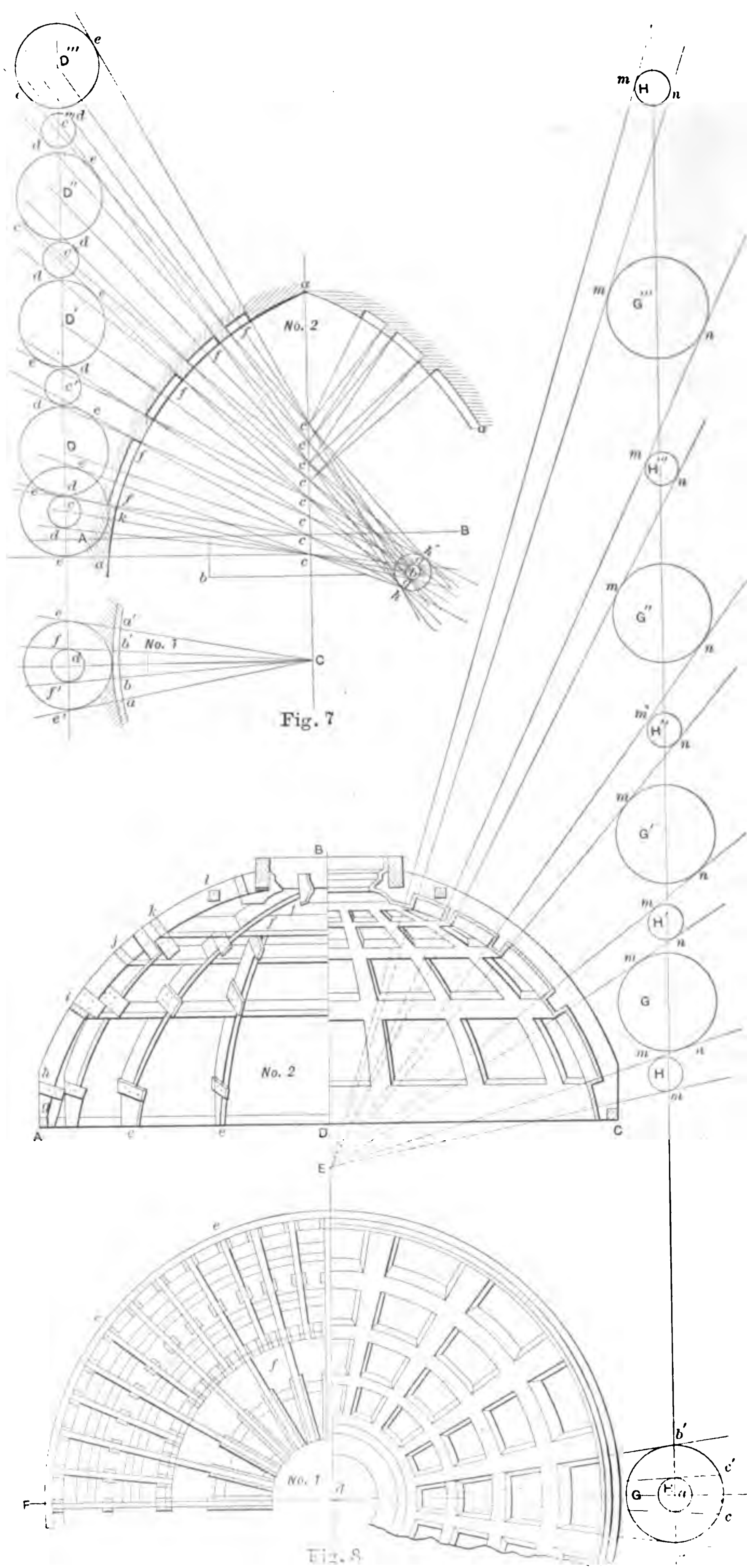


Fig. 7.—Manner of Dividing a Gothic Vault.
Fig. 8.—Determining the Hights of the Divisions of a Spherical Vault.

Construction and Coffering of Domes or Cupolas.

DECORATING THE EXTERIOR OF CONCRETE STRUCTURES.

BY CHARLES J. FOX, PH. D.

ONE of the most interesting of the many problems that have arisen in connection with the rapid extension of concrete construction is the method of decorating the exterior of buildings. The problem is all the more important, as there is no element of decoration contained in the material itself. The cold, gray surface of cement is necessarily uniform and somewhat monotonous, even more so than ordinary stone. It lacks the veining and tinting characteristic of marble and other natural stones, and its monochrome surface is not relieved by being broken up into individual pieces, except where concrete blocks are used in imitation of stone. In this case, where cement attempts to assume the character of a material which it is not, the disagreeable impression left by the discovery of the attempted deception of the imitative material, is stronger than the objection which it tries to relieve. Cement lacks, furthermore, that yellowish cast so often met with in stone which as a faint and almost imperceptible suggestion of warmth relieves the cold appearance of inorganic building materials.

Form and Color as Factors.

The two great factors in decoration of any kind are form and color. In attempting to decorate concrete buildings experiments have been made along both these lines. In view of the limitations of concrete it is easy to understand why the efforts in ornamenting the building by architectural form should have been much more successful than the attempts to supply the decoration by color effects. In the ornamentation of concrete it is quite natural that form should predominate. Concrete is a plastic material that is formable, and which can be easily molded. The fact that it can be given form without the labor of cutting, hewing and placing is one of the greatest technical advantages of the material and the one which, above all others, has added to its utility as a building material. Before the concrete or cement is set, it can be molded into almost anything from the most massive engineering works to the most delicate architectural members. Anything within the range of form, from the simplest lintel to the finest statuary, can be executed in concrete or cement. This fact added to the numerous improvements in reinforcing the material so as to overcome its lack of tensile resistance, suggests possibilities in the application of concrete, which even to-day no one would care to define or limit.

Although from the very nature of the material, form must necessarily be the predominating factor in its decoration, it is nevertheless imperative to make some use of color in all concrete buildings where architectural effect is desired. This use of color should not be radical; but in merely adding a touch here and there by means of friezes or other small designs it should emphasize the architectural forms and relieve the gray monotone appearance of the cement. Although almost any color will harmonize with the soft gray of cement, in this country where color decoration is not used to any great extent the different tints and shades applied to the cement surface should be inconspicuous. One of the reasons which makes a red tiled roof so appropriate on concrete buildings is that the color unconsciously relieves the monochrome appearance of the rest of the building. In cities, however, the roof of the building is hardly visible. Consequently the color effect must be applied to the exterior walls.

The problem of color decoration of concrete has led to many experiments in this country and in Europe in the mixing of pigments with the cement. This operation has been successful only to a limited extent, and its commercial value is seriously hampered by its expense. The alkaline character of the cement destroys all colors except lampblack, red ironstone or the quite expensive green oxide of chrome.

Since, therefore, the color cannot be added to the material itself, it must be applied to its surface. For numerous technical and artistic reasons the most successful method of accomplishing this is to use ceramic tile, either glazed or unglazed, or in the form of mosaic. The extreme durability of the baked clay tile, its decorative possibilities, the fact that it cannot absorb dirt or moisture, and its chemical affinity for Portland cement, with which it unites better than any other materials, all combine to make it the most appropriate decoration for concrete structures.

The durability of tile is demonstrated by the fact that there are in existence to-day in many European museums tiles that were baked thousands of years ago and have been dug up from the ruins of Babylon and other ancient cities, which are still in an excellent state of preservation. Many English and other European cathedrals have tiled floors that were laid during the Middle Ages and which are still in use. It can be truthfully said that there is no building material which withstands the ravages of time better than the hard baked clay. Many of the best archæological indications of prehistoric races are given by the fragments of pottery and other baked clay materials which have been found in their mounds, caves or primitive dwellings.

The decorative possibilities of tile are almost unlimited, as the plastic clay out of which they are made can be molded into almost any shape, and by the selection of clays and the addition of metal oxides they can be baked in numerous colors, shades and tints. Almost any conceivable design or color scheme can thus be worked out in the clay material by using either ordinary tile or ceramic mosaic, which is merely tile in which the individual pieces or "tesseræ," as they are called, are minute. The designs which can be executed in tiling range from the simple geometric patterns in one or two colors, and composed of pieces measuring as much as 6 to 9 in., to the most elaborate ceramic mosaic pictures, in which the individual pieces of clay are cut by hand in any desired shape and can be selected in almost any shade or tint.

The Clay Tile.

The clay tile is a very dense material, and in the glazed or vitreous forms is absolutely nonporous. Even the ordinary unglazed tile that have not been baked to a thoroughly vitreous state absorb very little moisture. This nonporous character of tiling prevents it from absorbing the dust and other dirt which is necessarily deposited upon it. None of the ordinary acids will stain tiling. Smoke cannot injure it, and its traces can be removed from its surface as easily as soot is washed from a lamp chimney. The tile colors never fade, even though exposed for years to the direct rays of the sun. Each of these facts is an important consideration in the exterior decoration of buildings. Marble, granite and other natural stones are generally more or less stained and discolored by the dust and smoke laden atmosphere of our cities. This, however, is not the case with a tile surface, because every shower washes it thoroughly and restores its original brilliant color. Unlike paint or other superficially applied pigments the colored tile never has to be replaced or repaired. The fact that it cannot be stained and is easily kept bright and clean looking makes the tiled exterior decoration especially appropriate for shop façades, where the stores are located on the first floor or in the basement of buildings.

Another important factor in the relation between cement and clay materials is the special affinity which baked clay has for Portland cement, with which it unites in chemical combination and not by mere adhesion, which is simply a close union or bond that is easily parted by mechanical means. If a clay tile that has been properly set in Portland cement is broken from its foundation, it will be noticed that the line of cleavage runs through the cement and tile as if they formed but one body. In marble, slate and other materials that are applied to cement this is not the case. In pavement work the fact that the floor tile unites firmly with the cement is of great importance, and yet it is even more so in the case of tiling that is held suspended on the walls of the building, perhaps many feet from the ground, and at the same time exposed to the rigors of the elements.

The application of tile to the exterior of concrete structures is a new departure in American architecture, but it is an innovation that is becoming quite popular, and with the gradual increase in concrete construction is certain to become more so. The architect and tile contractor, however, should realize that in some respects the work on exterior of buildings is quite different from that on the interior. The tile floor and an interior wall covering is usually seen from a distance of only a few feet or viewed in perspective. Where the tile is applied to the exterior, especially on the upper stories of buildings, it is seen from a much greater distance. In exterior work the treatment should be on a far larger scale. The design should be in keeping with the other architectural details of the building. The tiles are usually set with bold broad joints, and the tile setter should have constantly in mind the appearance of the work when seen from the street and not from the scaffolding upon which he stands. In ceramic work, especially, a design which might be most appropriate for a floor or for walls of a room would often be completely lost if used as a frieze, panel or border on the upper story of a building.

In deciding what kind of a tile should be used, the architect should bear in mind that the glazed tile should be applied to the wall in such a manner that its porous body cannot absorb dampness. The glazed surface is of course absolutely impervious to moisture, and there is consequently no danger of the tile absorbing it from outside. But the body upon which the glaze is applied in the factory must of necessity be of a porous character. Consequently any dampness which passes through the wall is absorbed by the tile body, and if it freezes behind the glaze it will lift it from the surface of the tile. For this reason in exterior work, in climates where there is danger of frost, it is advisable to give preference to the unglazed tile or to ceramic mosaic, unless the glazed variety can be applied in such a manner as to give an absolute guaranty against dampness from within.

In summing up, it may be said that the decorative qualities of tile, its great durability, the fact that the tile colors never fade and are uninjured by the street dirt or smoke, and that the tile unites chemically with Portland cement, are all equally important factors in the application of ceramic tiling as the most feasible method of adding the necessary touch of color decoration to concrete buildings.

Shop Lighting.

The matter of shop lighting comes more to the front these early darkening days, for eyes are not yet as easily repaired or replaced as teeth, and any method of adding to the general illumination of things is of pertinent importance at this season of the year.

Of course artificial lighting is just now more in mind than the question of making the supply of daylight of longer and greater efficiency. Perhaps the sunlight never gets as much attention at any time as it should. Things that are free are commonly held too cheap, and a highly effective system of electric lighting is sometimes housed in a building that has many dirty windows. But returning to artificial illumination in particular, there must be enough light to see by, the source of it must be placed where the light shall fall where it will do the most good, and the light should be free from flickering.

The improvements made in electric apparatus these recent years have greatly reduced the irritating uncertainty of the old lighting system that is all too well known to workmen of experience. There are good electric lights to-day having a splendid quality of illumination when they are carefully and skillfully handled. No other handling is safe for the eyes of those who work with their aid. Right here an intelligent supervision of the lighting equipment will give large interest returns.

A shop so lighted that the illumination is diffused at the expense of brilliancy is as wearisome to the sight as the dense shadows that go with the use of small high powered lamps, says a writer in an exchange. One is just about as bad as the other, and both contribute to the list of shop accidents. An ample source of diffused light that gives shadows of unobtrusive character is about the most comfortable light giving combination.

A letter recently received from a Chicago concern presents in brief a resumé of its experience in that branch of the business that is especially concerned with electric dynamos and lighting. The following extracts are made from the letter and will doubtless be found of a very generally useful type:

"The art of electrical illumination has recently undergone important changes. The introduction of the Nernst lamp seven or eight years ago; the mercury arc lamp two or three years ago, and of the high efficiency metallic filament incandescent lamp more recently has revolutionized the art of electrical illumination. But these types are rather expensive in first cost; for the production of best results must be carefully handled, are likely to deteriorate if allowed to become dirty and in general are suitable for fine buildings more than for foundries, woodworking shops or other manufacturing plants.

" There is one tendency which of late years has been growing in favor to which we desire to call your attention. This is the use of high candle power units of ordinary incandescent lamps. Where a cluster of four or more 16 candle power lamps are installed, one large 50 or 100 candle power could be used to much better effect. The lamp would require much less current for the amount of light given off, would have three or four times as long a life, would require less expensive wiring and fixtures, and in general would be much more rugged and suitable for a shop. Such large size incandescent lamps are much preferable to arc lights in many cases. For instance, if a 5-ampere arc light should be installed in a corner of a shop the shadow cast by it would be bad and the workman would be in his own light most of the time. This lamp could be replaced by five 1-ampere large size incandescent lamps which could be distributed around in different places so that there would be no dark shadows and the workman would not be in his own light.

" This tendency of the use of large size incandescent lights is not confined to new installations, but in many cases we have seen clusters of small lights or arc lamps taken out to be replaced by the large size incandescent lamps. One very good feature of the large size incandescent lamp is that it is very simple and can be used by parties not acquainted with electricity. We believe there is not a more satisfactory method of lighting a foundry, woodworking shop or mill than by means of a dynamo driven by the line shafting and operating large size incandescent lights."

Shrinkage of Wood When Dried.

Interesting experiments on the shrinkage of wood due to the loss of moisture have recently been completed by the Forest Service at its timber testing station at Yale University. These experiments show that green wood does not shrink at all in drying until the amount of moisture in it has been reduced to about one-third of the dry weight of the wood. From this point on to the absolutely dry condition, the shrinkage in the area of cross section of the wood is directly proportional to the amount of moisture removed.

The shrinkage of wood in a direction parallel to the grain is very small; so small in comparison with the shrinkage at right angles to the grain that in computing the total shrinkage in volume the longitudinal shrinkage may be neglected entirely.

The volumetric shrinkage varies with different woods, being about 26 per cent. of the dry volume for the species of eucalyptus known as blue gum, and only about 7 per cent. for red cedar. For hickory, the shrinkage is about 20 per cent. of the dry volume, and for long leaf pine about 15 per cent.

In the usual air dry condition, from 12 to 15 per cent. of moisture still remain in the wood, so that the shrinkage from the green condition to the air dry condition is only a trifle over half of that from the green to the absolutely dry state.

THE ART OF WOOD PATTERN MAKING.—I.

BY L. H. HAND.

A PHASE of the carpenter's work, which has been discussed comparatively little in the columns of the paper in the recent past, is that of making wood patterns or "forms" for metal castings in accordance with the most approved methods as taught in the school of experience. With a view to throwing some light upon the subject and using as illustrations some examples which are met with in every day practice by one who is working at the bench, I purpose presenting some comments which I hope will prove of interest, not alone to those who are thinking of indulging in this particular line of work, but to others who may wish to keep informed concerning the handling of problems which constantly confront the wood patternmaker.

At the very outset it may be stated with confidence that it is impossible for one to make patterns successfully without a considerable knowledge of the manner be constructed in such a way as to be readily taken off, leaving the core in a finished and perfect condition. When cores are used the wood pattern will have a projection, called a core print, which makes a cavity in the sand to hold the core in position. Cores which are supported at one end only should have the core print larger than the cavity in the casting—that is, the part of the core resting in the sand should be heavier than the part projecting into the mold, otherwise the core will have a tendency to fall down into the mold. The core is the exact size and shape of the print and the cavity in the casting taken together. Round cores of regular shape will only require half a core box, and the molder making two half cores and pasting them together.

A flask is a wood box made in two or more sections of a suitable size for the work required, and the sections so constructed as to come apart readily and se-

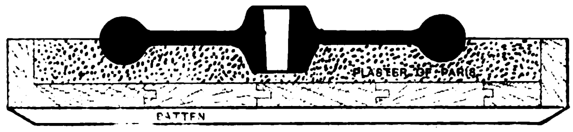


Fig. 1.—Special Follow-Board Made of Plaster of Paris.

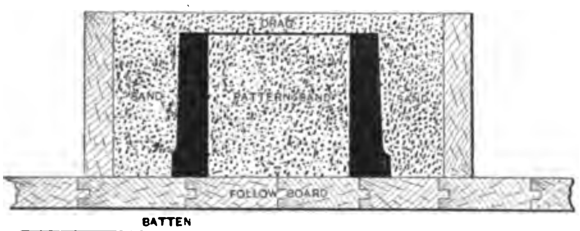


Fig. 3.—First Process of Molding the Brass Bushing.

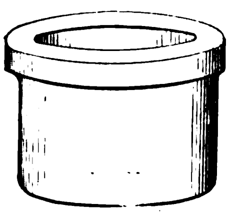


Fig. 2.—Brass Bushing for Side Rod.

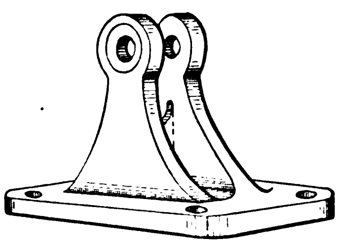


Fig. 5.—Equalizer Bearing for Locomotive.

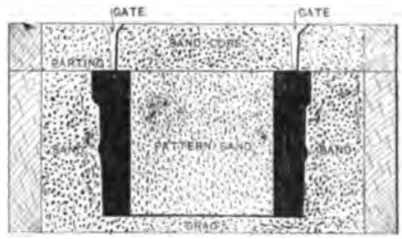


Fig 4.—The Second Process of Molding Brass Bushing.

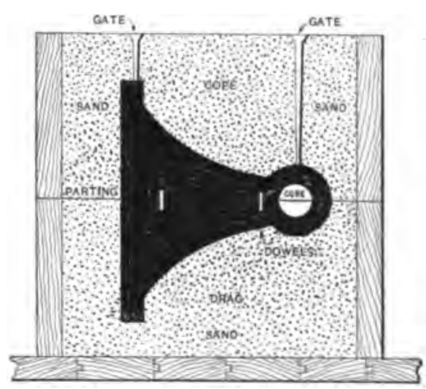


Fig. 6.—The Equalizer Pattern in the Sand, the Bolt Holes Being Drilled in the Casting.

The Art of Wood Pattern Making—I.

in which the molder will get them out and leave exactly the required form in the flask of sand to receive the molten metal. Small pieces or those of medium size are usually cast in a flask, while extra large ones are handled on the floor of the foundry. It is often the case that a crane is required to lift the wood patterns where extra large castings are involved. Small forms of castings are sometimes made from a single piece of wood cut of the required shape, but most patterns, especially those of the cylindrical shape, are split in the middle and dowled together, which is done for the convenience of the molder, although they may be cast without being in halves, in which case the molder makes a parting of the mold with his trowel. Patterns of other forms are usually more convenient for the molder if made in two parts, the parting in the patterns coming exactly where the molder would naturally part the sand in the flask. Occasionally a casting is to be made that may require more than one parting of the sand to allow the molder to withdraw the wood pattern without disturbing the sand. Odd shaped cavities, bolt holes which are parallel to the parting, holes for shafting in pulleys, &c., are made with cores, the latter being made by mixing sand with flour and molasses, which is tamped into boxes of the required form to bake in an oven. Core boxes must cured with clamps and dowels, so as to be fitted together exactly as they came apart.

The cope is the upper box, and the drag is the lower one. The follow board is a board the face of which conforms exactly to the parting of the sand in the cope and drag. It may be made of wood for most work when the parting of the pattern is a plane, but in some cases it may be any curve to suit the work. Sometimes it is made of plaster of Paris, into which the pattern is embedded half of its depth. We will take as an example a pattern of a brake wheel for freight cars, when the pattern is simply a wooden wheel of the desired form. An iron brake wheel may be used if more convenient by cleaning it up a bit and giving it one or two coats of black shellac. In such a case a shallow box of the proper size is filled with plaster of Paris and the wheel embedded half its depth in the soft plaster and smoothed down perfectly before it sets. The idea will be made clear from an examination of Fig. 1 of the illustrations, which represents a cross section through such a follow board, with the wheel in position ready to receive the drag.

Here the patternmaker should exercise good judgment to save expense to his employer, for, if one or even a half dozen pieces are required, the molder can make a parting with his trowel cheaper than the patternmaker can make a special follow board. But where the piece is required in hundreds, make the follow board by all means or even gate several pieces together on the same follow board, which is done by securing the pieces together with small strips, which leave a conduit in the sand for the molten metal to pass freely from one cavity to another. As an example of very simple forms from which to cast, we will take the brass bushing for a side rod of an engine as shown in Fig. 2, one of which the writer completed just as the whistle blew for the close of the day's work. In molding this kind of a piece the molder lays a follow board of suitable size face up on the floor of the foundry. On this board he next places the pattern and drag both in an inverted position and fills the drag with sand, ramming it up solid as indicated in Fig. 3. He then covers the drag with another board and turns it over. Removing the follow board, he makes a parting by sprinkling parting sand over the surface and puts on the cope, which is then securely clamped in place. He then throws in sufficient sand to hold the gates, which are usually simple tapered wooden pins, which are pushed down until they touch the pattern. The cope is then filled with sand and ished as before. It is a safe rule to always mold the heaviest part of the casting in the drag. As it is the aim of the writer at this time to touch only upon foundry practice, we will drop this particular casting for the moment and take it up again in connection with the work of the patternmaker, showing various ways in which a pattern may be built and still produce the same casting.

To illustrate the method of casting forms which will not draw out of the sand parted in only one place, but are easily cast in a flask of two or more partings, we have selected the driving pulley for a flue cutter and welder, Figs. 7 and 8. It might be stated in this connection that every pattern shown with the exception of Fig. 1 has been selected from the writer's personal work in the shop where he is now engaged. From the nature of the casting just referred to a difficulty presents itself in getting it out of the sand whole, hence the slotted arm holder at the small end of the hub is left loose, the rest being readily drawn.

To mold a casting from this pattern the molder places a follow board on the floor of the foundry and drag No. 1 in an inverted position upon it. He then removes the

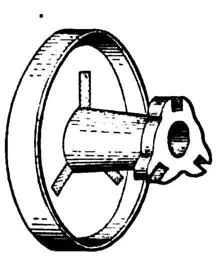


Fig. 7.—Casting Requiring a Compound Flask.

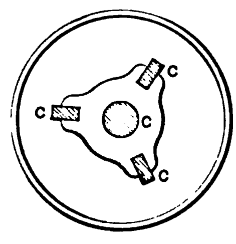


Fig. 8.—End View of Pattern, Showing Cores.

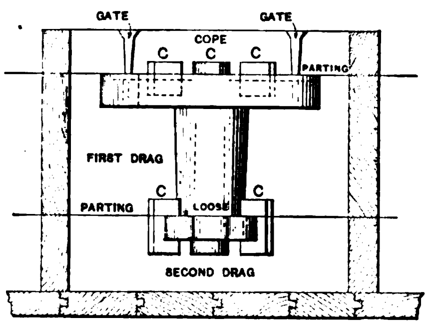


Fig. 9.—Compound Flask and Pattern.

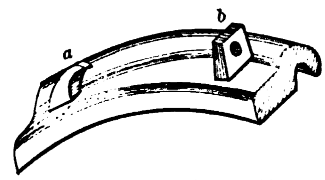


Fig. 10.—Driving Brake Shoe.

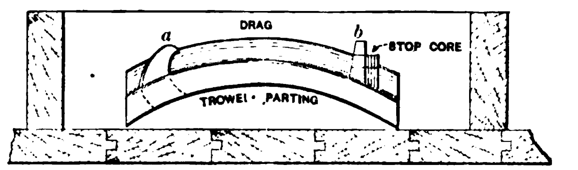


Fig. 11.—Showing How an Odd Shaped Projection May Be Left Loose from the Pattern or Pulled Through It.

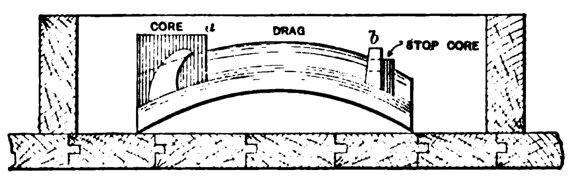


Fig. 12.—Showing How an Odd Shaped Projection May Be Made in a Core.

rammed up the same as the drag, all as clearly indicated in Fig. 4, after which the cope is lifted off, the pattern and gate pins removed and the metal poured in.

To mold the brake wheel indicated in Fig. 1 with the special follow board, is identical with the steps described in connection with the brass bushing. Without the special follow board the drag would be placed right side up on the floor of the foundry and filled up solid. The pattern would then be pushed down into the sand and a parting made at the center of the wheel with a small trowel.

Very many castings are of such a form as to require part of the mold to extend up into the cope, such as the brake wheel, Fig. 1, already described. A very good illustration of this class of castings is represented in Fig. 5, which pictures an equalizer bearing for a locomotive. In this instance, as frequently occurs in all locomotive repair shops, a somewhat costly pattern had to be made in order to take off a single casting. With a view to making the pattern as cheaply as possible it was deemed advisable to get along with few core boxes and cores, the work of drilling the four bolt holes being a much cheaper job than to have cored them all out. The equalizer pattern in the sand is shown in Fig. 6 of the sketches. In molding this class of work the molder places that portion of the pattern which has dowel pin holes in it with the parting on the follow board and proceeds as already described. When the drag is turned right side up the other part of the pattern is slipped on to the dowels and finishes core prints from the face of the main wheel and places it face down on the follow board, ramming it up, making a parting at the top of the hub. He then puts on drag No. 2 and the rest of the pattern and rams it up. Next he turns the completed drag right side up, places the core prints back into the face of the wheel and secures the cope in position, ramming it up as previously described. An inspection of Fig. 9 will render clear the entire process in question.

As we do not intend to study foundry practice, only as it relates to the making of the pattern, we will illustrate one more casting and then leave the foundry for the pattern shop. An otherwise difficult projection on a casting can be made in a core or by leaving the part loose from the pattern and picking it out of the sand after the pattern is withdrawn or by pulling it out through the pattern before it is removed from the sand. All of these methods can easily be explained in connection with the casting for a driving brake shoe shown in Fig. 10. It will be noticed that the retaining hook *a* of Fig. 10 and the bolt hole *b* will not draw out of the sand with the pattern. In Fig. 11 the pattern is shown in the drag, and on the follow board ready for the first process in making the mold. It will be seen that if the hook *a* is left loose from the pattern it will remain in the sand when the pattern is withdrawn and easily taken out when the pattern is out of the way. If, however, it was fitted into a curved mortise clear through the pattern it would slide out with the circular motion imparted by the curved mortise before taking the main part of the pattern out of the sand. In Fig. 12 is shown the manner a projecting part which will not draw may be made inside of a core of suitable shape to easily come out of the sand.

There are many points in foundry work of a very interesting nature and which should be known to the wood patternmaker, but this is sufficient for the present purpose, which is simply intended to familiarize the student with the work to such a degree as will enable him to work intelligently in making a pattern.

(*To be continued.*)

Contractor's Liability Where Building is Destroyed During Course of Construction.

Questions touching the legal aspects of various matters in connection with building construction are constantly confronting the contractor, and he is often in doubt as to his rights in the premises and the best method of procedure under specific circumstances. Many such questions have been passed upon by the courts and thus a precedent established which serves as a guide in similar cases, and these are of particular interest and value not only to the contractor, but to all engaged in the building business. In discussing a contractor's liability where a building is destroyed while in process of construction, John E. Brady, a member of the New York Bar, in a recent issue of the *Architects' and Builders' Magazine*, comments as follows:

Under the English authorities, where a building, which is being erected under a contract, is destroyed during the course of construction, the loss is allowed to remain where it falls. It is there held that one who has partly performed a contract upon the property of another, as a contract for repairs on a house, cannot recover for his services if the property is destroyed without fault of either party before the work is finished; on the other hand, one who has advanced money to a contractor on account of materials furnished in the construction of a house cannot, under such circumstances, recover his money. But in this country the rule is in general uniform, that where one is to make repairs on the house of another under a special contract, or is to furnish a part of the materials and labor used in the erection of a house, and his contract becomes impossible of performance on account of the destruction of the house, he may recover for the work that he has done or the materials that he has furnished. In Cleary *vs.* Sohier, 120 Mass., 210, the plaintiff made a contract to lath and plaster a certain building for 40 cents per square yard. The building was destroyed by a fire which was an unavoidable casulty. The plaintiff had lathed the building and put on the first coat of plaster and would have put on the second coat, according to his contract if the building had not been burned. It was held that he could recover for the work done and the materials found. And where the contractor agrees to furnish the material for and completely finish the construction of a building, if the building is destroyed before completion, the owner may recover back any money that he has advanced to the contractor on account of the work.

The cases naturally divide into two classes; in one class of cases the contractor agrees to furnish the material and do the work, and in the other his agreement is to perform work upon a building belonging to another. According to the American decisions a contractor, who agrees to construct and finish a building for a specified lump sum, is not excused from the full performance of his contract by the destruction of the work when partly completed. In such a case the loss is placed upon the contractor. Not only is he denied a recovery of compensation for the partially completed work, but he is liable to the owner for damage for failure to perform his contract and the owner may compel him to return any payments which have been made.

In Butterfield *vs.* Byron, 153 Mass., 517, the owner of a parcel of land entered into a contract with a builder by which the latter agreed to build and finish a three-and-one-half-story hotel upon the land. The agreement required the contractor to complete the building on or before a certain day specified, and provided a penalty for each day used beyond that time. The contractor had nearly completed the hotel and had complied with the terms of the agreement so far as he had gone, when the building was struck by lightning and burned to the ground, an event which rendered it impossible to complete the work on contract time. The owner was insured, and upon being reimbursed for his loss, assigned to the insurance company any claim that he had against the builder. In an action by the insurance company to recover money due the contractor, it was declared by the court that the law is well established that, where one contracts to furnish labor and materials and build a house upon the land of another, he will not ordinarily be excused from the performance of his contract by the destruction of the building, without his fault, before the time fixed for the completion of it. In another instance, the plaintiff agreed to fill in and grade the premises of the defendant, and, while he was engaged in the performance of his contract, 897 cu. yd. of earth filling was washed out by the occurrence of an extraordinary freshet and without any fault on the part of the plaintiff. The earth thus washed out was replaced by the plaintiff and he claimed the right to recover therefor at the same rate as fixed by the contract for doing the work originally. It was held that the law required that the contractor should be the sole sufferer. The contract was entire and by its terms the plaintiff was to perform certain work and accomplish certain results before being entitled to the compensation agreed upon. Norton *vs.* Fancher, 92 Hun. 463.

In Thompkins *vs.* Dudley, 25 N. Y., 272, a contractor agreed to erect and finish a schoolhouse for a specified sum, and to have it ready by a certain day. When nearly completed the structure burned down. At the time of destruction of the building there remained a small amount of painting to be done and a number of blinds to be hung and the building had not been formally accepted. An action was brought against the guarantors of the contractor's agreement to recover the money which had been paid to the contractor on account, and for damages sustained by reason of the nonperformance of the contract. It was held that the plaintiffs might recover. The contractor had obligated himself to deliver a completed school house on a day certain, and, under the circumstances, he had no legal justification for failing to perform his contract according to its terms.

No matter how harsh and apparently unjust the rule, which throws the loss in such a case upon the contractor, may occasionally appear to be, it cannot be denied that it has its foundation in good sense and sound legal theory. The contractor is the owner of the materials which go into the house he has agreed to build until the building is completed and formally turned over to the owner. His contract is to deliver a finished house, and, until he has fully performed his contract (except in certain cases of installment contracts), he cannot be entitled to the compensation provided for in the contract. When one of two innocent persons must sustain a loss, the law casts it upon him who has agreed to sustain it, or, rather, the law leaves it where the agreement of the parties has put it; the law will not insert for the benefit of one of the parties, by construction, an exception which the parties have not, either by design or neglect, inserted in their engagement. The contractor may, in such a case, protect himself by proper provisions inserted in the contract, but, if he neglects to do so, he must stand by his agreement and bear the loss. School Trustees of Trenton *vs.* Bennett, 3, Dutcher (N. J.), 514.

ACCORDING to figures recently issued by the Forest Service, Washington, D. C., more than 800,000,000 board feet of timber are used annually in the manufacture of "slack" barrels in the United States. It may be interesting to state that the ordinary slack barrel consists of 16 or 17 staves, two heads of three pieces each and half a dozen hoops. It is stated that if the barrels which are made in a single year were stood on end, side by side, they would cover an area of more than 80 acres.

Carpentry and Building

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(Entered at the New York Post-Office as Second-Class Mail Matter.)

JANUARY, 1908.

Eleven Months' Building Operations.

In view of the general tendency to restrict building operations, which has been such a marked feature of the situation in many of the leading cities of the country during the past few months, and especially in November, it is interesting to consider the figures which are found in the report just issued by the Superintendent of the Bureau of Buildings for the Borough of Manhattan covering the first 11 months of 1907. While the statistics show that there has been a decrease of something over 50 per cent. in the matter of tenement house construction during the year, as compared with 1906, there has been an increase of activity in other lines, such as in the building of private residences, structures intended for store and loft use and in office buildings. Coming down to details it is observable that in the first 11 months of the year just closed permits were taken out for 304 "tenement houses," in which is included all three classes of elevator apartments, flat houses and tenements with bathrooms, calling for an investment of $26,633,500, while in the same period of 1906 there were 951 such buildings projected involving an outlay of $56,339,400. The plans filed for what is known as loft and store buildings numbered 126 in the 11 months under review, estimated to cost $10,422,700, as against 113 similar buildings projected in 1906 at an aggregate cost of $12,058,100. In the matter of school construction the figures indicate comparatively little retrogression, as the plans filed call for 14 schoolhouses to cost $2,295,000, as against 18 school buildings costing in the aggregate $2,700,000, provided for by the plans of 1906. Several of the buildings in this class in both years were for private educational corporations, but are classed by the Bureau of Buildings as representing the city's activity in educational construction. In the matter of public buildings, places of amusement, &c., 19 were projected this last year costing $3,100,700, while in 1906 permits were taken out for 34 such such structures to cost $7,076,900. Of stables 53 were planned costing $2,295,700, as compared with 62 in 1906 costing $3,303,500. The private dwellings planned last year were slightly in excess of those the year before, the number being 64, to be completed at an estimated cost of $2,597,800, as against 43 provided for in 1906 and representing an aggregate expenditure of $2,176,500. Ten of the residences in last year's list are to cost over $50,000 each, as compared with 15 included in the list of 1906 as costing over that amount. In the matter of manufactories and workshops 18 were planned to cost $1,340,000, while in 1906 permits were taken out for 34 such structures involving an expenditure of $3,062,100. The increase of building activity was very marked in the matter of improvements to existing structures, being most noticeable perhaps in the improvements made to public buildings of different kinds, where the estimated expenditures are to be $2,211,751, as against $999,800 set aside in 1906, sums representing the enlargement and modernizing of 106 buildings the past year and 73 the year before. An increased expenditure is also shown in the improvements to manufactories and workshops, there having been $607,010 appropriated for this purpose in the 11 months of the year just closed, as compared with $385,350 expended in 1906. The total investment in all kinds of new buildings projected up to November 30, 1907, was $72,998,750, as compared with $106,228,215 in the corresponding period of the year previous. The sum of $16,108,529 was expended in alterations, as compared with $16,770,200 in the same period in 1906. Of this sum $4,228,884 was spent on alterations of tenement houses, while $5,022,191 was expended in 1906 for the same purpose.

The Apprenticeship Question.

There is no escape from the disadvantages that are felt in all branches of the building and allied trades due to the seeming neglect on the part of employers to see that the inducements were sufficient and attractive enough to bring young men into the various trades to be trained into competent workmen. To point out that self-interest is in a measure responsible for the present condition is unavailing, even though it shows that some were willing to adopt any measures which would take competent workmen away from their fellow tradesmen. One who has opportunities for national observation says "the consideration of the apprenticeship matter will be forced upon us at an early date, to judge from the character of information which is coming to me in reference to the incompetency of the average workman. Fortunately, there is a blazed trail for those who care to follow it in pursuing the right course to supply their own needs and do their part in recruiting the ranks of skilled workmen. There is a decided advantage in the fact that some men have already made important progress in this important work and are willing to explain to those who wish to follow their example the methods they have adopted. These men realize that in the present day the material most desired for skilled workmen is the graduate of the excellent schools which our country supports. They turn their backs on the old ideas as to apprenticeship and apprentices and the prejudices which the older tradesmen rigidly adhere to as to the customs which the new apprentice must submit to. They realize that the graduate of our public schools is far better qualified to take up the principles and theories of the trade than these employers were when they entered upon their apprenticeships. They waste no time in disputing the fact that knowledge is power, and that the 16-year old boy who has come from the grammar school or high school has a self-respect and has a basis for a self-reliance which makes him an invaluable subject for training in the principles. theories and craftsmanship which will make him a competent and reliable workman. In consequence they are not so foolish as to ask him to waste his time in unnecessary drudgery. but realize that his services will be more profitable in proportion to the different things in which he is instructed and the quickness with which he acquires the qualifications to do the work which is expected of him."

New Training Successful.

In these shops the value of the apprentice is held to be so great that he receives proper instruction from his entrance to the shop. A competent foreman is provided, part of whose duties it is to formulate a plan of instruction and advance the apprentice as fast as he exhibits a mastery of the different steps. The result is that in these shops the self-respect of the young man is maintained; he early acquires a value which brings to him higher wages, and instead of the apprenticeship being a period of undignified and underpaid drudgery, he soon takes a deep interest in his work, which fact is a long step toward the mastery of the trade which makes him at an early stage valuable alike in the shop and on outdoor work. The shop instruction is agreeable, inasmuch as it simply is further education, and in the realization that he has a proper and valuable part in the work of the shop further qualifies him for the duties of citizenship. Some employers have made it a condition that the advance in pay shall be held by the employer until the completion of the apprenticeship, and this, in connection with proper treatment, strengthens the loyalty of the apprentice to the man in whose institution he is adding to his value daily. It is the young man of a year or two of training who in a crisis is able to step forward and take the part of a workman and enable an employer to meet successfully an emergency which otherwise might result disastrously. There is everything in the modern method of treatment and training of apprentices to recommend it for wider consideration, and has in it the elements for a successful solution of the problem which has many perplexities for those who have been approaching it from the old point of view.

A Fire Protection Bulletin.

D. B. Haggerty, fire marshal of Louisiana, has issued a bulletin dealing with fire losses resulting from defective flues, and sounding a warning to property owners and householders, that may have a value to the tradesman if he brings it to the attention of those who could heed it with the advantage of reducing their fire risks. The bulletin follows:

The amount of wealth which disappears from the State annually because of carelessness with fire dangers is more than $200,000. The most important single source of loss is the defective flue, the word flue being used to indicate the stove pipe and chimney taken together. The fire waste from inattention to stove pipes and chimneys exceeds $200,000 a year. Three-fourths of this amount would be saved if the occupant of each house would now, before the weather requires heaters to be crowded, inspect chimneys and stove pipes. Fires from defective chimneys, usually being in the attic, gets a good start in the dryest of wood before the alarm is raised. Attics being difficult of access to one with a water bucket the fire is likely to get beyond control.

The settling of chimney foundations may open a crevice between the bricks or stones, so that sparks can escape. Sometimes a new chimney in settling forms a crack because one side of it is held by floor timbers. A chimney built up from joists or a bracket is always a source of danger because of the liability of cracks from springing of the timbers. Chimneys so built often have as their base a plank, whose only protection from sparks and heat is a layer of mortar on it. Many fires result from this practice. Salmon tinted bricks disintegrate. Poor mortar crumbles out, leaving openings. Nails driven into brick chimneys are likely to come out, leaving holes. A joist end should not rest in a chimney wall. Tile chimneys of all sorts are unsafe because they are very likely to crack off at the level of the roof, where cold air strikes them. A hood should make no offset to hold soot. The chimney top should be inspected and soot swept down and removed from below.

BUILDING COLUMNS AS AIR FLUES are used in the heating and ventilating system of a spinning mill in Lancashire. England. The air, which is propelled by a 12-ft. fan and passed through a revolving water filter to purify and humidify it, is distributed through ducts below the basement level to the iron columns of the mill and from them into the different rooms, the columns being fitted near the top with openings regulated by means of metal hoppers. The vitiated air outlets are located in flues built in the brickwork at several points for each room, these carried to the roof and exhausted by means of an exhaust fan.

Brick Manufacturers' Convention.

The twenty-second convention of the National Brick Manufacturers' Association will be held at Columbus, Ohio, February 5 to 8, 1908, with headquarters at the Southern Hotel. As Ohio is the chief clay working State of the United States and as Columbus is of such geographical location as to be readily reached from adjoining sections, it is expected that the convention will be the largest and most successful yet held by the association. One of the attractive features of the city is the School for Clay Workers, which during convention week will be thrown open to visiting clay workers, who will be able to witness the advances made along technical lines in clay working matters.

The sessions of the Brick Manufacturers' Association will commence on Wednesday afternoon, and special facilities will be provided for exhibit space. Detailed information concerning the convention arrangements can be obtained through Secretary T. A. Randall, Indianapolis, Ind.

As in former years, the American Ceramic Society will meet on Monday, Tuesday and Wednesday mornings of the brick convention week, their headquarters being at the Hartman Hotel.

The twenty-seventh annual convention of the Iowa Brick and Tile Association will be held in Des Moines, Iowa, January 22 and 23, 1908.

The thirtieth annual convention of the Illinois Clay Workers' Association will be held in Peoria, Ill., January 14 to 16, inclusive, the headquarters being at the National Hotel.

Officers of Massachusetts State Association of Master Builders.

At the annual meeting of the Massachusetts State Association of Master Builders, held in the rooms of the Builders' Exchange at Worcester, Mass., on November 20, the following officers were elected for the ensuing year: President, A. B. Murdough of Watertown; vice-presidents, John A. Jackson of Brockton and Frank P. Dillon of Milford; secretary, H. W. Sweetser of Worcester; treasurer, B. C. Fiske of Worcester.

The Executive Board elected consists of John A. Jackson of Brockton, F. F. O'Neil of Holyoke, Thomas B. Gilbert of Springfield and George W. Putnam of Salem, with the officers.

Plastering at the Corners.

Some architects are now including in their plastering specifications instructions that the plaster must be cut down the corners with a trowel when it is put on. The purpose is to prevent cracks from shrinkage. It is argued that when plaster is cut through at the corners with a trowel it will leave it free to shrink in drying and thus prevent in a great measure the ugly cracks that sometimes disfigure the walls. The instructions apply not only to room corners, but especially to corners around flues and chimneys. They want what cracks there are to be in these corners, ready made and straight, so that they will not show so plainly. And besides, it is easier to fill them, or when paper is used on the walls it will cover over them without their showing. If this is a new idea to you, try it once and see whether it is a wrinkle that is worth while or not.

CORRESPONDENCE.

Elevations for "A. E. P's" Floor Plans.

From R. F. H., Duson, La.—I noticed in the September issue of *Carpentry and Building* that "A. E. P.," Morris Park, L. I., wanted some one to send elevations for the first and second floor plans as presented therein. I therefore send a front and side elevation of a cottage, which I trust may be of some benefit to him, and if so I would be greatly obliged to hear from "A. E. P."

Finding the Perimeter of an Ellipse.

From S. D. S.—Noting the communication of "H. S.," page 388 of the December issue, I wish to correct his statement as to the length of the perimeter of an ellipse. Trautwine says: "Mathematicians have furnished practical men with no simple working rule" to find the circumference of an ellipse. "The so-called approximate rules do not deserve the name." He gives four of these, the first being that proposed by "H. S." In an ellipse whose long and short diameters are 10 and 2 the circumference is actually 21, very approximately; but rule 1 gives it as equaling 18.85; rule 2 or 3 equals 22.65, and rule 4 equals 20.51. He gives the following as "sufficiently exact for ordinary purposes," not being in error probably more than 1 part in 1000. When D is not more than five times as long as d

$$\text{Circumference} = \sqrt{\frac{D^2 + d}{2} - \frac{(D-d)^2}{8.8}}$$

If D exceeds five times d, then instead of dividing $(D-d)^2$ by 8.8, divide it by the number in the following table:

D =	Divide by
6d	9
7d	9.2
8d	9.3
9d	9.35
10d	9.4
12d	9.5
14d	9.6
16d	9.68
18d	9.75
20d	9.8
25d	9.87
30d	9.92
40d	9.98
50d	10.04
60d	10.10
70d	10.17
80d	10.23
100d	10.35

Reuleau gives

$$\text{Circumference} = 3.1416\ (D + d)\ \left(1 + \frac{n^2}{4} + \frac{n^4}{64} + \frac{n^6}{256} + \text{————}\right)$$

in which $n = \frac{D - d.}{D + d.}$ This is practically the formula derived by the use of the higher mathematics for the length of the circumference of the ellipse.

From S. F. A., Foxcroft, Maine.—Being an interested reader of your very valuable periodical, I take occasion to criticize the article in the December issue from "H. S.," Shelby, bearing the above title. The results he obtains are wholly erroneous, and cannot be said to be a mathematical demonstration in any sense of the word, and at best are but a poor mathematical approximation to the correct result.

An ellipse is a section of a right cone made by passing a plane through all the elements obliquely to the base, the latter being circular. Many ovals are sometimes erroneously called ellipses by the uninformed.

With the mechanical construction of an ellipse this article has nothing to do. The area of an ellipse is a mean proportional between the circumscribed and inscribed circles.

Let a be the semimajor axis and b the semiminor axis of an ellipse.

Area $= \sqrt{a^2\ 3.1416 \times b^2\ 3.1416} = a\ b\ 3.1416$, which was demonstrated thousands of years ago.

The formula for the circumference of an ellipse is not easily derived, and requires a good knowledge of integral calculus to understand.

Section and Front Elevation.

Side (Right) Elevation.

Elevations for "A. E. P.'s" Floor Plans.—Submitted by "R. F. H.," Duson, La.

Let e be eccentricity—the distance from the center to a focus divided by the semimajor axis.

Let L equal the circumference, and the formula is as follows:

$$L = 2 \times 3.1416 \times a$$

$$\left\{ 1 - \frac{e^2}{2 \times 2} - \frac{3\,e^4}{2 \times 2 \times 4 \times 4} - \frac{3 \times 3 \times 5\,e^6}{2 \times 2 \times 4 \times 4 \times 6 \times 6} \ldots\ldots \&c. \right\}$$

The limits of e are 0 and 1.

When $e = 0$ all the terms containing e vanish and the ellipse becomes a circle and $L = 2 \times 3.1416 \times a$, which is as it should be.

When $e = 1$ the semiminor axis becomes zero and the ellipse at the limit becomes two parallel straight lines which coincide, and $L = 4\,a$, the terms in the brackets when carried to infinity being the double reciprocal of *pi* or 3.1416.

By giving values to a and b, e, the eccentricity, is easily found, and "H. S." of Shelby can compare results with the method he gives. I will try and answer any questions on the above the critics may ask.

From E. E. P., Gloversville, N. Y.—In answer to "H. S.," Shelby, Ohio, who tells in the December issue how to find the perimeter of an ellipse, I would say that while it is very true there is no exact method of accomplishing this result, the following is sufficiently accurate for most cases:

Multiply the major axis by 1.82 and the minor axis by 1.315. The sum of the results will be the perimeter.

Let D = major diameter.

d = minor diameter.

c = perimeter or circumference.

The formula then reads as follows:

$c = 1.82 \times D + 1.315 \times d.$

To correctly find the area of an ellipse multiply the product of its two diameters by 0.7854.

The formula will then read:

$A = 0.7854 \times D \times d.$

I should like to have "H. S." give a formula for finding the two diameters of an ellipse when the perimeter is given. As he describes crushing of a ring to a uniform elliptical figure, one could take a hoop and crush in a thousand shapes or more down to a straight line, and yet not have one of those shapes a true ellipse. If he figures the area of the hoop and perimeter before he started he would have the same at all times, but few people know how to draft a true ellipse of different diameters.

Design of Truss for Flat Roof.

From S. C. P., Caribou, Maine.—We need a truss for the roof of a building 42 x 70 ft. in area, the roof to be flat and pitch to the center. We figure on 35 lb. snow per square foot. We would like to get along with 3-ft. rise for roof, as the building is four stories high, and even now looks too high for its size. Cannot some of the readers furnish a sketch of a suitable system that is cheap and safe? There is no objection to the number of trusses used. The roof itself, with its load of snow, &c., is all there is to be taken into account.

Answer.—In reply to the inquiry of the above correspondent, I would suggest spacing the trusses, the type to be used and the depth in accordance with the sketches presented herewith. The depth of the truss has been made equal to one-twelfth of the clear span, which is close to the limit of good practice, although one-tenth of the depth would make a better truss.

The roof load, including 35 lb. per foot for snow, amounts to 47½ lb. per foot. The plastered ceiling load is 12¼ lb. per foot, making a total load of 59¾ lb. per foot.

The clear span of the building is 40 ft., and the trusses are spaced 10 ft. on centers, as indicated on the plan shown herewith. The truss is of the Howe type, with upper and lower chords and struts of yellow pine, with vertical members of steel rods not upset.

The panel load on the top chord is equal to 3166 2-3 lb., while the panel load on the bottom chord is equal to 816 2-3 lb. The effective reaction of the wall at the bearing ends is equal each to 9958 1-3 lb. The stresses have been worked out according to the formulæ used for the Howe type of truss as follows:

Pounds.

$R_1 = 816\frac{2}{3}$ lb. in tension = ... $816\frac{2}{3}$

$R_2 = \frac{816\frac{2}{3}}{2} + 816\frac{2}{3} + \frac{3{,}166\frac{2}{3}}{2} =$ .... $2{,}808\frac{1}{3}$

$R_3 = \frac{816\frac{2}{3}}{2} + 2 \times 816\frac{2}{3} + \frac{3{,}166\frac{2}{3}}{2} + 3{,}166\frac{2}{3} =$...... $6{,}971\frac{2}{3}$

Compression in A $= (\frac{1}{2}\,816\frac{2}{3} + \frac{1}{2}\,3{,}166\frac{2}{3}) \times \frac{7.5}{3\frac{1}{3}} =$ 4,481

Compression in B $= (\frac{1}{2}\,816\frac{2}{3} + 816\frac{2}{3} + \frac{1}{2}\,3{,}166\frac{2}{3} + 3{,}166\frac{2}{3}) \times \frac{7.5}{3\frac{1}{3}} =$ 13,444

Compression in C $= (\frac{1}{2}\,816\frac{2}{3} + 2 \times 816\frac{2}{3} + \frac{1}{2}\,3{,}166\frac{2}{3} + 2 \times 3{,}166\frac{2}{3}) \times \frac{7.5}{3\frac{1}{3}} =$........ 22,406

Tension in N $= (\frac{1}{2}\,816\frac{2}{3} + 2 \times 816\frac{2}{3} + \frac{1}{2}\,3{,}166\frac{2}{3} + 2 \times 3{,}166\frac{2}{3}) \times \frac{6\frac{2}{3}}{3\frac{1}{3}} =$........... 19,917

Tension in M = Tension in N $+ [(\frac{1}{2}\,816\frac{2}{3} + 816\frac{2}{3} + \frac{1}{2}\,3{,}166\frac{2}{3} + 3{,}166\frac{2}{3}) \times \frac{6\frac{2}{3}}{3\frac{1}{3}}] =$.. 31,867

Tension in O = Tension in M $+ [(\frac{1}{2}\,816\frac{2}{3} + \frac{1}{2}\,3{,}166\frac{2}{3}) \times \frac{6\frac{2}{3}}{3\frac{1}{3}}] =$........................ 35,850

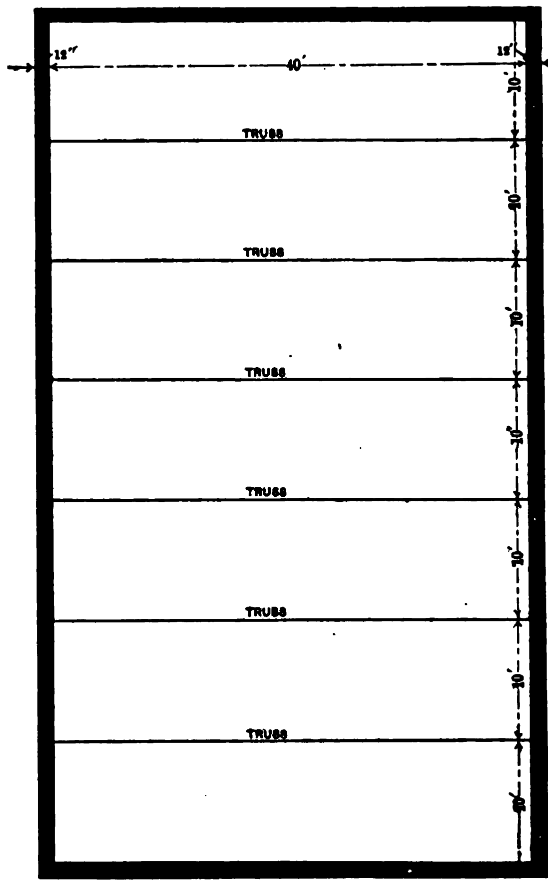
Compression in D equal tension in N.

Compression in E equal tension in M.

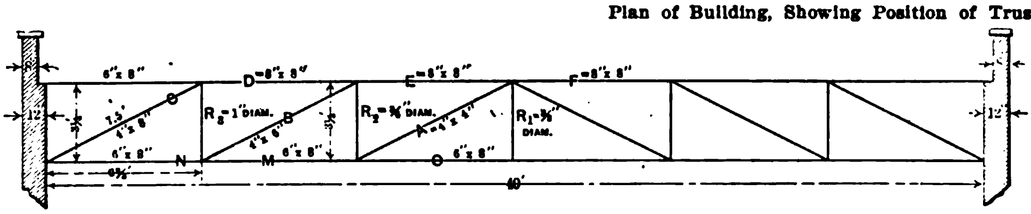
Tension in R is provided for by a steel rod, not upset, allowing for the area at the root of the thread, it would require a rod with a diameter of ⅝ in.

Tension in R_2 is provided for by the same kind of a rod ¾ in. in diameter.

Tension in R_3 would require a rod, not upset, of 1 in. in diameter.



Plan of Building, Showing Position of Trusses.



Elevation of Truss.—Scale, ⅛ In. to the Foot.

Design of Truss for Flat Roof.

Compression in A is 4481 lb., length of strut 7½ ft., a 4" x 4" piece of yellow pine would be ample.

Compression in B is 13,444 lb., same length, a 4" x 6" piece of yellow pine would answer.

Compression in C is 22,406 lb., same length as A—a 4" x 8" would suffice.

Tension in N = 19,917 lb., tension in M = 31,867 lb., but tension in O = 35,850 lb., which would need a 6" x 6", but allowing for framing and cutting and ceiling load distributed as for a beam, it would be best to use a piece of yellow pine 6" x 8", and as the lower chord should be of uniform section it is unnecessary to figure what the minimum requirements of N and M are.

Compression in D is equal to the tension in N, and it also has to act as a beam for support of roof rafters and roof load, which would make it advisable to increase the thickness of the chord about 2 in., making the total section 8" x 8".

Compression in E is 31,867 lb., and its maximum section governs that of D for the same reasons, and this, too, should be an 8" x 8" piece of yellow pine.

Suggestions for Porch Column Arrangement.

From J. B. C., New York City.—I am sending two piazza plans, Figs. 1 and 2, showing solid railings and short columns, which may prove of interest to " A. H. H.," Gardner, Mass., who asked for such in the November issue of the paper. The plans speak so clearly for themselves that extended comment would seem to be unnecessary.

From G. M. R., Middleboro, Mass.—Inclosed find several sketches in answer to the inquiry of " A. H. H.," Gardner, Mass., which appeared in the November issue of your valuable magazine, who asks for a porch with solid railing and three columns at the corners with two elsewhere. In the design shown in Fig. 3, which is for a porch with solid railing, the steps project from the foundation as in any ordinary porch and as clearly indicated in the plan and also in the side elevation. The length of the porch is 30 ft.; the depth, 8 ft.; the hight of the underpinning, 2 ft.. and the hight from the floor to the ceiling. 8 ft. 6 in. The main railing is 2 ft. 6 in. in hight, and the columns are 4 ft. 6 in. in hight and 5 in. in diameter. The hight of the caps for base of columns is 3 ft.

In design, Fig. 4, the scheme of the steps is reversed,

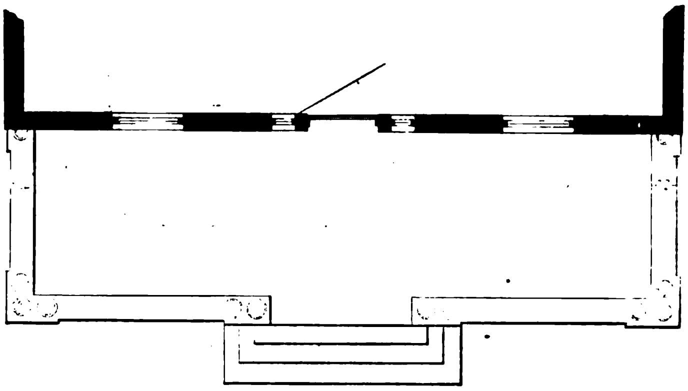
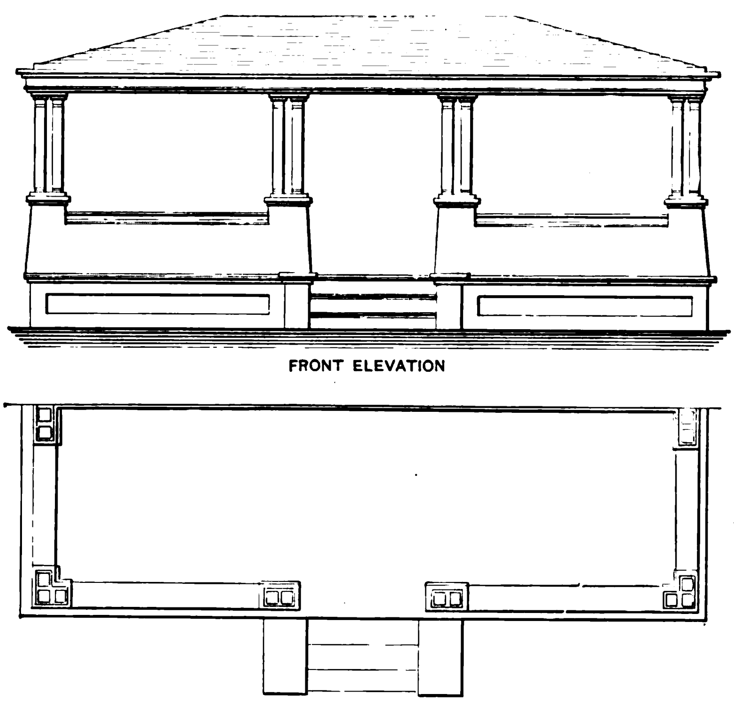


Fig. 1.



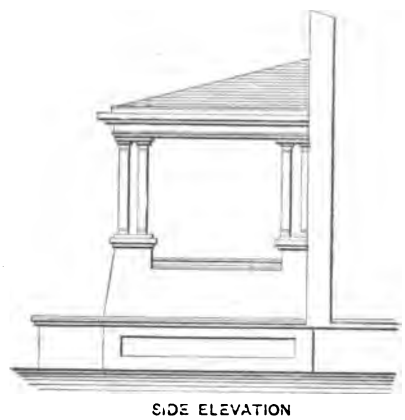


Fig. 3.—Design Contributed by " G. M. R.," —Scale, ⅛ In. to the Foot.

Suggestions for Porch Column Arrangement.

the riser of the first step coming out almost flush with the base of the underpinning, the cap turning back as at the corners and three columns being used as elsewhere. In this case the length of the porch is 30 ft. and the depth 9 ft. The columns are 5 ft. in hight and 5 in. in diameter, the other dimensions being the same as in connection with the design shown in Fig. 3.

In design Fig. 5 the steps extend out as in Fig. 3, but the railing motif is brought forward flush with the riser of the first step. The roof is extended to form a portico over the steps with three columns at each corner. The length of the porch is 30 ft., and the depth, excluding the steps and the portico which covers them is 9 ft. In other respects the dimensions are the same as in connection with design Fig. 3.

All the sketches are based upon the solid shingled

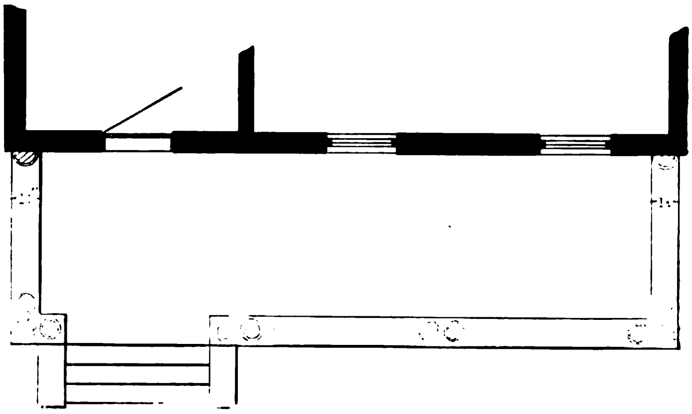


Fig. 2.—Plans of Porches as Contributed by " J. B. C.," New York City.

railing motif with Doric columns. A gutter may be placed around the edge of the porch roof and the drain pipe carried down through one of the columns, which has previously been bored for the purpose, and then underneath the porch floor into the waste pipe into the cellar.

A Convenient Centering Tool.

From F. A. R., Interlaken, N. Y.—Referring to the description of a convenient centering tool by " H. M. Ball," Watervlelt, N. Y., on page 390 of December *Carpentry and Building*, I wish to say I have a similar, and I think, better tool that I prize very highly. It was bought from Orr & Lockett for 50 cents, and perhaps a mention of this in your valuable journal might be of use to some of your subscribers.

Obtaining Miter Cuts for Bed Moldings.

From J. W. R., Crescent City, Ill.—I would like to ask some of the readers of the Correspondence Department how to lay off the cut in a miter box so as to cut a bed molding where it fits up under a valley. I have taken the paper for some time past and think a great deal of it.

Problems the Architect Has to Consider.

From J. K., Toronto, Canada.—In the October issue of the journal, page 334, appeared an article under the heading "Problems the Architect Has to Consider," and as it is not of the nature of correspondence or marked as being taken from another journal, I regard it as being an expression of opinion by *Carpentry and Building*. Too much space would be taken up in a criticism of the whole article, but I would like to comment upon some portions of it as affecting the contractor.

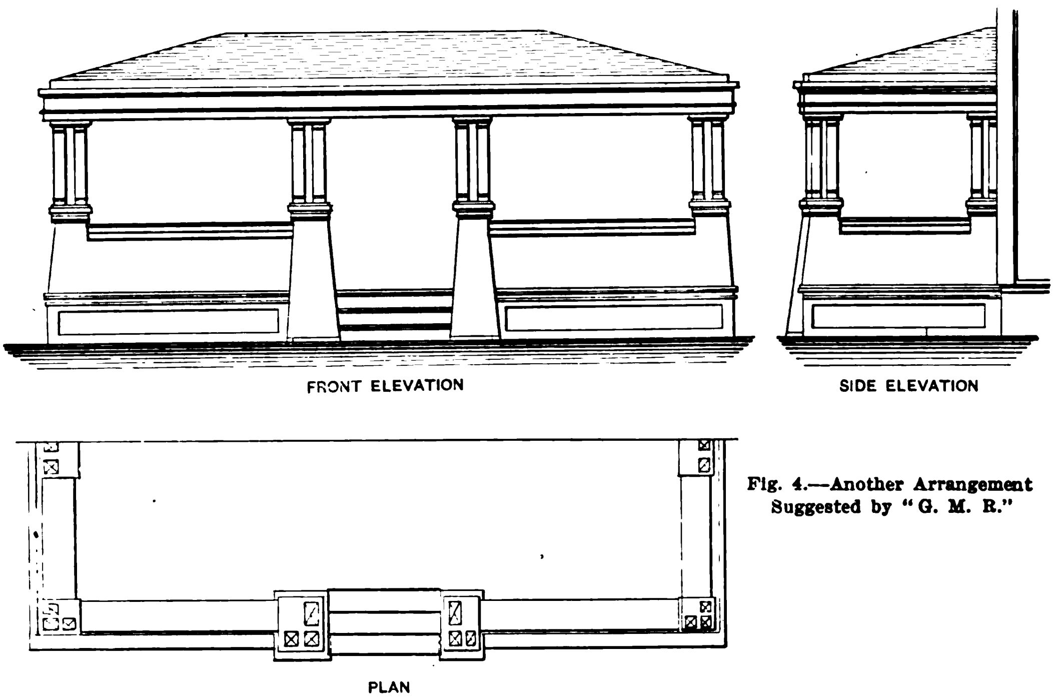


Fig. 4.—Another Arrangement Suggested by "G. M. R."

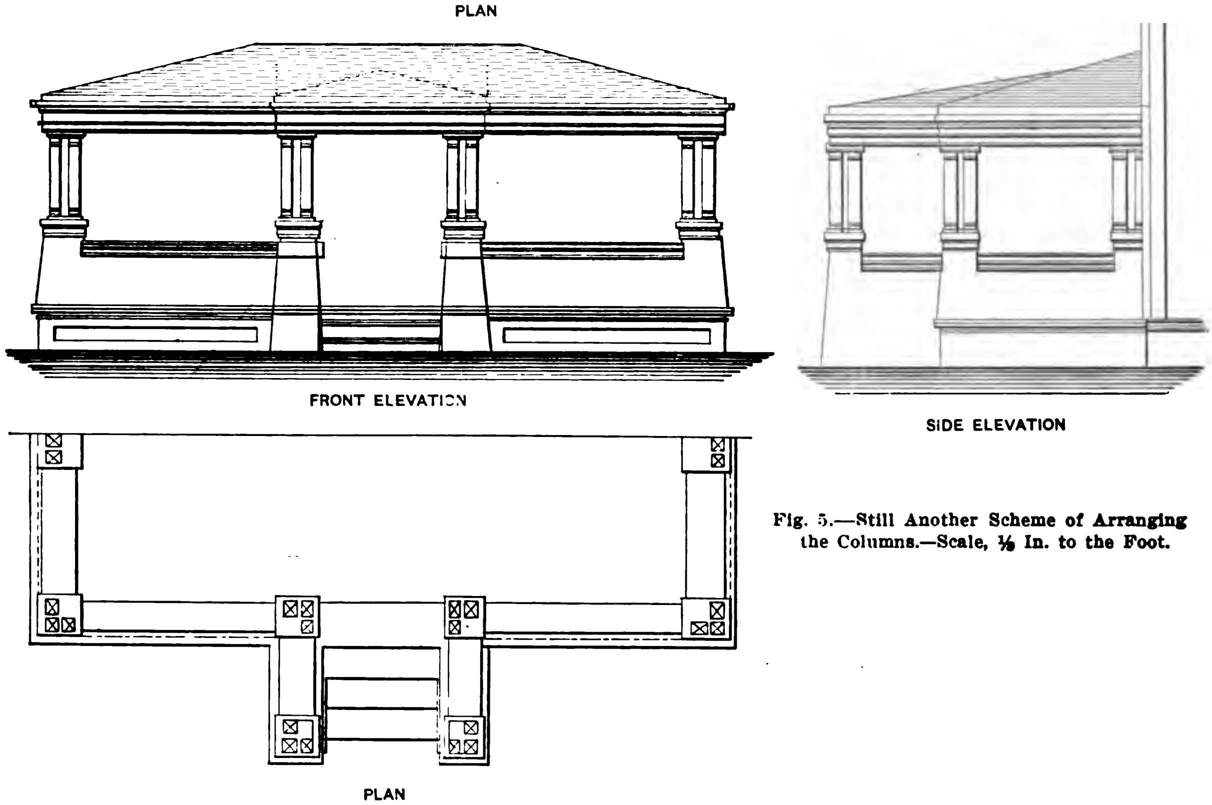


Fig. 5.—Still Another Scheme of Arranging the Columns.—Scale, ⅛ In. to the Foot.

Suggestions for Porch Column Arrangement.

It will not be disputed that the architect is the principal man on a building. He it is who has been consulted by the owner and received all instructions as to the kind of building, the use for which it is intended and the cost which may be incurred in the construction. The contractors who may be selected by him to figure on the job appear upon the scene. They know nothing of the owner, and all they can possibly know is what is before them in the plans and specifications. They are not in a position to figure on anything else. They prepare their tenders from the plans and specifications furnished, and even should the floor boards of an entire floor be omitted the contractor has done his part according to plan and specification. How is he to know what may be the intention of the owner in regard to that floor; whether it is intended to be laid with pine, cypress, oak, cherry, maple, hemlock or to be prepared for mosaic tiling. Surely 'tis enough to make a man answerable for what he bargains to do, and not make him responsible for the shortcomings of one so much his superior in knowledge of building.

Why should not an architect warrant or guarantee the correctness of his plans and specifications? Why should he not warrant the correctness of his figures, and why, above all things, should the contractor be put to the expense of remedying the architect's mistakes? Would it not be better before tenders are called in to refer the plans and specifications to some architect of pre-eminent ability whose indorsation would be a guarantee that the contractor might place reasonable reliance on being able to complete his work without having to make up for the mistakes of the architect.

No doubt many of the readers of *Carpentry and Building* in going over specifications have come across a clause something like this:

"Anything required for the proper completion of the work, though it may not be shown on the plan or mentioned in the specifications, must be done by the contractor."

And who is to be the judge as to the necessity of the work? Why! the architect, of course. Would it not be just as fair to add a clause in the contract something like this?:

"Any portion of the work necessary for the completion of the contract, the value of which has been omitted by the contractor in preparing his tender, shall be paid for by the owner."

What a howl would go forth if this were suggested by the contractor? And yet is it not as fair; yes, even fairer, than the one previously referred to, for in the latter case the owner only paid for what he gets, while in the former he gets that for which he does not pay? You may rest assured, Mr. Editor, the architects as a rule, though there are some noble exceptions, get enough saving clauses in their specifications without any assistance from such an influential source as *Carpentry and Building*. The best plan would be to let them shoulder their own mistakes, while holding the contractors close to their contracts, and the result will be better architects, more honest contractors and more skillful mechanics.

Note.—All that our correspondent has to say is most interesting, and his points are well taken. He is, however, laboring under a misapprehension as regards the article in the October issue not being credited to another journal, and therefore being an expression of opinion by the Editor. If he will carefully read the article in question he will discover at the top of the second column on page 334 that it was reprinted from the London *Building News*.

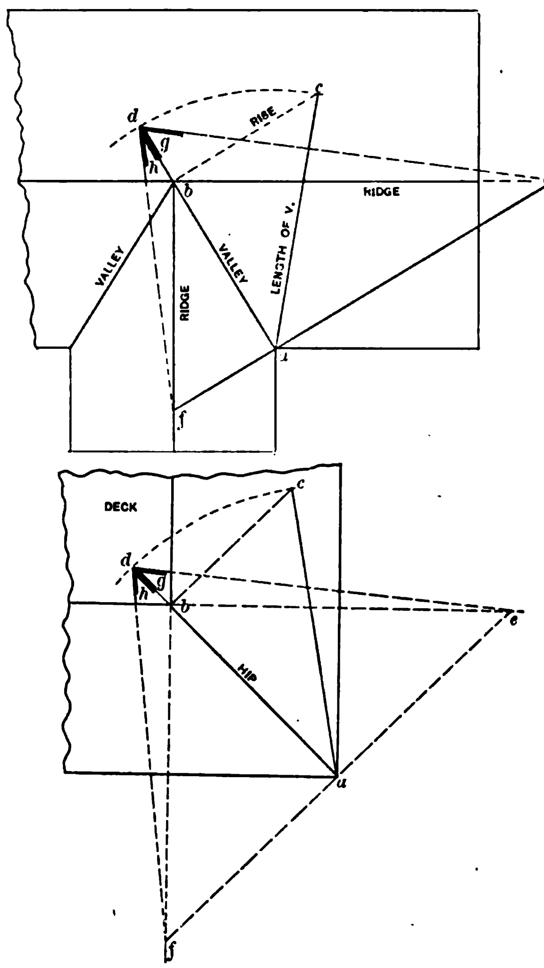
The points raised by our correspondent are timely and interesting, and we shall be glad to have our practical friends in the trade take them up and discuss them in the light of their own experience.

Finding Side Cut of Valley Rafter in Roof of Unequal Pitch.

From A. E., Hartford, Conn.—In the issue for September last there appeared an inquiry from "C. W. H.," asking for a method of finding the bevel or side cut for a valley rafter in a roof of unequal pitch. In ordinary house framing a valley or hip rafter is very seldom "backed," or if it is done it is first cut to length. Therefore a rule which applies only when the rafter is backed causes more confusion than help to the average carpenter. The methods given by "L. K.," Cragsmoor, N. Y., in the October number and by "C. J. M." in the November issue apply only when the rafter is backed. I believe that the method given by "Kese," Westover, Pa., is correct, but he confuses or misleads by saying that the plumb and level cut of the valley rafter which he shows is 12 and 17. How can that be when the rise is 11 ft. and the run about 14 ft. 2½ in.? Only if both intersecting roofs were equal half pitch would the cut be 17 and 12.

I submit herewith sketches, Figs. 1 and 2, showing a method which applies to hips or valleys for a roof of any pitch and whether equal or unequal. Lay out the true length of the valley or hip, as shown at *A C*. Transfer this length to the plan line as shown at *A D*; from the foot of the rafter as *A* draw a line *F A C* square to *A D* and intersecting the lines of the two ridges as at *F* and *e*. Connect *F* and *D*, also *e* and *D*, and the required bevels are found at *H* and *G*. This bevel is for the square rafter or before it is backed.

In conclusion, I wish to say that I have taken great interest in the Correspondence Department for many years and consider the paper in general very valuable.



Figs. 1 and 2.—Diagrams Submitted by "A. E."

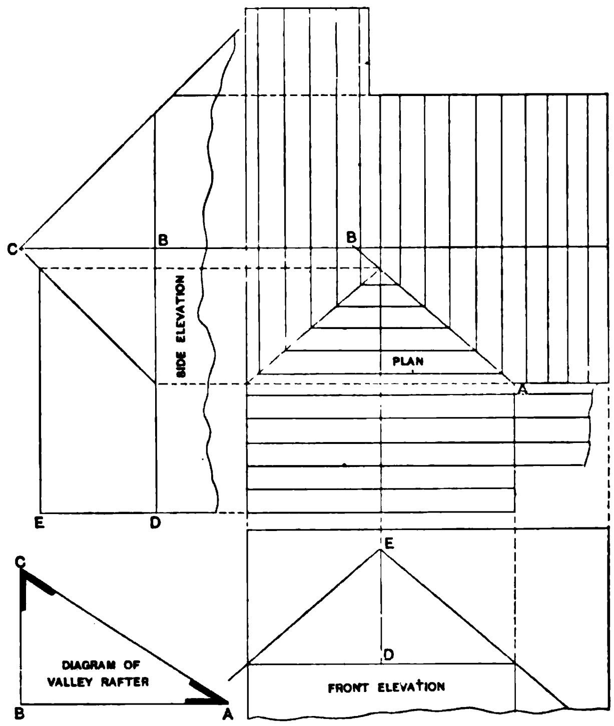


Fig. 3.—Diagram Accompanying Letter of "J. J."

Finding Side Cut of Valley Rafter in Roof of Unequal Pitch.

From J. J., Weldon, Pa.—In the September issue there appeared an inquiry from "C. W. H.," East Haven, Conn., in regard to a question in roof framing as indicated by the above title. I have just such a roof to construct, and I always find the inclined plane over the plan as shown in the accompanying diagrams, Fig. 3, in which *A B* represents the plan and *B C*, of the side elevation, the hight. The inclination which gives the bevel cuts is indicated by *A C* of the small diagram at the lower left drawing. This I consider a sure way of doing the work and is always correct. All cuts, regular or irregular, are found on the inclined plane and are easily remembered.

Regulations Regarding Use of Reinforced Concrete in Philadelphia.

THE extent to which concrete is at present being used in connection with building construction renders more than ordinarily interesting the following copious extracts from the regulations of the Bureau of Building Inspection of the City of Philadelphia in regard to the use of reinforced concrete:

The term "reinforced concrete" shall be understood to mean an approved concrete mixture reinforced by steel or iron of any shape, so that the steel or iron will take up all the tensional stresses and assist in the resistance to compression and shear.

Before a permit to erect any reinforced concrete structure is issued, complete specifications and drawings shall be filed with the Bureau of Building Inspection, showing all details of the construction, size and position of all reinforcing rods, stirrups, &c., and giving the composition and proportions of the concrete. . . .

Reinforced concrete construction will be accepted for fireproof buildings of the first class, if designed as hereinafter prescribed; provided, that the aggregate for such concrete shall be clean, broken, hard stone, or clean graded gravel, together with clean siliceous sand or fine grained gravel; should the concrete be used for flooring between rolled steel beams, clean furnace clinkers entirely free of combustible mattter, or suitable seasoned furnace slag may be used; when stone is used with sand gravel it must be of a size to pass through a 1-in. ring, and 25 per cent. of the whole must not be more than one-half the maximum size; and provided further, that the minimum thickness of concrete surrounding the reinforcing members of reinforced concrete beams and girders shall be 2 in. on the bottom and 1½ in. on the sides of the said beams and girders. The minimum thickness of concrete under slab rods shall be 1 in. All reinforcement in columns to have a minimum protection of 2 in. of concrete.

All the requirements herein specified for the protection of steel and for fire-resisting purposes shall apply to reinforced concrete flooring between rolled steel beams, as well as to reinforced concrete beams and to entire structures in reinforced concrete. Any concrete structure or the floor filling in same, reinforced or otherwise, which may be erected on a permanent centering of sheet metal, of metal lathing and curved bars or a metal centering of any other form, must be strong enough to carry its load without assistance from the centering, unless the concrete is so applied as to protect the centering as herein specified for metal reinforcement.

Concrete Flooring.

Exposed metal centering or exposed metal of any kind will not be considered a factor in the strength of any part of any concrete structure, and a plaster finish applied over the metal shall not be deemed sufficient protection unless applied of sufficient thickness and properly secured, as approved by the Chief of the Bureau of Building Inspection.

All concrete shall be mixed in a mechanical batch mixer to be approved by the Bureau of Building Inspection, except when limited quantities are required or when the condition of the work makes hand mixing preferable; hand mixing to be done only when approved by the Bureau of Building Inspection. In all mixing the material shall be measured for each batch.

When hand mixing is done under the aforesaid limitations, the cement and fine gravel or coarse sand shall be first thoroughly mixed dry and then made into a mortar by gradually adding the proper amount of water. The crushed stone or gravel shall be spread out to a depth not to exceed 6 in., in a tight box or upon a proper floor, and be sprinkled with water as directed; the mortar is then to be evenly spread over the crushed stone, and the whole mass turned over a sufficient number of times to effect the thorough mixing of the ingredients.

All forms and centering for concrete shall be built plumb and in a substantial manner, made tight so that no part of the concrete mixture will leak out through cracks or holes, or joints, and after completion shall be thoroughly cleaned, removing shavings, chips, pieces of wood and other material, and no debris of any kind shall be permitted to remain in the forms. All forms to be properly supported and braced in a manner to safely sustain the dead load and the load that may be imposed upon them during construction.

The reinforcing steel shall be accurately located in the forms and secured against displacement.

Concrete shall be placed immediately after mixing.

Whenever fresh concrete joins concrete that is set, or partially set, the surface of the old concrete shall be roughened, cleaned and spread with cement mortar, which mortar shall be mixed in proportions of 1 of cement to 2 of sand.

Concrete shall not be mixed or deposited in freezing weather, unless precautions are taken to avoid the use of material covered with ice or snow or that are in any other way unfit for use, and that further precautions are taken to prevent the concrete from freezing after being put in place. All forms under concrete so placed to remain until all evidences of frost are absent from the concrete and the natural hardening of the concrete has proceeded to the point of safety.

Concrete laid during hot weather shall be drenched with water twice daily, Sunday included, during the first week. The broken stone, if hot and dry, must be wet before going to the mixer.

The time at which props or shores may safely be removed from under floors and roofs will vary with the condition of the weather, but in no case should they be removed in less than two weeks; provided, that column forms shall not be removed in less than four days; provided further, that the centering from the bottom of slabs and sides of beams and girders may be removed after the concrete has set one week, provided, that the floor has obtained sufficient hardness to sustain the dead weight of the said floor and that no load or weight shall be placed on any portion of the construction where the said centers have been removed.

The concrete for all girders, beams, slabs and columns, shall be mixed in the proportions of 1 of cement, 2 of sand or fine gravel, and 4 of other aggregates as before provided. The concrete used in reinforced concrete steel construction must be what is usually known as a "wet" mixture. When the concrete is placed in water it must be placed in a semidry state.

Only Portland cement shall be permitted in reinforced concrete constructed buildings. All cement shall be tested, in carload lots when so delivered or in quantities equal to same, and report filed with the Bureau of Building Inspection before using it in the work. Cement failing to meet the requirements of the accelerated test will be rejected.

Soundness, Accelerated Test.

Pats of neat cement will be allowed to harden 24 hr. in moist air, and then be submitted to the accelerated test as follows: A pat is exposed in any convenient way in an atmosphere of steam, above boiling water, in a loosely closed vessel, for 3 hr., after which, before the pat cools, it is placed in the boiling water for 5 additional hours.

To pass the accelerated test satisfactorily, the pats shall remain firm and hard, and show no signs of cracking, distortion or disintegration.

Such cements, when tested shall have a minimum tensile strength as follows: Neat cement shall, after one day in moist air, develop a tensile strength of at least 150 lb. per square inch; and after one day in air and six days in water shall develop a tensile strength of at least 500 lb. per square inch; and after one day in air and 27 days in water shall develop a tensile strength of at least 600 lb. per square inch. Cement and sand tests composed of 1 part of cement and 3 parts of crushed quartz shall, after one day in air and six days in water, develop a tensile strength of at least 175 lb. per square inch., and after one day in air and 27 days in water shall develop a tensile strength of at least 240 lb. per square inch. These and other tests as to fineness, set, &c., made in accordance with the standard method prescribed by the American

Society of Civil Engineers, may, from time to time, be required by the Bureau of Building Inspection.

Walls.

Reinforced concrete may be used in place of brick and stone walls, in which cases the thickness may be two-thirds of that required for brick walls, as shown in the schedule, section 18 of the act of assembly No. 123, of the Commonwealth of Pennsylvania, approved June 5, 1901, provided the unit stresses as set forth in these regulations are not exceeded.

Concrete walls in such cases must be reinforced in both directions in a manner to meet the approval of the Chief of the Bureau of Building Inspection.

Steel.

All reinforcements used in reinforced concrete shall be of standard grade of structural steel or iron of either grade to meet the "Manufacturers' Standard Specifications," revised February 3, 1903.

Reinforced concrete slabs, beams and girders shall be designed in accordance with the following assumptions and requirements:

(*a*) The common theory of flexure to be applied to all beams and members resisting bending.

(*b*) The adhesion between the concrete and the steel is sufficient to make the two materials act together.

(*c*) The design shall be based on the assumption of a load four times as great as the total load (ordinary dead load plus ordinary live load).

(*d*) The steel to take all the tensile stresses.

(*e*) The stress strain curve of concrete in compression is a straight line.

(*f*) The ratio of the moduli of elastacity of concrete to steel:

Stone or gravel concrete	1 to 12
Slag concrete	1 to 15
Cinder concrete	1 to 30

The allowable unit transverse stress upon concrete in compression:

	Pounds per square inch.
Stone or gravel concrete	600
Slag concrete	400
Cinder concrete	250

The allowable unit transverse stress in tension:

	Pounds per square inch.
Iron	12,000
Steel	16,000

The allowable unit shearing strength upon concrete:

	Pounds per square inch.
Stone or gravel concrete	75
Slag concrete	50
Cinder concrete	25

The allowable unit adhesive strength of concrete:

	Pounds per square inch.
Stone on gravel concrete	50
Slag concrete	40
Cinder concrete	15

The allowable unit stresses upon concrete in direct compression in columns:

	Pounds per square inch.
Stone or gravel concrete	500
Slag concrete	300
Cinder concrete	150

The allowable unit stress upon hoop columns composed of stone or gravel concrete shall not be over 1000 lb. per square inch, figuring the net area of the circle within the hooping. The percentage of longitudinal rods and the spacing of the hoops to be such as to permit the concrete to safely develop the above unit stress with a factor of safety of four.

When steel or iron is in the compression sides of beams the proportion of stress taken by the steel or iron shall be in the ratio of the modulus of elasticity of the steel or iron to the modulus of elasticity of the concrete; provided, that the rods are well tied with stirrups connecting with the lower rods of the beams; provided, further, that when rods are used in compression the approval of the Chief of the Bureau of Building Inspection must be obtained.

In the design of structures involving reinforced concrete beams and girders, as well as slabs, the beams and girders shall be treated as T-beams, with a portion of the slab acting as flange in each case. The portion of the slab that may be used to take compression shall be dependent upon the horizontal shearing stress that may exist in the beam, and in no case shall the slab portion exceed 20 times the thickness of the slab.

All reinforced concrete T-beams must be reinforced against the shearing stress along the plane of junction of the rib and the flange, using stirrups throughout the length of the beam. Where reinforced concrete girders carry reinforced concrete beams, the portion of the floor slab acting as flange to the girder must be reinforced with bars near the top, at right angles to the girder, to enable it to transmit local loads directly to the girder and not through the beams, thus avoiding an integration of compressive stresses due to simultaneous action as floor slab and girder flange.

In the execution of work in the field, work must be so carried on that the ribs of all girders and beams shall be monolithic with the floor slabs.

In all reinforced concrete structure special care must be taken with the design of joints to provide against local stresses and secondary stresses due to the continuity of the structures.

Shrinkage and thermal stresses shall be provided for by the introduction of steel.

In the determination of bending moments due to the external forces, beams and girders shall be considered as simply supported at the ends, no allowance being made for continuous construction over supports. Floor slabs, when constructed continuously, and when provided with reinforcement at top of slab over the supports, may be treated as continuous beams, the bending moment for uniformly distributed loads being taken at not less than $\frac{WL}{10}$. In case of square floor slabs which are reinforced in both directions and supported on all sides, the bending moment may be taken at $\frac{WL}{20}$; provided that in floor slabs in juxtaposition to the walls of the building the bending moment shall be considered as $\frac{WL}{8}$, when reinforced in one direction, and if the floor slab is square and reinforced in both directions, the bending moment shall be taken as $\frac{WL}{16}$.

When the shearing stresses developed in any part of a reinforced concrete building exceed under the multiplied loads the shearing strength as fixed in this section, a sufficient amount of steel shall be introduced in such a position that the deficiency in the resistance to shear is overcome.

When the safe limit of adhesion between the concrete and steel is exceeded, provision must be made for transmitting the strength of the steel to the concrete.

Reinforced concrete may be used for columns in which the ratio of the length to least side or diameter does not exceed 15. If more than 15 diameters the allowable stress shall be decreased proportionally. Reinforcing rods that are introduced for lateral stresses must be tied together at intervals of not more than the least side or diameter of the columns.

Longitudinal reinforcing rods will not be considered as taking any direct compression.

The contractor must be prepared to make load tests in any portion of a reinforced concrete building within a reasonable time after erection, and as often as may be required by the Chief of the Bureau of Building Inspection. The tests must show that the construction will sustain a load equal to twice the calculated live load without signs of cracks.

MOISTURE IN BUILDINGS is being overcome in the city of Ghent by means of a process recently invented by a Belgian. It appears that walls showing excessive humidity are treated with saltpeter, which draws out the moisture in the walls. The libraries in Ghent were seriously threatened by excessive moisture to such an extent that certain parts could no longer be used, and the success of these experiments is regarded as proved in the fact that within two months the humidity within the rooms was reduced from 83 per cent. to 60 per cent.

ELEMENTARY PERSPECTIVE DRAWING.*—V.

By George W. Kittredge.

THE perspective of circles has been merely hinted at in the earlier part of this work. Since this is a department of the subject which seems to be less perfectly understood by many draftsmen, and in which naturally more errors are to be noticed than in any other part of the work, a few words thereon will serve to put the beginner on the right track. Any one with the least geometrical knowledge knows that a square can be circumscribed about a circle; that is, drawn so as to touch the circle at four points. With what has been already said, there should be no difficulty in putting a square into perspective as seen from any point of view, either in a vertical or a horizontal plane, after which the line representing the circle can be easily drawn within the lines representing the square. The method of accurately drawing the circle within the square will be made clear

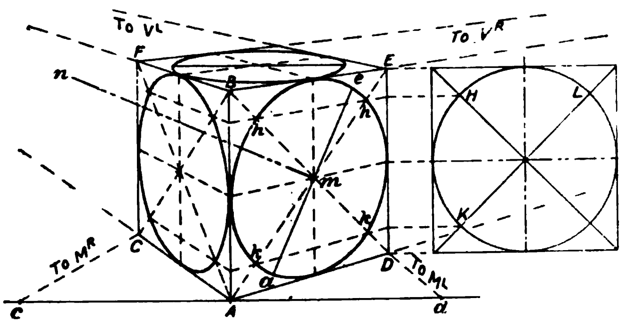


Fig. 8.—Perspective of Circles Inscribed Upon the Sides of a Cube.

by an inspection of Fig. 8, which shows a cube in perspective upon the three visible faces of which circles are drawn; the point of view being such that the three sides are seen at different angles. The method of putting the cube into perspective is so clearly shown as to require no explanation, A *c* and A *d* being of course equal to the hight A B.

To draw the circle within one of the sides, as, for instance, the right side, first cross the diagonals obtaining the center *m*, through which draw a vertical and a horizontal line (the horizontal line being of course drawn toward V^R). The four intersections, with the sides thus obtained, will be the points where the curve representing the circle will be tangent to sides of the square. If for greater accuracy it is desirable to locate other points on the curve, this can be done in the following manner: First construct a square in elevation upon one of the vertical sides of the plane in perspective, as A B or D E, or in line with the same as shown at the right, in which inscribe the circle and draw the two diagonals. Then from the points H and K draw lines horizontally to D E and carry them thence in perspective to cut the diagonals previously drawn across the sides of the cube, cutting them as shown at *h h* and *k k*. This gives four points upon the curve in addition to the four points of tangency with the sides of the square. Through these eight points the curve can be drawn by eye, or with the assistance of the "French" curve if necessary.

In the case of a circle in a horizontal plane, as that upon the top of the cube in Fig. 8, the method of procedure is practically the same as that just described for circles in a vertical plane. Diagonals are crossed locating the center, through which point lines are drawn to both vanishing points, giving the four points of tangency of the curve with the sides of the square. Since, however, neither side of this square is in the plane of the view nor parallel thereto, as is the case of those forming the sides of the cube, the square in elevation must be constructed below the ground line—that is, with one part of the ground line, say, A *d*, as one of its sides, instead of at the right as before. This is more fully shown in Fig. 9, in which the circumscribing square is represented as being seen from different points of view for a purpose which will be explained later. The reference letters for corresponding points are the same in both positions, so that either one or both can be referred to, and both correspond in that respect, so far as possible with Fig. 8. Having constructed the square in elevation with its diagonals (or one-half of it, which is quite sufficient) below the ground line, as shown by A B C D, lines are now carried up from points H and L to cut B C first, then toward M^L to cut B E, and finally toward V^L to cut the diagonals, as shown at *h h* and *l l*. This gives the four additional points in the line of the curve as before, through which, and the four points of tangency previously obtained, the curve can easily be drawn.

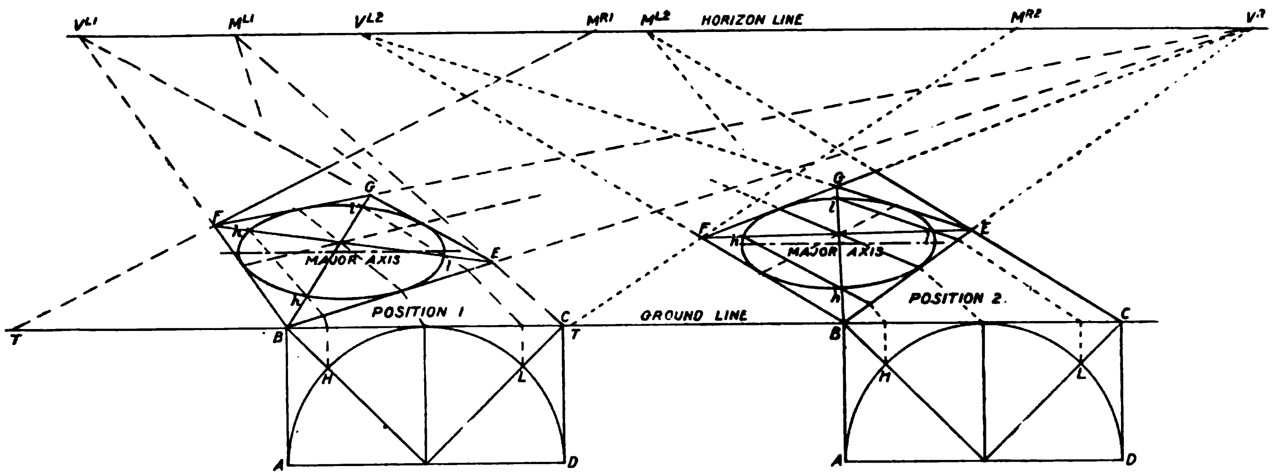


Fig. 9.—Perspective of Circle Lying in a Horizontal Plane.

Elementary Perspective Drawing.—V.

Additional points upon the curve can be obtained in a similar manner. A point, for instance, between A and H can be carried first, upward to cut B C, thence into perspective as before, another line can then be carried from the point to the left to cut A B, when its distance from B can be set off on the ground line from B toward T, and thence carried toward M^R to cut B F, and finally toward V^R, to cut the first line drawn. The intersection thus obtained will occur on the curve in perspective.

An inspection of the curves as obtained in the side planes of the cube in Fig. 8 will now show that a circle in perspective will appear upon the paper as an ellipse more or less flattened, according as the plane in which it is drawn is more or less oblique to the line of sight. Being an ellipse, it will be observed further that its major axis or longest diameter is not vertical, as it is

* Continued from page 377, December issue, 1907.

sometimes drawn, but is at right angles to the axis of an imaginary or real cylinder, of which the circle in question is one end. Thus the line *a e* of Fig. 8, being the longest line that can be drawn through the center *m* of the ellipse *h h k k*, is at right angles to *m n*, which may be considered as the center line or axis of a cylinder, of which the circle represented is one end. Almost every circle used in the delineation of mechanical subjects or solids does represent the end of a real cylinder, because in architectural drawing lines are used to represent the angles between surfaces.

The circles in the elevation of an arch represent not only the outlines of the vertical or plane surfaces, but also the profiles of the receding surfaces. The under surface or soffit of a fillet of half an inch projection, as M or N of Fig. 10, is just as much a cylinder (or a portion of one, in case the full circle is not used), as is that of an arch a foot thick or as the sides of a circular opening whose depth is greater than its diameter. It is necessary to bear in mind that the axis of a right cylinder in reality, not as it appears in the picture, is at right angles to the plane of its end at its middle point; that is, whose axis C X is perpendicular or normal to the plane of the arch at the point C, just as *m n* of Fig. 8 is perpendicular to the plane A B E D at the point *m*. The method of drawing the several curves of the arch is fully shown by the dotted construction lines, and thus furnishes another illustration of the principles already explained in connection with Fig. 8, and shows that C K, which is one-half the long diameter or axis of the ellipse, is at right angles to C X, the axis of the cylinder.

The illustration will possess additional interest as a simple lesson in perspective, in that its parts, including the plan, are all above the horizon line. The perspective of the half square in which the semicircle of the arch is

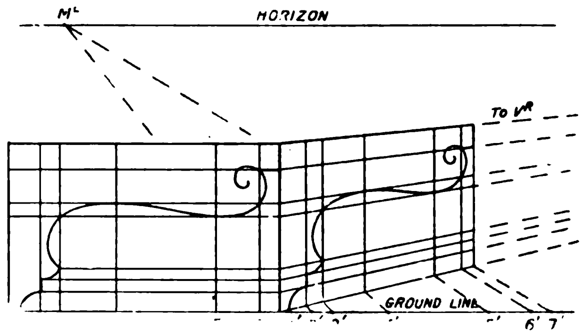


Fig. 11.—Perspective of Figure, the Outline of Which Is an Irregular Curve.

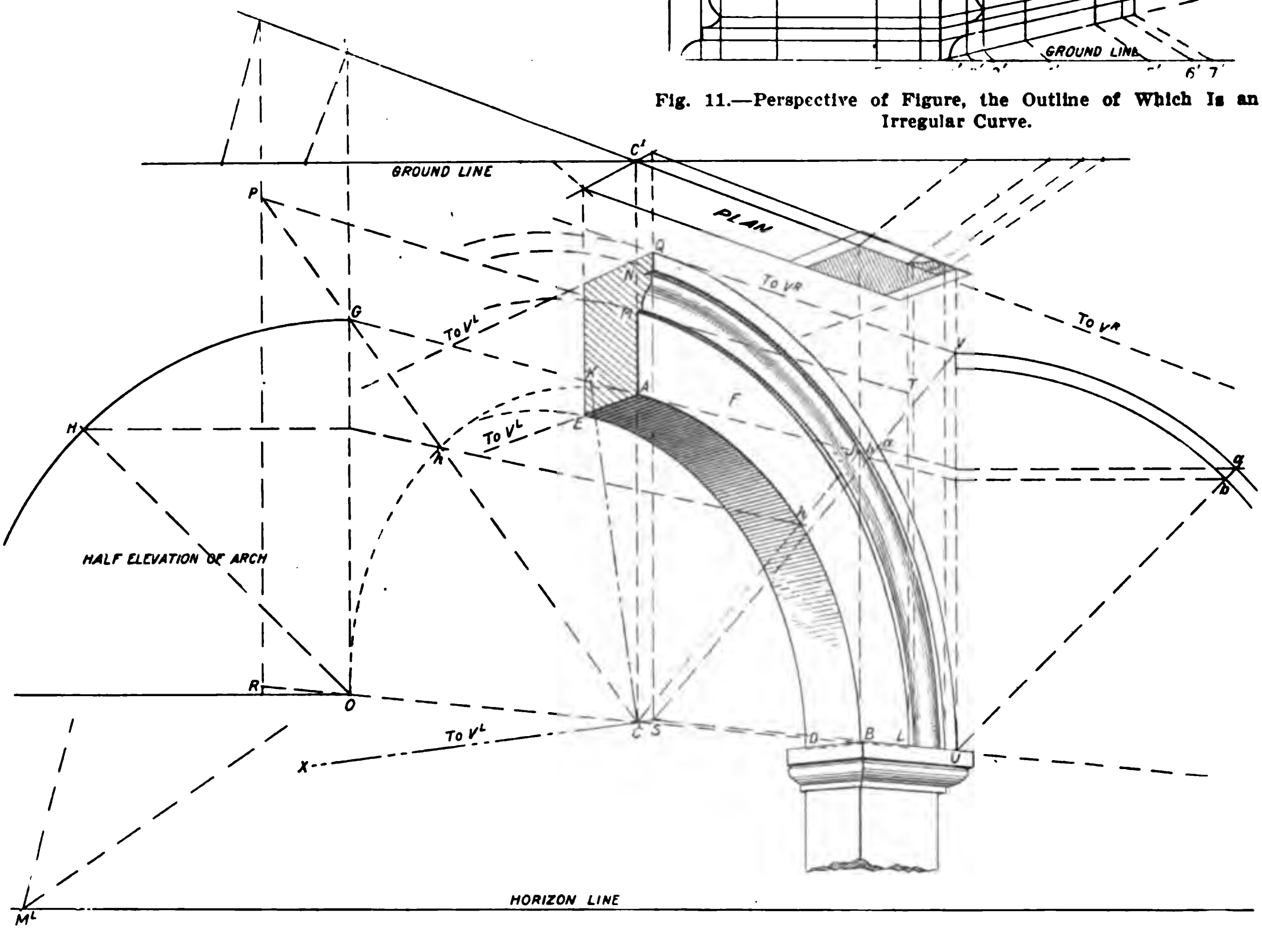


Fig. 10.—Perspective View of an Arch, Showing Method of Determining the Positions of the Curves.

Elementary Perspective Drawing.—V.

normal to the plane of the circumscribing square at the crossing of the diagonals.

In order, therefore, to locate upon the paper the long diameter of an ellipse, which does not actually represent the end of a cylinder, as in the case of a mosaic or a painted design, it becomes necessary to first draw the normal in perspective; that is, to draw a line from the crossing of the diagonals toward V^L or V^R, as the case may be, and then to draw the major axis, or long diameter, of the ellipse, at right angles thereto.

The relation to each other of the several parts just described will be made clear by an inspection of Fig. 10, which shows the perspective view of one-half an arch. In this figure line A B represents at once the outline of the arch, of which C is the center and A C the radius, and also the profile of the soffit, of which E A B D is one-half, E A B D being also one-quarter of a cylinder inscribed is shown by O G J B. Upon the left side of this, with O G as a radius, a sufficient portion of an elevation of the inner curve of the arch is drawn to meet the line O H. This line being drawn from O at an angle of 45 degrees, thus constitutes part of the diagonal of a square whose outside dimensions are equal to two times O G. A line from the intersection, H, is then carried horizontally to cut O G, thence toward V^R to cut the diagonals C G and C J, thus locating the points *h* and *h* upon the curve of the arch intermediate between the points of tangency O A and B of the circle with the circumscribing square.

The construction of an ellipse upon its major axis, as the representation of a circle in perspective, will be found of great advantage, both in preliminary sketch work and also as a means of verifying the curve as drawn first within the square. To avoid possible error, however, it should be noted that the lines *a e* of Fig. 8 and C K of Fig. 10, while they represent the center lines of the ellipses in perspective, do not divide them as they appear upon the paper into exact halves, and are not, therefore, in strict accuracy, their longest diameters for the following reason: Objects of equal size diminish in apparent size as they recede from the eye, consequently that half of the ellipse which appears beyond the line *a e*, or the line C K, must be smaller or narrower than the near half. The position of the real major axis can easily be found, if desired for constructive purposes, by bisecting the minor axis, as shown in Fig. 9. This operation, however, has no particular value in perspective drawing.

From what has now been said regarding the relation of the major axis of an ellipse to the axis of the cylinder the conclusion will be easily reached, that the long diameter of an ellipse representing a circle in a horizontal plane must itself be horizontal, because the cylinder is vertical. This would seem to be self-evident, yet, nevertheless, the error of drawing it otherwise is of frequent occurrence. It is not uncommon to find the major axes of the ellipses representing the bases of a row of columns which stand near the edge of a porch floor, or other continuous base, drawn parallel or nearly so to the said edge of the floor. In Fig. 9 the method of drawing the circle in a horizontal plane is fully illustrated. In the first position in that figure one side of the inclosing square is seen much more obliquely than the other, while in position two both sides of the square have nearly the same angle of obliquity to the picture plane, and yet in both cases the long diameters or axes of the ellipses maintain their horizontal positions. This fact becomes important when it is noted that if known to them at all it is disregarded by some of the best artists, in whose paintings portions of buildings form important accessories. To be exact, there are certain conditions—viz., when the subject is placed near the edge of a picture which includes a very wide angle in the view, under which the major axis of the ellipse deviates somewhat from the horizontal, but as this is not a matter of sufficient importance to justify the extended explanation it would require we omit further reference to it. If the squares within which the circles are to be represented are drawn to the same vanishing points as the other lines of the work, of which they form a part, the resulting curves will appear correct, whatever be their position, when the picture is properly viewed.

In reference to curves other than circles which it becomes necessary to show in perspective, as, for instance, ogee arches, or sides of brackets having fanciful outlines, the work can most easily be accomplished by first inclosing the design in a rectangle, which can be subdivided into smaller rectangular spaces. These spaces may be equal in size or the lines can be drawn so as to touch the important points of the design. The rectangle can then be put into perspective and the design drawn, so that its lines cross or touch the lines of the perspective correspondingly with those of the elevation, all as shown in Fig. 11.

(To be continued.)

Concrete Floors for Barns.

It is well known that at the present day concrete is being extensively used in connection with practically every form of building construction, and not the least interesting application is that for floors in barns. Some suggestive comments on this phase of construction have been furnished by Prof. H. M. Bainer of the Colorado Agricultural College in the shape of an article which appeared in a recent issue of *Hoard's Dairyman*. He states that "too much care cannot be exercised in preparing the foundation for a concrete floor which should always be well drained and firmed to a depth of from 6 to 8 in. below the concrete. If the soil contains a great deal of clay, it may be necessary to remove part of it and to fill in with broken stone, gravel or cinders to within 4 or 6 in. of the proposed finished surface, depending on the thickness of the floor. Blind drains of coarse gravel or tile may be laid from the lowest points in the excavation to carry off any water that may accumulate beneath the structure.

For the construction of the ordinary stable or barn floor, which is not to carry any great weight, the following proportion is to be recommended for the concrete base: 1 part cement, 2½ parts clean sharp sand and 5 parts of loose gravel or broken stone. This should be finished on the surface with a 1 to 1½ in. layer of a mixture of 1 part cement and 1½ to 2 parts of clean, sharp sand. The total thickness of this floor must be from 5 to 8 in., depending upon the load it has to carry.

For engine foundations, floors or driveways over which heavy loads pass, the following proportion is to be recommended: 1 part cement, 2 parts sand and 4 parts broken stone or gravel.

For all large floors it is advisable to place the concrete in sections not to exceed 6 ft. square. This may be done by placing a 2-in. plank of a width equal to the desired thickness of the floor on edge as a box in which the concrete is tamped until water begins to show on top. Make several of these forms, holding the plank in place by means of stakes driven into the under surface. These stakes should be driven on the outside of the form, so they may be easily removed after the concrete has set and the planks have been taken out. Fill alternate forms at first, tamping the concrete thoroughly, especially the edges. On the same day, as soon as the concrete has set, remove the crosswise plank and fill in the forms not filled at first. Mark the side plank to show exactly where the points come.

The finishing coat should be spread on before the concrete has set. To make this of uniform thickness it is best to place either 1 or 1½ in. wood strips, as desired, on top of the concrete over which a straight-edge may be run. Smooth with a trowel for a smooth surface, or with a wooden float for a rough surface. Groove exactly over the joints of the concrete so as to bevel the edges of the block.

Do not trowel the surface too much until it has begun to stiffen, as it tends to separate the cement from the sand and injures the wearing surface.

The floor should be constructed with slope enough to carry all liquids to certain points from which they may be drained.

Protect the new floor from the direct rays of the sun, currents of air and frost and keep constantly moistened for several days. Water is very important in the curing of concrete constructions and must be used liberally.

Use nothing but the best cement that can be obtained. The sand should be clean, sharp and not fine; it should be free from loam or clay, as these will tend to destroy the adhesive quality and retard the setting of the cement. Use clean, pure water for mixing. Mix thoroughly; tamp thoroughly; water thoroughly.

School House Heating in Boston.

The fan system of positive heating and ventilation has been extensively introduced in Boston under the following conditions, imposed by the Schoolhouse Commission:

(a) Allow about ¼ sq. ft. area cross section of heat ducts for each 14 occupants.

(b) Locate in a corner room within 10 ft. of outside wall.

(c) Locate in a room with one outside wall on inside wall near middle.

(d) Bottom of opening to be about 8 ft. above floor.

(e) Opening to be one-third larger than area of duct.

(f) Opening will be provided with ⅞-in. ground and galvanized steel.

(g) Galvanized iron deflectors to match will be placed in each opening.

This commission has responsibility of appointing architects and of erecting and furnishing the buildings ready for use.

It's not the greatest quantity of glue you can get on a piece of work that makes the best glue joint. What is wanted is close contact, with the glue spread evenly and thin. Of course, the quality of the glue has a lot to do with it, too.

USE OF CONCRETE AT ELLIS ISLAND EMIGRANT STATION.

BY WALTER MUELLER.

WITHIN the shadow of the Statue of Liberty's torch, in New York Harbor, lies Ellis Island, the immigrant's threshold into the "land of the dollar." If possessed of the requisite financial capital and a clean record the island is to him an open door into the promised land beyond. Should he be found deficient in any of the necessary qualifications he enjoys Uncle Sam's hospitality for a short time before being shipped back to the land from whence he came.

One of the important departments of the station is that devoted to the treatment of immigrants suffering from contagious diseases, and in order to secure thorough isolation a group of hospital buildings for their exclusive treatment is now under construction on what is officially known as Island No. 3.

The buildings will constitute an effective barrier in guarding the country in general, and New York in particular, against the introduction of diseased immigrants. As Island No. 3 is connected with the main island only by a narrow footbridge, it can be practically isolated at any time.

The entire group is being built throughout of fireproof materials, reinforced concrete and hollow terra cotta tile, and when completed will considerably enhance the general appearance of the entire station. Perhaps the most interesting as well as important use to which concrete is being put in this work is in the foundations, which consist of concrete piles. This is the second instance of the application of this type of piling at Ellis Island.

By invitation a large number of architects and engineers, among them representatives from nearly all of the trunk lines entering New York, recently visited Ellis Island to watch the placing of the piles. The keen and critical interest with which the work was followed, together with the favorable comment upon the methods employed, augurs well for a more widespread use of concrete piling.

Visit to the Island.

Much of the ground occupied by the immigrant station is of "fill," very soft and sticky in its nature and largely interspersed with rock and débris from dredging. This is more particularly so in the case of Island No. 3, which is composed entirely of soil of this character. Under the circumstances the idea of using wood piling was discarded, concrete piles being deemed more suitable in every way.

After a thorough consideration of the various types of concrete piling by the Government's engineer, Frank S. Howell, the Raymond pile was ultimately selected as meeting all requirements. This type of pile is made by placing tapering sheet steel shells in the desired location, and thereupon filling them with concrete, which is carefully tamped during the operation. The shells remain in the ground permanently, and effectively protect the setting concrete against distortion through earth pressures.

At Island No. 3 the earth pressure is particularly severe on account of the filled ground, the tendency of the soil being to slip toward the middle of the island, where many of the 1200 piles have so far been placed. Obviously, any concrete pile made in place without the protection of a permanent form would stand but a small chance of retaining its specified shape in soil of this character.

The shells, which are of 20 gauge sheet steel, 16 gauge at the boot or point, are placed in the ground by means of an iron driving core propelled by a 3000-lb. Vulcan steam hammer falling 3 ft. and delivering 10 blows for the final inch of penetration. The core consists of two cones, which can be separated or brought together through the action of a series of wedges. A driving cap is attached to the head of the core. The shells, which are made in sections, are slipped over the core, the cones of which are now separated, until it is entirely encased or dressed. It is thereupon driven into the ground to the proper depth and then withdrawn by bringing the cones together or collapsing the core, as the operation is termed. The shell thus deposited in the ground is filled with concrete, after having been carefully and thoroughly inspected by means of an electric light lowered into it.

The favorable results secured with Raymond piling as foundations for the corridor of one of the hospitals on the main island, as well as for the academic group of buildings at the United States Naval Academy at Annapolis, were influencing factors in the selection. In the latter instance, a saving of more than 50 per cent. over the cost of the wood piling originally specified was effected.

The increased bearing value claimed for piles of tapering shape is being fully substantiated at Ellis Island. In most soils large, tapering concrete piles, 18 or 20 in. in diameter at the top and 6 or 8 in. at the point, are very much more effective than straight piles of greater length. This is particularly true where a comparatively hard stratum is underlaid by softer material, as is the case in the operations described herein.

In New York City 25-ft. tapering piles have been found to be equal to 40-ft. piles of a uniform diameter. At Salem, Mass., 20-ft. piles of the same size were found to be equal to 50 and 60 ft. wooden piles, which, while large, were nearly straight. At Boston a pile 20 ft. in length, 20 in. in diameter at the top and 6 in. at the bottom, while requiring fewer driving blows, offered more final resistance than a pile of the same length, 18 in. at the top and 13 in. at the point.

The explanation is that a tapered pile distributes its load more uniformly throughout its entire length. In a straight pile, on the other hand, the load is largely concentrated upon the limited area of the point. Thus, where a pile penetrates the hard stratum lying near the surface and into the softer underlying material, the bearing value of the upper stratum is fully developed by the large, tapering wedge-shaped type of pile. This bearing value would be almost lost, however, with a pile which is straight or nearly so.

An unusual feature of the construction, and one which is attracting considerable attention on account of its novelty and economy, consists in the floor and foundation girders of the superstructures of the buildings being built 2, 3 and 4 ft. above ground. In place of the usual brick piers or columns, the concrete piles, instead of being cut off flush with the ground, as is the usual practice, are run up to the desired hight. The concrete girders are built directly upon them. This feature eliminates all excavation and cuts down the concrete to the girders over the tops of the piles. The piles used in this manner are reinforced with round rods.

The Edison Idea of Cement House Construction Not New.

The idea of casting a whole building in a single piece is not novel, writes Nikola Tesla to the New York *Globe* in discussing the "monolithic" house construction. It was advanced years ago by the famous gun manufacturer, Krupp of Essen, Germany. Engaged in founding and casting on a vast scale and confronted with the necessity of constructing cheap dwellings for his army of workmen, the scheme presented itself quite naturally to his mind.

To what an extent he applied it in practice I do not know, but I recall distinctly that at one time he proposed to cast an entire fort in one piece. The plan is fascinating and appears at first practicable, but it is more likely to prove an *ignis fatuus* than my Martian telegraphy.

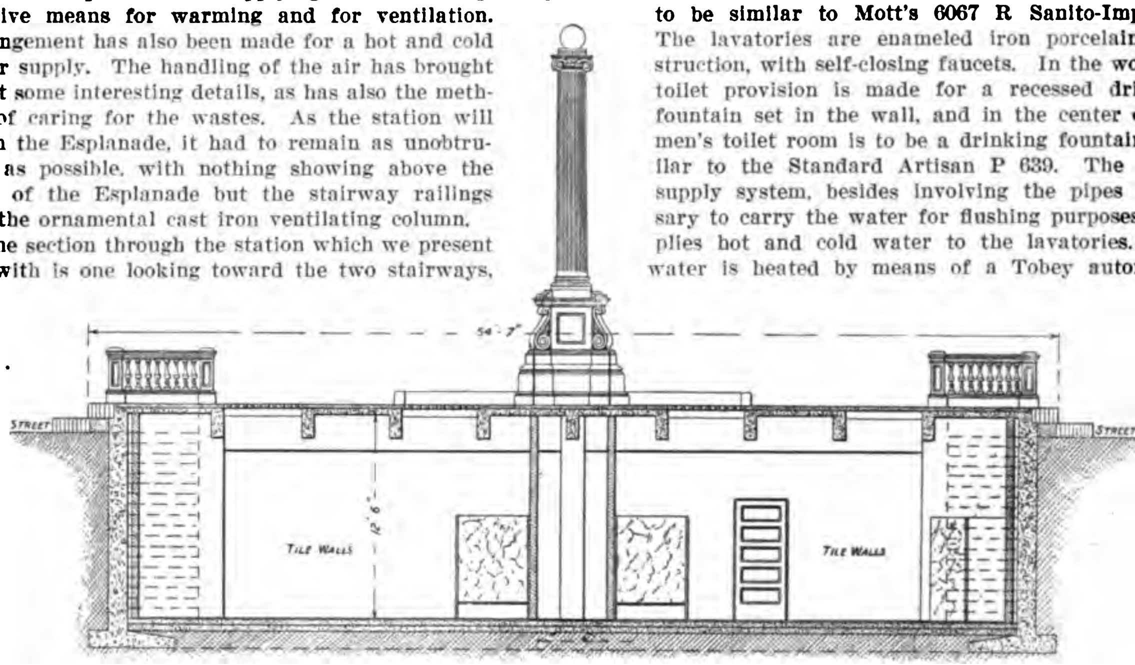
It is the universal experience in building and manufacture that the most economical and satisfactory results are obtained by producing separate parts and joining them into a whole. This also applies to a cement house. Quite apart from this general principle, however, the "monolithic" process is by no means a safe one, and a single bad casting, necessitating breaking up and removal, will offset the profits on a great number of good ones. Taking everything into consideration, I think that a dwelling manufactured in suitable parts would be decidedly cheaper and for many reasons preferable.

A PUBLIC COMFORT STATION IN CINCINNATI.

FOR several years past there have at intervals been erected in several of the leading cities of the country public comfort stations embodying in their arrangement many novel and interesting features, not alone from the standpoint of the architect and builder, but from that of the public at large. One of the latest constructions of this character is a station now in course of building in the city of Cincinnati, Ohio, the work being sufficiently advanced to allow of the presentation of some of its more interesting features. It is located at the east end of what is known as Fountain square, and in addition to an equipment of thoroughly up to date sanitary fixtures installed in rooms finished in bright hard smooth surfaces calculated to minimize the chances for the lodgement of dirt, apparatus is provided for supplying and exhausting air by positive means for warming and for ventilation. Arrangement has also been made for a hot and cold water supply. The handling of the air has brought about some interesting details, as has also the methods of caring for the wastes. As the station will be on the Esplanade, it had to remain as unobtrusive as possible, with nothing showing above the level of the Esplanade but the stairway railings and the ornamental cast iron ventilating column.

The section through the station which we present herewith is one looking toward the two stairways, ing into a 3-in. pipe carried to the 4-in. fresh air inlet shown. The local vent for each urinal stall is 3 in. in diameter, and these are connected into a main which is carried underground in an 8-in. vitrified pipe to the exhaust fan intake. The main or running trap of the system, 6 in. in diameter, is set in a brick lined vault, and the main pipe is provided with a Barrett back water valve to prevent a back flow, if such a tendency should ever arise through the water in the sewers rising too high.

The water closets are of the seat action type, with flushing tanks concealed in the space behind the partitions, and the specifications suggested fixtures similar to the Douglas Samson combination. The urinals in the men's room, the piping to which is run concealed behind the marble partitions in the rear of them, were specified to be similar to Mott's 6067 R Sanito-Imperial. The lavatories are enameled iron porcelain construction, with self-closing faucets. In the women's toilet provision is made for a recessed drinking fountain set in the wall, and in the center of the men's toilet room is to be a drinking fountain similar to the Standard Artisan P 639. The water supply system, besides involving the pipes necessary to carry the water for flushing purposes, supplies hot and cold water to the lavatories. The water is heated by means of a Tobey automatic



Section Through the Fountain Square Comfort Station, Cincinnati, Looking Toward Stairways.

A Public Comfort Station in Cincinnati, Ohio.—Gustave W. Drach, Architect.

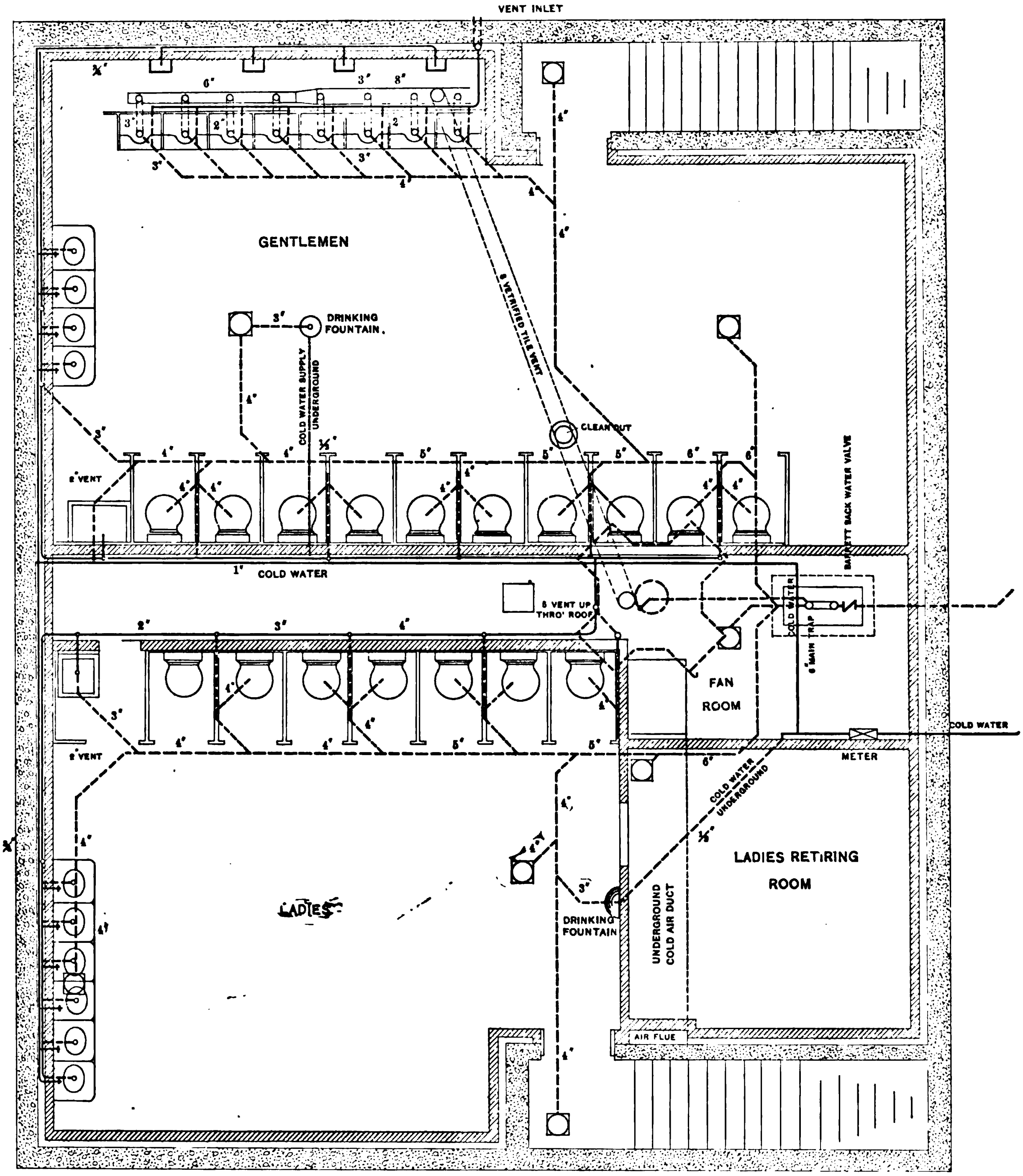
there being departments for both men and women. The plan on the following page, reproduced to show the drainage system, indicates the arrangement of the rooms and fixtures. In addition to the main rooms there is also a women's retiring room, a room for the fresh air and exhaust fans and a pipe space between the two rows of toilets. The walls are to be of a white enameled brick and the floors to be tiled with 6 x 6 in. red quarries. All partitions in and about the rooms are to be of gray Tennessee marble. The general construction of the roof and walls is of reinforced concrete, and the walls have a 4-in. air space between the outside concrete work and the inside thickness of 4-in. hollow tile. The floors of the pipe space and the fanroom—that is, the spaces not set apart for public use—are covered with cement.

Seven water closets are provided in the women's room, eight urinals and ten water closets in the men's room, six lavatories in the women's department and four in the men's, and a slop sink in a closet in each room. The soil and waste pipes are, of course, run underground and are extra heavy cast iron pipe. The back venting pipes are indicated on the plan, as well as the main drainage pipes. The main vent for the sewerage system is run into the intake box of the exhaust fan, near the center of the building, so that this air can be discharged above ground level through the ventilating shaft, the position of which is shown in dotted lines on the plan. In one of the details is shown the air inlet for the drainage vent system at street level back of the urinal stalls, and in another will be noted the method of draining the traps at the urinals. At the discharge sides of these traps the vent pipes are 2 in. in diameter, these branches connect-heater in the fanroom, and steam for the purpose and for general heating is obtained from a neighboring building. All the piping for both the hot and cold water systems is seamless brass pipe, iron pipe size.

Both toilet rooms and the ladies' retiring room are to be heated and ventilated by means of supply and exhaust fans, which are to be operated by electric motors, although some direct radiation is contemplated. The supply fan will have a tempering coil for taking the chill off the fresh air supply, and the way the fresh air is conducted to the fan is shown in one of the acompanying detail drawings. It will be noted that the air is taken from a point close to the stairway area on the women's side of the station by means of a flue provided in the concrete work. This flue opens into a duct under the floor, and this is carried over to the center line of the building where the fanroom is located. The discharge from the fan is conducted in a system of galvanized iron piping, as also indicated in one of the engravings, which shows the number and size of the different branches. The total supply of air counted on is 2600 cu. ft. per minute, which would change the air in the rooms at the rate of eight times an hour with a velocity at the registers in the room walls of 200 to 225 ft. per minute.

The air is drawn out through registers located near the floor in each closet stall, also at a point close to the floor in the women's retiring room, and as already stated, through the local vents at the urinals. The exhaust fan discharges into the ornamental column through one of the openings at the base shown in the detailed view of the column, the two openings being occasioned by a concrete beam which spans the building at this point, and allowing a space through which the interior of the column can be reached at any time if necessary, the one opening having the air discharge duct from the fan and ordinarily closed by an air tight cover. The air escapes from this column through a series of openings 2 in. wide around the base of the ball top of the column and also through an opening in the top of the ball. Incidentally, it may be stated that encircling this row of openings at the base iron ducts are of No. 20 gauge, with seams locked and soldered. Each branch from both the air supply and the exhaust systems is to have a damper for the proper equalization of the air flow.

The station has been designed as a whole by Gustave W. Drach, architect, with offices in the Union Trust Building, Cincinnati, Ohio, and the mechanical details were developed by W. G. Franz, mechanical engineer.

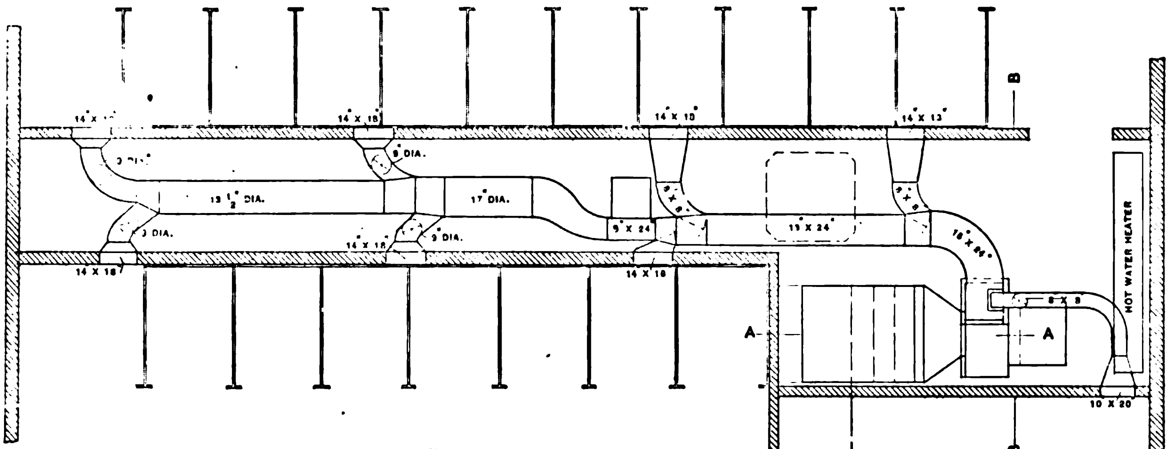


Plan of the Station, Showing the Water Supply and Drainage Pipes.

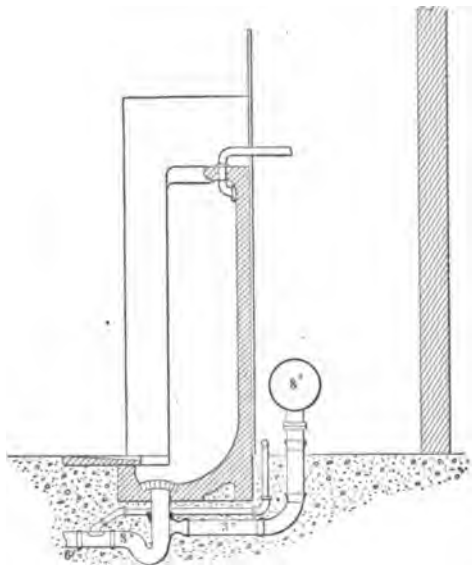
Public Comfort Station in Cincinnati, Ohio.

of the ball is to be a ring of incandescent electric lights for night illumination. The exhaust fan has a capacity to handle 2000 cu. ft. of air per minute, which, it will thus be seen, is about 77 per cent. of the amount of fresh air supplied, resulting in the creation of a slight plenum within the station, so that there will not be cold drafts driving down the stairways into the rooms, but tendencies for a reverse current. The tempering coils of the fresh air supply are to have thermostatic regulation, so that the temperature of the air can be automatically controlled, and there is also to be sufficient direct radiation in the rooms to take care of the wall losses. The galvanized The work is being done under the supervision of the Park Department, of which J. W. Rogers is superintendent, and the contractor for the plumbing work is William Attlesey, Cincinnati, Ohio.

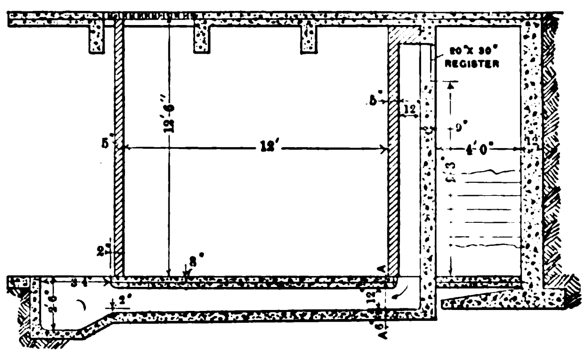
It is stated that Oregon has 300,000,000,000 ft. of standing timber, which is more than any other State in the Union, and one-sixth of the entire supply of the United States. At $12 per 1000 ft., the State's timber is worth $3,600,000,000. The most productive area lies west of the Cascades, where the average of standing timber is 17,700 ft. to the acre, but many tracts are found that



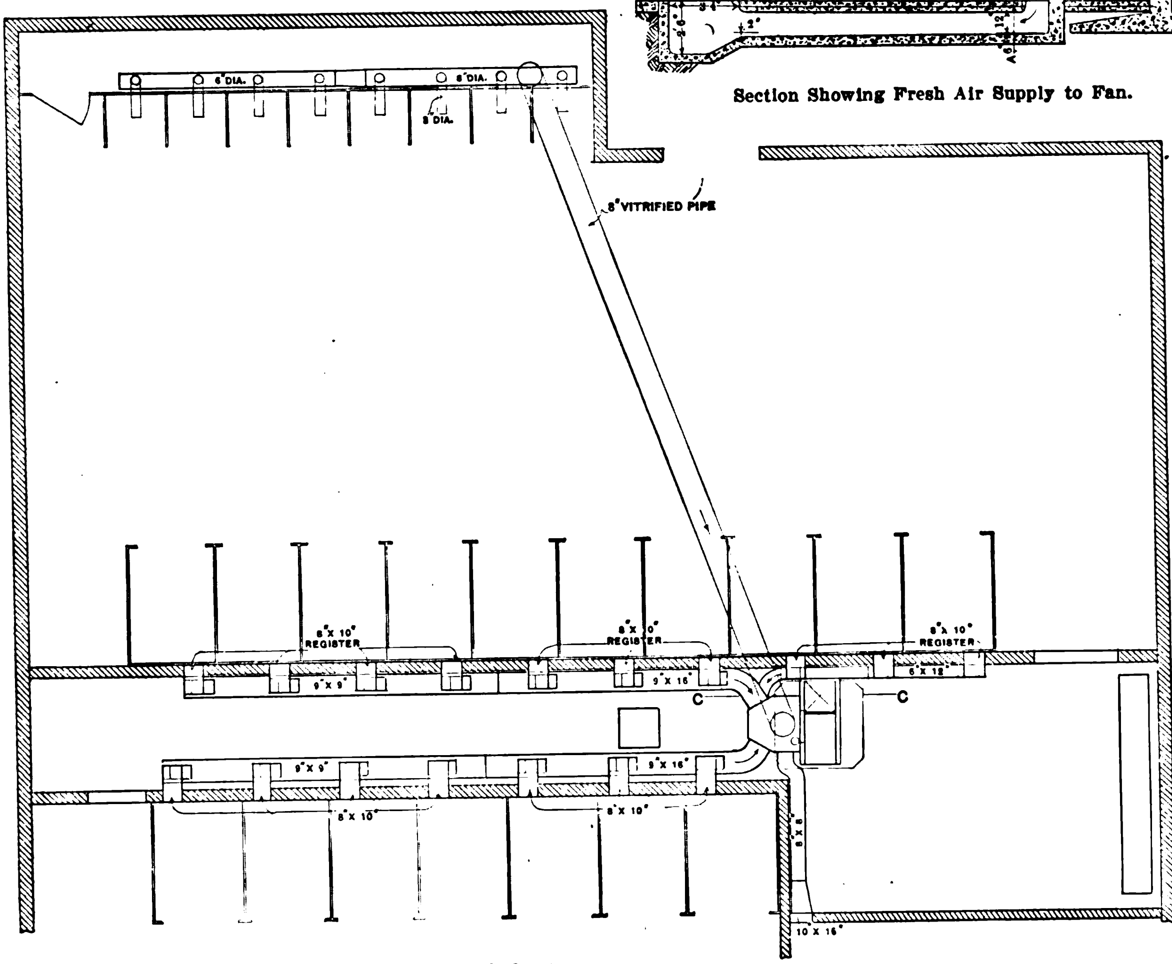
Plan of the Fresh Air Heating System.



Method of Ventilating Urinals.



Section Showing Fresh Air Supply to Fan.



Plan of the Air Exhausting System.

Public Comfort Station in Cincinnati, Ohio.

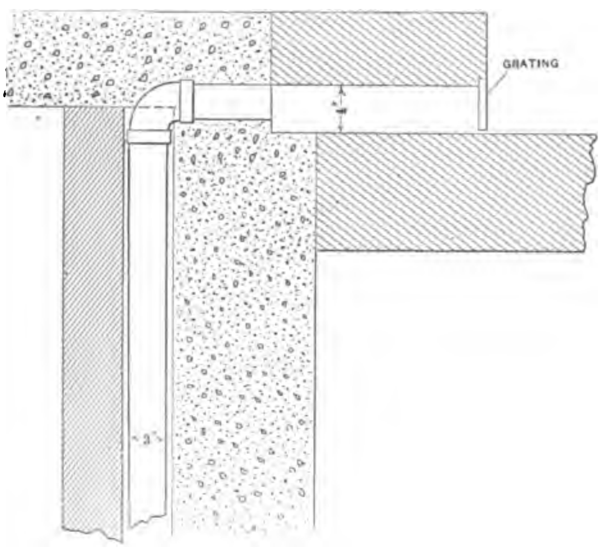
yield 50,000 ft. Single logs, that in the form of sawed lumber are worth from $50 to $100, are commonplace. Six hundred sawmills, employing 15,000 men, besides 7000 men in the logging camps, produce 2,000,000,000 ft. of lumber every year, for which the world's markets pay Oregon nearly $45,000,000 for forest products of all classes. Federal withdrawal of extensive forest reserves and the State's new laws for the protection of its forests are depended upon to prolong indefinitely the existence of Oregon's timber supply as its principal source of revenue.

Wages in the Building Trades of New York City.

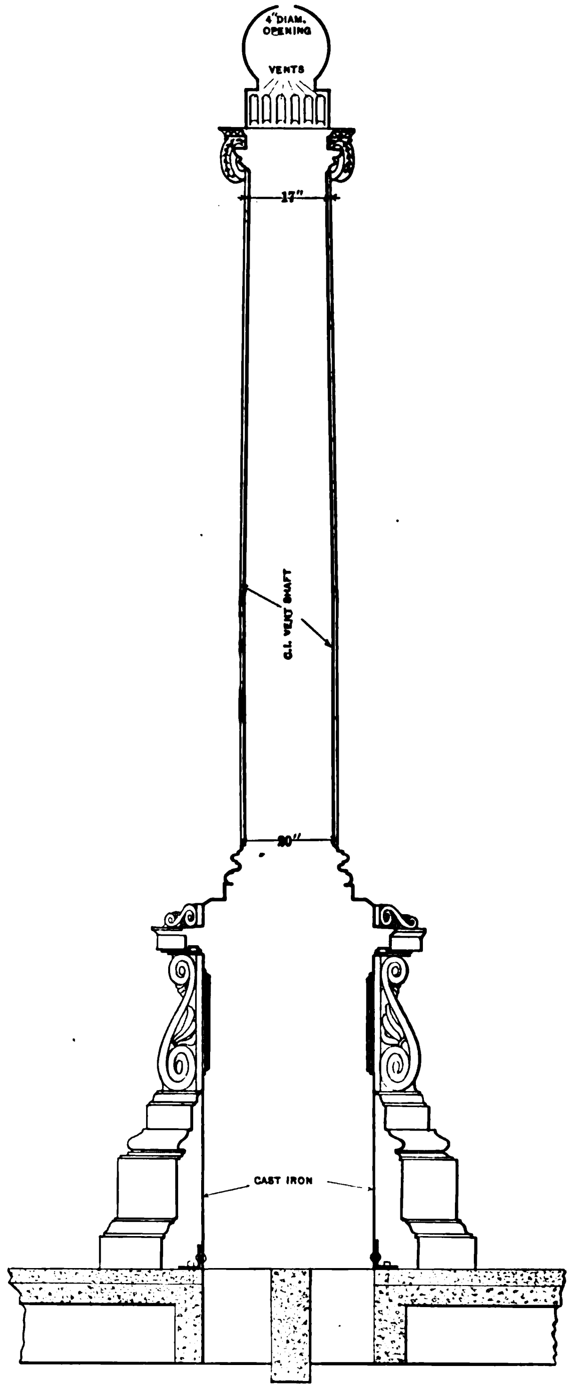
About the middle of November an official statement was issued on behalf of the Building trades Employers' Association bearing upon the conditions existing in the building trades in the various boroughs of Greater New York. It was pointed out that while there have not been so many idle building mechanics at this season of the year for a long time past, the general sentiment among contractors forming the association was against reducing wages when the present trade agreements expire at the close of December. While there has recently been some increase in the number of projected buildings in the Borough of Manhattan, there has been an appreciable shrinkage in Brooklyn and the Bronx.

The present wages in each of the branches of trade specified are as follows:

Bricklayers and Masons' International Union, 70 cents an hour.
Cement Masons' Union, 62½ cents an hour minimum. Laborers, skilled, 35 cents an hour; unskilled, 25 cents.
United National Association of Plumbers and Steamfitters, $5 a day for 8 hr.
United Brotherhood of Carpenters, $5 a day for 8 hr.
Elevator Constructors and Millwrights Union, $4.50 a day for 8 hr.
Insulators and Asbestos Workers' Union, $4.50 a day for 8 hr.
Hoisting and Portable Engineers' Union, $5.50 a day for 8 hr.
Metallic Lathers' Union, $4.50 a day for 8 hr.
Plain and Ornamental Operative Plasterers' Union, $5.50 a day minimum. Laborers, $3.25; both for 8 hr.



Fresh Air Inlet for Plumbing System.



Section of the Ventilating Column.

Public Comfort Station in Cincinnati, Ohio.

Sheet Metal Workers' Union, $4.50 a day for 8 hr.
Stone Setters' Union, $5.50 a day for 8 hr.

The statement continues:

"The volume of work now going on is less than it has been for years at this time of the year, but reducing wages would not increase the volume of business. Of course, it would not be possible to predict absolutely the prospects of building for 1908, but there is little work now and next year is the year of the Presidential election, when trade generally is unsettled. A good deal depends on the time occupied in completing the tunnels and other public improvements now in progress. If they are pushed along with the prospect of being finished sooner than is now expected it will stimulate building operations and contractors will be inclined to take more chances. The contractors in our association employ about 40 or 45 per cent. of the mechanics in the Greater New York and about 75 per cent. of the building mechanics in Manhattan alone. What the independent contractors may do, whether they will reduce wages or keep them at the present figure and select the best men, remains to be seen. In contract work in New York, where everything is wanted in a hurry, speed counts for a good deal."

The popularity of concrete in the structural world, instead of curtailing the use of lumber, seems to be enlarging the demand, for the present at least. This is due to the fact that many big buildings which might have been built of steel, stone and brick are now being built of concrete, and in this work it takes a large quantity of lumber to make the forms—lots more, in fact, than would have been used in a brick building, and all this calls for more extra lumber than is being replaced in structural work by concrete.

WHAT BUILDERS ARE DOING.

NOTWITHSTANDING the unusual activity which prevailed in building circles in Atlanta, Ga., in 1906, the season just closed has made a most gratifying showing, the records of the office of the City Building Inspector for the month of November, 1907, indicating a slight increase in the value of the projected improvements as compared with the same month of the year before. The increase while small, is regarded as significant owing to the fact that the fall and winter months are not those which ordinarily show an increase in the amounts invested for new buildings. During November, 1907, the value of the improvements for which permits were issued was placed at $374,385, while in the same month of the year before the amount involved was $371,775.

Chicago, Ill.

A decrease of 51 per cent. is noted in total for the month of November, over the same month in 1906, the record being as follows: November, 1907, number of buildings, 496; number of feet frontage, 13,121; total cost, $2,205,150; November, 1906, number of buildings, 830; number of feet frontage, 19,426; total cost, $4,561,300. Thus it will be seen that while the decrease in the number of buildings was only a little more than 30 per cent., the cost was reduced more than one-half. This is accounted for by the fact that the County Court House, the Commercial National Bank Building and two or three other very large structures came into last year's record, swelling the figures for the month of April to $12,139,875, which was nearly double the cost reached for the next highest month of that year. For the 11 months of 1907, there were permits issued for 9083 buildings, costing $53,600,180, while in the same period of 1906 there were 9859 permits taken out for buildings costing $61,138,680.

Notwithstanding the financial depression of 1907, the general average of building operations held up well, until the beginning of November, when by reason of the money panic, then in its acute stage, many projects under way were held up. Unquestionably the high costs of building material and labor were also potent factors in holding back new construction work that otherwise would have been undertaken.

Evidences of readjustment of prices are beginning to appear and by the time work begins to open up in the spring it is confidently expected that building cost will be materially reduced. Prices on lumber already show some decline and cement has reached an extremely low level, sales having recently been made below 85 cents per barrel.

The work in prospect for 1908 includes several large buildings, the plans for which are completed and work will probably be begun as soon as weather conditions permit. Principle among these are the Corn Products new $5,000,000 plant to be erected at Summitt, the new City Hall and the La Salle Hotel Building. It is probable also that the new year will witness the beginning of work on the new Northwestern Depot. On the whole, therefore, the building prospect for 1908 promises a large amount of new construction.

Cleveland, Ohio.

Building operations fell off somewhat during November as compared with the corresponding month the year previous. The report of Building Inspector Lougee shows that during November last 473 permits were issued for buildings and improvements, the estimated cost of which was $870,318. During November, 1906, there were 661 permits issued, totaling $808,027. Of the permits issued during November last, 26 were for stone and brick structures to cost $540,360, and 179 were for frame buildings, to cost $246,335. There were 268 for alterations and additions to cost $83,623.

Building operations fell off considerably early in December, and this falling off, due partly to the financial situation, has resulted in much keener competition among contractors.

At the recent annual meeting of the Carpenters' Contractors Association of Cleveland, the following officers were elected for the ensuing year: President, George Y. Farmer; vice-president, G. A. Rutherford; secretary-treasurer, J. H. Caunter; delegate to the Executive Board of the Building Trades Employers' Association, W. B. McAllister; alternate, Oscar Alexander.

The annual meeting of the Builders' Exchange of Cleveland was held on the evening of November 13, being preceded during the day by the election of directors for the new fiscal year. The voting for directors started at 11 o'clock and was conducted under the direction of five judges of election, the annual custom of depositing ballots according to the Australian system being followed. When the polls closed at 8 o'clock in the evening, it was found that 206 ballots had been cast out of the total membership of 375 in the exchange. The following were the successful candidates:

Messrs. Geo. B. McMillan, F. G. Hogen, Geo. H. Brown, R. J. Humphries, Geo. A. Rutherford, Henry A. Taylor, Geo. Y. Farmer, Elmer E. Teare, Geo. J. Lang and Geo. F. Thesmacher. The board organized by electing Geo. B. McMillan, a prominent general contractor, president, Henry A. Taylor, vice-president, F. C. Hogen, treasurer, and selected Edward A. Roberts as secretary for the ninth consecutive term.

At the annual meeting held in the evening, the attendance was nearly 200. Reports presented by the officers of the exchange indicated a very prosperous year. Among the important events recorded were the holding of the annual banquet jointly with the Cleveland Chapter, American Institute of Architects, at which Frank Miles Day, president of the American Institute, was the guest of honor; the holding of the annual Christmas party in the Chamber of Commerce Hall, with a programme of mirth and jollity; the annual summer outing to Mackinac on the steamer Northland; the annual watermelon feast in August; a series of social and business luncheons, held at noontime and addressed by prominent men on subjects of interest; the holding of regular 'change hour sessions every business day in the year and the reading of bulletins of information at each of these sessions.

It was reported that the Board of Directors had held 46 meetings during the year, averaging 1 hr. for each session; that the average daily attendance of members and officers at the exchange rooms was 231, compared with 219 for the previous year; that an exchange directory with classified list of members had been issued and distributed; conferences held by the Committee on Trade Education in Cleveland; that the exchange had joined with the local chapter of architects to consider modifications in the new building code and that important work had been done by the Committee on Legislation.

The average number of pieces of mail received and distributed at the exchange was reported to be 140 per day, and the average number of telephone messages in and out over 500 per day.

A handsome illustrated report was issued in connection with the annual meeting, this report containing attractive halftone portraits of the members of the Board of Directors and other illustrations. Following the business meeting the members of the exchange enjoyed a luncheon at the Chamber of Commerce Club, where addresses were made by the retiring officers.

Detroit, Mich.

The prevailing financial stringency has so far made no great impression on the building business in Detroit and the wonderful increase in the valuation of building permits in the first 10 months of 1907 seems to be maintained. Of course the greater portion of the work now under construction was contracted for before the present stringency, but, nevertheless, permits are still being taken out for many large buildings and a great deal of building will be done throughout the winter.

Building permits issued from the Fire Marshal's office for November, 1907, reached a total of $1,418,450, for 266 new buildings and 22 additions, as against $679,200, for 308 new buildings and 41 additions, during the same month in 1906. This brings the total valuation for the first 11 months of 1907 to $13,756,600, as against $11,376,600 for the same period last year. The value of permits taken out so far in December are well in advance of 1906.

Builders in Detroit generally are considering a new building code for the city. The present code is an old one and does not specifically cover all points now brought up. This new code will undoubtedly be one of the first duties to be taken up by the new building commission recently appointed by Mayor Thompson.

Indianapolis, Ind.

The effects of the recent financial stringency are strikingly manifest in the heavy shrinkage in building operations during November of the year just closed. The figures compiled in the office of the City Building Inspector show the total value of the improvements for which permits were issued to have been only $163,255, while in November of the year before the amount was $434,197. The number of permits issued were 194 and 258, respectively.

Kansas City, Mo.

Building improvements during the month of November were slightly in excess of the corresponding month a year ago, notwithstanding the financial stringency and the difficulty generally experienced in obtaining funds to carry on projected operations. According to F. B. Hamilton, Superintendent of Buildings, there were 248 permits issued by the department for buildings having a frontage of 2578 ft. and estimated to cost $591,280, while in November, last year, there were 227 permits issued for buildings having a frontage of 3588 ft. and estimated to cost $496,810. From these figures it will be seen that there was a slight increase both in the number of permits issued and in the estimated cost of improvements, although a rather marked decrease in the frontage of buildings projected.

Los Angeles, Cal.

Considering the comparative dullness of the building season the report issued by the Building Inspector for November, 1907, is more than ordinarily interesting. It shows 522 permits to have been issued for new structures and alterations involving an outlay of $846,780, while in November, 1906, there were 653 permits issued and the value of the improvements was placed at $1,089,543. A striking feature of the report for November last was the permits for one-story building of Class D, these being 197, calling for an outlay of $211,856. One Class A reinforced concrete building called for $300,000, and one Class A steel frame structure, $75,000. There were 19 permits for two-story buildings of Class D, involving an outlay of $70,694, and 15 buildings of Class C costing $61,135.

The city building department has issued a circular governing the issuing of building permits and construction work, from which the following is of interest:

Masonry foundations for one two-story frame building shall not be less than 8 in. wide at the top and 12 in. at the base or footing, nor less than 6 in. below the curb lever, or surface of ground.

Masonry foundations of one and one-half and one story frame buildings shall not be less than 8 in. wide at the top and 16 in. at the base or footing, nor less than 12 in. below the curb level or surface of ground. (See sections 52 and 53 of Los Angeles Building Ordinance).

No cellar or foundation wall shall be less than 8 in. wide at the top—no 4-in. wall allowed under any circumstances. (See section 53, Los Angeles Building Ordinance).

In a one-story frame building having studs not more than 12 ft. long, and nonbearing partitions, 2 x 3 may be used; one and one-half and two story frame buildings must have not less than 2 x 4 studs. (See section 55, Los Angeles Building Ordinance).

Solid bridging over all bearing partitions; and in all walls and partitions fire stops must be provided, as required by sections 31 and 55 of Los Angeles Building Ordinance in all buildings.

Brick chimneys must be built from the ground up and flues must not be smaller in the interior than as follows:

No. of inlets.	Size in the clear.
1	7½ x 7½
2	7½ x 11½
3	7½ x 15½

and for a larger number of inlets shall be increased in size in the same proportion. (See sections 103-5, Los Angeles Building Ordinance).

Outside fire limits terra cotta chimneys may be used on the outside of buildings, provided they be exposed the full length. (See section 105, Los Angeles Building Ordinance).

No smoke pipe or stove pipe shall be extended through any roof, wall or window. (See section 109, Los Angeles Building Ordinance).

Gas grates, gas logs, instantaneous heaters, &c., shall be provided with double vents as requested by sections 107-108, Los Angeles Building Ordinance, but in no case shall they be vented into a fire flue.

Two inches by 6 in. shall be the minimum size of first floor joist, and 2 x 8 in. of second floor joist. Two inches by 6 in. shall be the minimum size of mud sills.

So-called California houses, over one story in hight, must have 2 x 4 studding 16 in. on centers.

Milwaukee, Wis.

There has been little or no let up in the onward march of building improvements, notwithstanding the scarcity of funds which characterized the month of November and the latter weeks of October. The records of the Bureau of Building Inspection show that in November, permits for 211 buildings were issued, estimated to cost $1,119,887, while in November, 1906, permits were taken out for 243 buildings costing $925,242.

For the 11 months of the year just closed 3534 permits were issued representing an investment of $10,494,414, while in the corresponding 11 months of 1906 there were 3602 permits taken out calling for an estimated outlay of a trifle less than $9,000,000, and for the entire year was only $9,713,284. The highest amount for any year previous to 1907 was that for 1905, when the amount involved was $9,806,729.

Omaha, Neb.

A summary of the report of the building inspector for the month of November, 1907, shows a slightly increased volume of operations as compared with the year before, notwithstanding the financial stress which has exerted such a restraining influence in all branches of trade during the past few weeks. Figures show that there were 106 permits issued in November last for building improvements estimated to cost $391,765, while in the same month of the year before 100 permits were taken out for improvements costing $357,175. For the 11 months of last year there were 1434 permits issued by the Building Department calling for an estimated outlay of $4,256,868, while for the corresponding months of 1906 the value of the improvements for which permits were issued was $4,053,380, and for the entire year $4,273,050. From this it will be seen that the record of 1907 is likely to exceed that of the year before and it will also be in excess of that of 1905.

Pittsburgh, Pa.

The opinion is beginning to prevail in architectural and engineering circles that there will be a decided revival in the building business early the coming spring, and the impression is gaining ground that there will be a rather decided reduction in the price of building material. This taken in connection with the expectation that labor will be cheaper leads to the belief that buildings can be erected much more cheaply the ensuing year than for some time past. It is expected that work on the new Oliver skyscraper to be erected in Smithfield street, from Sixth avenue to Oliver avenue, will be started in the spring, although the buildings in Smithfield street will not be torn down until next year.

Portland, Ore.

Building operations in this city were very perceptibly affected by the financial stress which the country experienced in the late weeks of October and the month of November, yet the year 1907 as a whole will be chronicled as a record breaker so far as building operations are concerned. In November, 1907, the value of building improvements for which permits were issued was $194,360 as against $675,225 in November, 1906. For the 11 months, however, of the year just closed, there were $8,250,527 invested in building improvements in the city, while in the same period in 1906 the amount was $6,570,853.

Beginning with January the construction movement was heavy and showed an increase month by month over 1906, in April and May the totals running over $1,000,000 each, the record for April being $1,645,450, and for May $1,152,467, both record breakers. Included in the improvements projected those months were a number of fine office buildings.

Philadelphia, Pa.

While there was a decline shown in building operations in this territory during October, that during the month of November showed a still further decrease. This, however, can be attributed entirely to the financial disturbances which have been prevalent for the past two months. The total amount of work authorized by the Bureau of Building Inspection during the month was 553 permits for 723 operations, at a total estimated cost of $1,159,025. This is the smallest total estimated expenditure for any month of November since 1898, when the amount was slightly under $1,000,000. A year ago the cost of new work begun in November was $2,013,615, so that the comparative decline has been over $850,000. For the past 11 months of the year the estimated total cost of building operations will show a loss of something like $3,000,000 when compared with a like period last year.

A large number of propositions which would undoubtedly have been taken up during the past few months have been held in abeyance owing to the fact that they could not be financed and it is comparatively certain that these will again be considered just as soon as money matters assume more definite shape. It is to be noted that operations which are usually the most difficult to finance are those in which the greatest decline is to be found during the past few months. Two story building operations which in September amounted to $1,104,950 fell off in October to $789,550, and a further decline to $359,300 was to be noted during the month just closed, while the same comparative falling off is to be noted in many of the other lines of building.

Some branches of the trade continue very active. Others are dull. Builders are using their best efforts to get the work under way as fully completed as possible before bad weather sets in, but it is hardly likely that as large an amount of winter work will be undertaken as is usually the case in this territory. Meanwhile builders are viewing the situation philosophically and are adjusting their affairs as far as possible to meet the changed conditions. Retrenchment policies are being adopted in some lines and business will no doubt be conducted on a very conservative basis until business affairs generally assume more favorable conditions.

San Francisco, Cal.

The opening of the rainy season is now a month overdue and the continued fine weather is being taken advantage of by contractors to hasten the completion of many buildings under construction and to get a good start on numbers of other new structures.

Construction materials are still low priced, especially lumber, which can be had at wholesale in cargo lots at the low figure of $13 per 1000 ft. for fir from Oregon and Washington. Redwood prices are higher and better sustained.

There is not much demand now for the red cedar shingles from the North, the supply of which has been curtailed by the closing of most of the mills in the State of Washington to prevent overproduction. California redwood shingles are in fair demand and heavy shipments have been arriving in San Francisco bay during the past month.

Cement is down in price, there being fair stocks of European cement here with much afloat and loading for the Pacific Coast. The price is about $3 per barrel on the wharf here. Domestic cement made in California is in fair supply at lower prices. Common brick are still plentiful and low in price, which has been as low as $8 delivered. Face brick are also reduced somewhat in price. The stoneyards have been very busy ever since the strike was settled a few months ago, getting out sandstone and granite for facing a number of fine steel frame buildings.

The total valuation of the buildings for which construction permits were issued in San Francisco during November last was over $2,300,000, and the total for the entire period of reconstruction since the fire $89,366,520. Building contracts are still being closed at about the average rate of the past six months, and it is safe to say that a good deal of construction work will be under way throughout the winter. Many buildings will be finished and occupied during the next month or two, but rents are still high and more buildings must be erected downtown before the needs of business are met.

The Supervisors' Joint Fire and Judiciary Committee has decided to extend the time for the removal of all of the temporary wooden buildings erected after the fire from one year to two years from January 1, 1908. Accordingly an ordinance will be presented to the board fixing January 1, 1910, as the time limit. A committee from the Board of Fire Underwriters argued against the extension of time, but it was granted to avoid working a hardship on many persons living in frame houses.

McDougall Bros. have prepared revised plans for the proposed $800,000 building for the Young Men's Christian Association of San Francisco, which have been approved by the Building Committee.

The erection of steel for the new Palace Hotel on Market street will be well under way by the first of the year. Mahony Bros., the contractors, estimate that it will require 100 working days to erect the 7000 tons of steel in the eight-story and basement structure. A very large ground site is occupied by the massive foundations. It is expected that the hotel will be ready to open on Christmas Day, 1909.

St. Paul, Minn.

In common with other cities of the country, and what might naturally be expected under the circumstances, the value of building improvements projected in November last showed a falling off, as compared with the same month in 1906, the decrease, however, being only $20,770. The permits for building in the city issued during the first 11 months of the year just closed show a slight falling off, as compared with the corresponding period of 1906, when the customary addition of 20 per cent. is made to the totals of the permits to allow for under estimates on the part of the owner of the cost of his building. During the first 11 months of 1907 the estimated cost of the building improvements was placed at $7,538,505, as compared with $7,850,905 in the first 11 months of 1906. The number of permits issued in the two years was 2837 and 2634, respectively.

The annual meeting of the Builders' Exchange occurred on the afternoon of Tuesday, December 3, there being a large percentage of the membership present. The report of the president showed an individual membership of 340, comprising 175 firms, while the reports presented by the secretary and treasurer showed the association to be in a most flourishing condition.

The following officers were elected for the ensuing year:

President, William Rhodes.
First Vice-President, Andrew Rankin.
Second Vice-President, A. Dahlman.
Treasurer, A. C. Raymer.
Secretary, A. V. Williams.

Worcester, Mass.

The report of Superintendent of Public Buildings George C. Halcott, for the fiscal year ending November 30, shows that 1051 permits were issued for new buildings and alterations estimated to cost $2,605,341, while for the previous fiscal year 912 permits were issued for improvements involving an outlay of $2,939,403. The most extensive building was done by the American Steel & Wire Company at its three plants, the buildings being constructed on a number of sub-divided permits. The permit for the new Slater block, estimated to cost between $500,000 and $1,000,000, was taken out in 1906, and gives that year an advantage over 1907, although the bulk of the work was done during the past year, with considerable yet to be done in 1908. With the exception of the total for 1906 the estimated cost of the improvements for which permits were granted in the fiscal year ending November, 30, 1907, was the largest since 1899.

Notes.

The volume of building in November, 1907, in Columbus, Ohio, showed a shrinkage as compared with the corresponding month in the year before of nearly 50 per cent. The recent stringency in the money market and the consequent inability of persons to command ready money is given as the cause for the slump.

Building operations in Evansville, Ind., for November last showed a valuation of $57,071, while in November, 1906, the valuation was $203,162.

Why People Buy Houses Instead of Building Them.

The reason why a man buys a house instead of, as formerly, buying a lot and building, is accounted for by the fact that the practice of speculative building, as it is called, has increased to such an extent that it is now claimed a man can buy a house already built for better terms than it is possible for him to build one, and, naturally, the great bulk of people do the thing that apparently costs them the least trouble and expense.

When a young man takes up the question of building a home in this great city, says *The Record and Guide*, he discovers that a less sum of ready cash is needed when buying from a builder than when building for one's private order. Most men are not so situated that they can pay all cash for a lot and have means enough left also to erect a house thereon without borrowing funds.

The builder will take a small cash payment and installments thereafter until the second mortgage is paid off, and one of the reasons for the great building boom in the suburbs of recent years has been the aid which builders have given to homeseekers.

In other words, the individual builder of houses has disappeared and the large operator, the man who puts up rows of houses, has taken his place. It is, of course, said that houses put up in this way are not well built, and the same might be said of a good many of the houses built by people for their own use; for, while a man who is building a house which he intends to occupy as his home is supposed to have stronger reason for making it substantial than one who is merely building to sell, yet that does not always prove to be the case.

It will probably be recognized as true that in proportion to the entire number built there were quite as many shoddy houses put up under the old system as is the case at present, for the building regulations are more stringent and exacting and run into more money than those which were enforced some years ago. Then, also, materials are higher and labor is better paid, so that altogether it costs more to build now than it did a few years ago. But the cost is still not prohibitive to the individual builder. and as far as the more elaborate houses are concerned they are still put up directly by the families which intend to occupy them. It is also possible to build houses of more moderate character and at an expenditure that will show some profit to the builder when he comes to place them on the market.

Of course, the main call for houses lies within the range of prices from $4000 to $8000 or $9000, and the problem is how to furnish houses that can be offered within that range. In trying to solve this, builders have been on the hunt for ground which can be had on such terms as to bring the cost within such limits. This fact of the demand for houses and the efforts made to meet it explain the remarkable extension of the city in all directions. New suburbs of the city have sprung up with a rapidity that seems almost marvelous, and a person who does not move about a good deal with his eyes open is apt to find in the city where he lives a good deal that is to be seen that he never saw before.

In this period of the city's growth there seems to have been but very little question as to the market for houses when once built. The principal question is the securing of ground on such terms as to make it possible to put up houses that can be sold so as to show a small profit. The latter is also a feature of the modern movement, for that has been the practice right along, and. in fact, in view of the competition and the advance in wages and in materials, the main source of profit for such enterprises has been in the land, and then also the saving due to the wholesale method of building.

Proposed New Building Laws for New York City.

FOR several months past a committee of experts appointed to undertake the work has been engaged in revised the building code of Greater New York, with a view mainly to safeguarding the city from the danger of a sweeping conflagration, and also to bring the present requirements to a more modern basis. This committee was made up of 30 members, as follows:

Chairman.—Thomas J. Brady.

Architects.—Charles H. Israels, Electus D. Litchfield, Ulrich J. Huberty and Clarence Luce.

Engineers.—Rudolph P. Miller, Charles O. Brown, Charles G. Smith and J. Clark McGuire.

Builders.—Theodore Starrett, George Vassar, Jr., Thomas J. Brady and Thomas L. Hamilton.

Legal Expert.—William Blau.

Mechanics.—George Harsch and T. J. Cosgrove.

Plumbers.—P. F. Kenny and Joseph D. Duffy.

Chief of the Fire Department.—Edward F. Croker.

Representing the Borough Presidents.—Edward S. Murphy, David F. Moore, P. J. Reville, Carl Berger and John Seaton.

Aldermen's Committee on Buildings.—Max S. Grifenhagen, chairman; John Hann, Jacob Bartscherer, F. J. Doltzler, J. J. Farrell, Charles Kuntze and W. P. Kenneally.

During the interval since its appointment in March last, the commission went into all the details pertaining to proper construction, having had at its disposal for consultation the building laws of all the large cities of the United States as well as those of Europe and even of Australia. The commission, which recently submitted its report to the Board of Aldermen for consideration, has incorporated in the proposed building laws for future use in New York City all the modern methods and materials believed to be of effective value. It has adopted as far as practicable reasonable measures for the protection of human life and property against loss by fire, and much attention has been paid to hygiene. The new code provides that a "construction certificate" shall be filed with the Superintendent of Buildings. This certificate constitutes a sworn statement either from a registered architect or constructor, as the case may be, to the effect that the work has been completed in strict conformity with the plans and specifications previously filed and approved by the Building Department upon which the customary building permit has been issued. After the "construction certificate" has been executed the Superintendent of Buildings shall be required to issue a certificate of occupancy or use, stating the purpose for which the building or structure may be used. The intention of this is to prevent the use of a building for purposes other than that which the plans and specifications denoting the strength and load carrying capacity indicated.

The following summary of the leading recommendations of the commission will demonstrate the thoroughness of their work:

Walls and floors of all classes of buildings have been given careful study, proper provision having been made for stability, carrying capacity and protection against fire.

Fireproof Buildings.

Improved methods and advanced ideas have been adopted for the protection of metal members as the result of recent experiments and of experience gained by searching investigation of all recent conflagrations and many other serious fires. In general this class of construction has been given exhaustive consideration.

Concrete construction has been given close study, the commission availing itself of lessons taught by the collapse of several buildings of this construction.

Mill Construction.—A well drawn section has been provided covering all the essential features of this class of building.

Vertical Openings.—This most prolific cause of loss of life, principally through the rapid spread of fire which present defective safeguards invite, has been properly considered, and hereafter all stairs, elevators, dumbwaiters, vent shafts, ducts, and in fact all floor openings through buildings, will be properly protected so as to check as much as possible the spread of fire from floor to floor.

Heating Apparatus.—This section provides for the proper installation of heaters, boilers, furnaces, ranges, bake ovens, core ovens, smelting furnaces, grease kettles and all other apparatus of like character.

Roof Covering.—Shingle or other combustible roof covering is prohibited within the city limits.

Hights of Fireproof Buildings.

No nonfireproof building, except as otherwise provided for mill construction, used for mercantile or manufacturing purposes, shall exceed 60 ft. in hight. No fireproof building to be used for manufacturing and mercantile purposes shall exceed 100 ft. in hight, except such buildings as are strictly fireproof and equipped with automatic sprinklers. In such case the hight shall not exceed 150 ft.

Fireproof buildings used for office and hotel purposes may be built to a hight not exceeding 200 ft.; in case the building shall, however, have offsets, yards or courts in excess of those required by the code, then the hight of 200 ft. may be exceeded to the point that the cubage of the building measured above the mean street grade level may be 174 times the area of the lot.

Buildings of mill construction and those of reinforced concrete construction limited to 85 ft. in hight. The report requires that hereafter all dwelling houses in excess of 40 ft. in hight shall have the first floor above the cellar constructed of fireproof material. The very frequent fires and loss of life in private dwellings, caused by defective heating apparatus in the cellars and accumulation of rubbish there, make this requirement important.

Churches may be built of ordinary construction to a hight not exceeding 60 ft., and shall have the entire first floor constructed of fireproof material. This hight meets the usual demand for church structures. In case, however, they are built of fireproof material a hight of 150 ft. will be allowed. The hight of steeples when constructed of wood is limited to 90 ft., but when constructed of fireproof material the hight shall be determined by the Superintendent of Buildings. The present requirements for the construction of tenement and apartment houses are not affected by the new code. Frame dwellings outside of fire limits, occupied by not more than two families, may be 40 ft. in hight. This particular provision conforms with the requirements of the Tenement House act.

Internal and External Fire Protection.

The installation of interior fire protection, stand pipes, hoses, automatic sprinklers, &c., where called for by this code, will follow the rules of the National Board of Fire Underwriters, which are accepted as standard throughout the United States. The installation of these appliances will also require the approval of the Superintendent of Buildings.

Provision has been made for the protection from fire of outside doors and windows, excepting the openings fronting on the street and where the buildings are separated more than 100 ft.

Hereafter any kind of wood approved by the Building Department may be used for interior trim in a building not exceeding 100 ft. in hight—the use of so-called fireproof wood not being compulsory. Buildings higher than 100 ft. shall have no interior trim of combustible material.

Garages are to be fireproof construction only.

Areas.

Nonfireproof buildings, when fronting on one street, 5000 sq. ft.; when fronting on two streets, 7500 sq. ft.; when fronting on three streets, 10,000 sq. ft. By installing a standard equipment of automatic sprinklers these areas may be increased 50 per cent.

Fireproof buildings of mercantile or manufacturing occupancy up to 150 ft. in hight, when fronting on one street, 7500 sq. ft.; when fronting on two streets, 10,000 sq. ft.; when fronting on three streets, 12,500 sq. ft. If provided with standard equipment of automatic sprinklers these areas may be increased 33 1-3 per cent.

Fireproof buildings used for hotel or office occupancy when fronting on one street, 20,000 sq. ft.; two streets, 25,000 sq. ft.; three streets, 30,000 sq. ft. When provided with standard equipment of automatic sprinklers these areas may be increased 33 1-3 per cent.

Fireproof buildings without restriction as to occupancy, the hight of which shall not exceed 60 ft., when fronting on one street, 10,000 sq. ft.; two streets, 12,000 sq. ft.; three streets, 15,000 sq. ft. If provided with standard equipment of automatic sprinklers these areas may be increased 33 1-3 per cent.

Special Buildings and Theatres.

SPECIAL BUILDINGS.—For buildings of this class, which, for example, include the following: Railroad depots, city halls, court houses, schools, colleges, museums, libraries, synagogues, light and power stations, hospitals, asylums, police stations, fire houses, jails, buildings to be occupied for fair and exhibition purposes and all other structures used for similar purposes, the hight and area restrictions, and in some cases other conditions of construction, shall be determined by the Superintendent of Buildings.

THEATRES.—All theatres are to be constructed absolutely fireproof, and all necessary means of exit, together with standard equipment of automatic sprinklers, stand pipe and hose, fire pails and other internal protection, must be so arranged as to safeguard life. The stage roof is to be provided with automatic ventilating flues (instead of the present unsatisfactory automatic skylight), to carry off heat and smoke in case of fire. Special provision is made for proper fireproof stage curtain.

Restricted Area.

Within a specified area every large building used for mercantile and manufacturing purposes shall hereafter be constructed fireproof, except that this does not prohibit the erection of one-story brick buildings not exceeding 20 ft. in hight and 8000 sq. ft. floor area; nor two-story brick buildings not exceeding 30 ft. in hight and 6500 sq. ft. floor area; nor three-story brick buildings not exceeding 40 ft. in hight and 5000 sq. ft. floor area, used for mercantile and manufacturing purposes, nor the alteration of buildings to be occupied for stores, saloons, offices, dressmaking establishments or other similar mercantile and business purposes, provided the hight of such building does not exceed 60 ft. and the area of any one floor does not exceed 5000 sq. ft. When a standard equipment of automatic sprinklers is provided the above floor areas may be increased 50 per cent.

Fire Escapes.

All buildings of mercantile class, exceeding three stories, and resident buildings, such as hospitals, asylums and other public buildings, are required to have at least two separate means of exit. One of these is required to be a fire tower so arranged that entrance can be had only through a masonry balcony fastened to the walls of the building, there being no direct communication between tower and inside of building.

Fire Doors.

All interior openings in brick dividing or fire walls are to be protected by standard fire doors so arranged as to be automatic.

Skylights.

The frames of all skylights are to be riveted and glazed with wire glass, except in strictly fireproof shafts, when thin glass, protected by wire mesh above and below, is required.

ST. MARY'S HOSPITAL, in Center street, Orange, N. J., is to have a quarter of a million dollar extension, the plans for which have recently been completed by Architect W. S. Knowles of the Borough of Manhattan, New York. The plans call for the most up to date contrivances and arrangements for the care of the sick, and the management of the hosptial announces that the new structure when completed will be the finest hospital building in the State of New Jersey. The general plan is for extensions or pavilions to the north and south of the present structure, with a tower six stories in hight in the rear of the present building. The basement and six stories will be divided into sections for the general public and private hospital patients, and on the sixth floor of the tower will be located a modern operating amphitheatre.

New Publications.

The Principles of Architectural Design. By Percy L. Marks. Size, 6½ x 9¾ in.; 266 pages; profusely illustrated. Bound in board covers. Published by Swan, Sonnenschein & Co., Ltd., London, and in America by William T. Comstock.

From cover to cover this work marks itself as thoroughly English, not only in phraseology and spelling, but also in the formality in which the subject is treated and in the buildings referred to as illustrative examples—such buildings being found with very few exceptions within the confines of Great Britain. The very first page introduces the reader to a list of subscribers whose several titles and degrees are as carefully set forth as are the ideas of the author in the body of the work.

As expressed in the title, the subject is treated entirely from an artistic viewpoint, with a decided leaning toward the Gothic school, the matter of construction being entirely ignored. Material as affecting design is referred to more in the sense of color effect as part of the ensemble than in regard to the character of detail or ornamentation of which this or that material is capable. In this connection the author takes care to express his disapproval of shams; that is, making one material to appear like another.

The 20 chapters composing the work are presented in two parts, devoted respectively to exterior and interior design. The subject matter begins with an enunciation of 16 qualities or principles to be observed in architectural design which are treated separately in the chapters which follow. Among these especial attention is given to expression, emphasis, symmetry and proportion, perspective effect, individuality and fenestration. As features of design the work treats on roofs, domes, gables, bell "cotes," balconies, corners, doorways, windows, symbols, staircases, fireplaces, cupboards, &c. The illustrations are contained in 33 plates, supplemented by 133 figures, which in the main are photo-engravings from drawings of the general character of those produced by architectural draftsmen; only two of the plates being half-tone reproductions from photographs.

Pattern Making. By James Ritchey; 142 pages. Size, 7 x 9¾ in. Illustrated with 254 engravings. Bound in board covers. Published by the American School of Correspondence. Price, $1, postpaid.

This is a work which has been compiled by a former instructor in pattern making at the Armour Institute of Technology, and is especially adapted for home study, great care having been used to bring the subject well within the range of apprentices. The treatment is direct and comprehensive, and necessarily the presentation is in an elementary style. The work is divided into two parts, the first of which deals with materials and tools. These are discussed in a way to be of the greatest possible value to the mechanic, the illustrations being numerous and the descriptions explicit. Methods of molding embrace a consideration of the flask, the cope, the drag, the core and coreboards, shrinkage, draft, finish and patterns from drawings. The second part of the work deals with simple and built-up patterns, the subjects embracing among others, a sheave pulley, a 12-in. hand wheel, a countershaft pulley, a 12-in. crank, &c. A comprehensive index alphabetically arranged completes the volume.

Hendricks' Commercial Register, sixteenth annual edition. Size, 8 x 10½ in.; 1224 pages. Bound in heavy board covers. Published by S. E. Hendricks Company. Price, $10, expressage paid.

Each year this valuable work of reference shows an increase in size and in the number of its trade classifications and headings. A comparison of the present with past editions shows that while the one for 1906 required 62 pages to index its contents, the 1907 edition requires 76 pages, the 14 additional pages giving 5768 additional trade classifications and making for the 76 pages a grand total of 31,212 headings, each one of which represents the manufacturers, &c., of some machine, tool, apparatus, specialty or material. The work under review contains over 350,000 names and addresses, and is especially devoted to the interests of the architectural, contracting, mechanical, engineering, electrical, iron, steel, mining, mill, quarrying, railroad, exporting and kindred industries.

An examination of its pages reveals the fact that the list of architects requires something like 25 pages; the list of builders, especially those doing a contract business, something like 60 pages; roofers, tinners, &c., 56 pages, while roofing of various kinds, skylight makers, plumbers, steam fitters, cement block machine manufacturers, sash, door and blind manufacturers, plasterers, and others connected with the building and allied industries require scores of pages for their enumeration. The book has been compiled with a great deal of care, and will be found valuable for buyers and sellers, as well as for those who wish to have conveniently at hand an extensive book of reference covering the industries mentioned. Each annual edition is carefully corrected so far as it lies in the power of the publishers to secure the necessary information.

The Roofer's Handbook.

The National Association of Sheet Metal Workers of the United States has just issued from the press an interesting little text book for the instruction of roofers, sheet metal workers and other apprentices, bearing the suggestive title above. It is a manual of 20 odd pages bound in colored paper covers, and was compiled by the Joint Committee on Tin Plate for the association named. It is issued in the interests of good tin roofs, one of the objects being to instruct roofers as to the proper methods of laying tin roofs. To this end the association has adopted standard working specifications, which are set forth at length in the handbook and fully illustrated by numerous well executed engravings. There is a brief history of tin roofing, an enumeration of some of the advantages of a good tin roof, together with practical hints for the roofer. The little work gives evidence of careful compilation, and will be found of practical use to any one interested in the choice of roofing materials. It is distributed free of charge by the association, and any one making application can secure a copy.

Galvanized Nails for Building Purposes.

One of the rapidly growing industries of this country is the production of galvanized nails for building purposes. Only a few years ago their use was confined almost entirely to the seaboard towns, and more especially to the boat building trade. Of late years, however, builders in general are fast becoming familiar with the satisfactory and economical results obtained by their use where rusting out would prove detrimental.

For such purposes as shingling, slating, lathing, fence building, tin and sheet metal roofing and fastening steel siding, the ecenomy of using galvanized nails is apparent. While the iron rust which forms on a plain nail burns the wood, causing premature decay, the zinc oxide forming on a galvanized nail acts as a preservative, and tends to protect the surrounding portion of the wood from rotting.

In the olden days the only method pursued in galvanizing nails was to immerse the material in molten zinc by the use of perforated baskets, and then throw them into water to cool and set the zinc. While this method left the nails rough and unsightly, the coating was ample to protect them from corrosion. Galvanized nails are frequently shown which, after having been exposed to the elements for upward of 30 or 40 years, are found to be in perfect condition.

But the trend of the times is working vast changes in this now important industry. The constant endeavor to lessen the cost of production has brought forth numerous devices and processes, many of which, while successful in producing a cheap product, owe their success entirely to the fact that they enable the operator to apply an exceedingly thin film of zinc. Some unscrupulous parties, says a writer in *Metal Industry*, even go so far as to coat their product with lead or solder, and brand it as galvanized. Nails coated by these methods naturally prove unsatisfactory, as they invariably rust out in a short time, and the deceived consumer loses faith in galvanizing in general.

While there are many reliable brands, it is a difficult matter, even for an expert, to determine from the appearance of a galvanized nail as to whether or not its coating is of sufficient thickness to afford the desired protection. Happily we have at hand an infallible though simple test which may be readily applied at any time.

Pure zinc, owing to its extremely brittle nature, will crackle and flake from a well coated nail when bent at right angles, while a thinly coated nail, or one which has been leaded or soldered, may readily be bent without noticeably affecting its coating. This fact is taken advantage of by shrewd buyers, who never fail to apply the bending test before accepting galvanized nails bearing an unfamiliar brand. It should be borne in mind by everyone having occasion to handle these goods, that they may determine the thickness and quality of the coating and detect an inferior article as quickly as an expert.

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VIEW IN THE DINING ROOM

CEMENT BLOCK HOUSE OF MR. W. O. STEELE, AT GRENLOCH, N. J.

W. O. STEELE, ARCHITECT

Carpentry and Building

NEW YORK, FEBRUARY, 1908.

Free Public Library Building at Kearney, N. J.

WE take for the subject of our halftone supplemental plates this month an attractive library building suitable to meet the requirements of small cities and towns, it being one of the many donations of the well-known ex-ironmaster and philanthropist, Andrew Carnegie. The structure has a frontage of 60 ft. and a depth of 72 ft. It is of the modern renaissance style of architecture in which the features of the Grecian-Doric order are strikingly manifest. An excellent idea of the appearance of the finished structure may be gained from the picture of the exterior which we present, while the interior arrangement and finish is partially indicated by the interior views, all made from photographs taken especially for *Carpentry and Building.*

An inspection of the plans shows the basement to be divided into a boys' clubroom, a stackroom, store and boiler rooms, with cloak, coat and toilet rooms for men and women at the front portion of the building. Passing through the main entrance doors the visitor finds himself in a vestibule 14 x 25 ft. in area, in which is a bronze tablet to the donor. Beyond the vestibule is the delivery room and desk, reached by a broad stairway. The main hall has a segmental ceiling with heavy cornice supported on plastered columns and pilasters of the Doric order, this arrangement leaving the center of the building open. To the right and left of the delivery room or hall, as it may properly be called, are the children's room and general reading room, each 18 x 25 ft. in plan, while at each corner of the building are four additional rooms, each 15 ft. square and used, respectively, as reference, trustees, librarian's and ladies' room. The details here shown afford some idea of the general style and finish of the building.

The exterior walls of the building are of brick laid in Flemish bond, with bluestone and terra cotta trimmings. The foundation walls are of local stone, and below grade have a ½-in. coat of Portland cement on the outside. The roof is covered with 1-in. yellow pine boards laid diagonally, over which is placed tarred roofing felt, this in turn being covered with 10 x 20 in. Chapman slate laid 8½ in. to the weather. All slate for 2 ft. each side of valleys and 2 ft. up from the gutters is laid in plastic roofing cement. The flat decks are covered with asphalt roofing. The entire basement bottom has a 3-in. concrete floor composed of 1 part cement, 2 parts sand and 4 parts fine broken stone, with a top finish of 1 part Portland cement to 2 parts of sand.

The exterior walls and the interior walls are anchored to steel beams, while the wall plate is anchored to the wall with ¾-in. bolts, 24 in. in length, and placed not over 8 ft. apart.

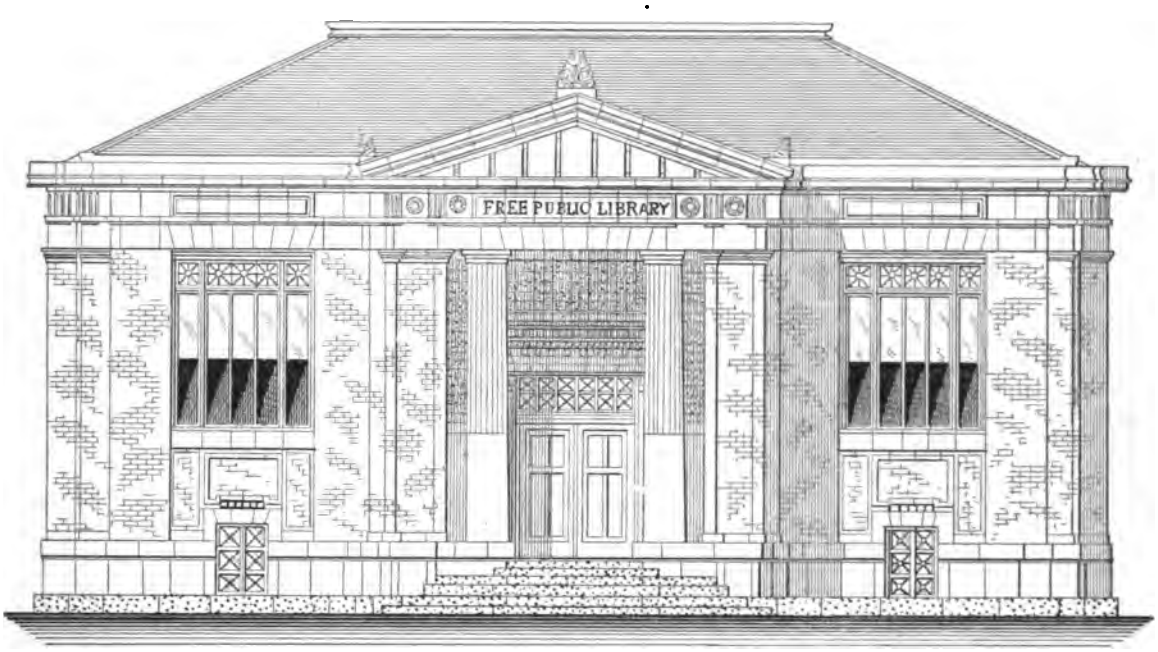
The stone and terra cotta facings and cornice are anchored to the brick backing and iron beams by wrought iron anchors 1¼ in. wide by 3-16 in. thick, and of lengths required for the different thicknesses of the walls. One end of each anchor is turned down and let into the stone or terra cotta 1 in., while the other end turns up 4 in. in the walls. There is one anchor for each stone.

The partitions each side of and under the stairway in the basement are 2-in. terra cotta blocks, while the inside 4 in. of all outside walls in the first story is built up with 4 in. terra cotta blocks, all securely tied into the brickwork with galvanized iron wall ties. All the terra cotta material used is set in cement mortar, composed of one part Portland cement and one part lime, with a due proportion of sand.

All partitions in the basement except that around the coal bin are of brick, 4 in. thick and neatly pointed on both sides.

The plinth and base courses, the panel trim under the main story windows except on the rear, the main story window sills, pilaster caps, cornice, pediment, chimney cap and entrance doorway are of carefully selected limestone color terra cotta.

The side walls throughout the main story are plastered with two-coat work, while the ceilings are three coats, finished with smooth sand lime putty. The ceilings of the delivery room and entrance lobby are paneled and



Front Elevation.—Scale, 3-32 In. to the Foot.

Free Public Library Building at Kearney, N. J.—Herbert E. Davis, New York City, and Calvin Kiessling, Boston, Mass., Associated Architects.

molded. The pilasters in delivery and reading rooms have plain molded caps.

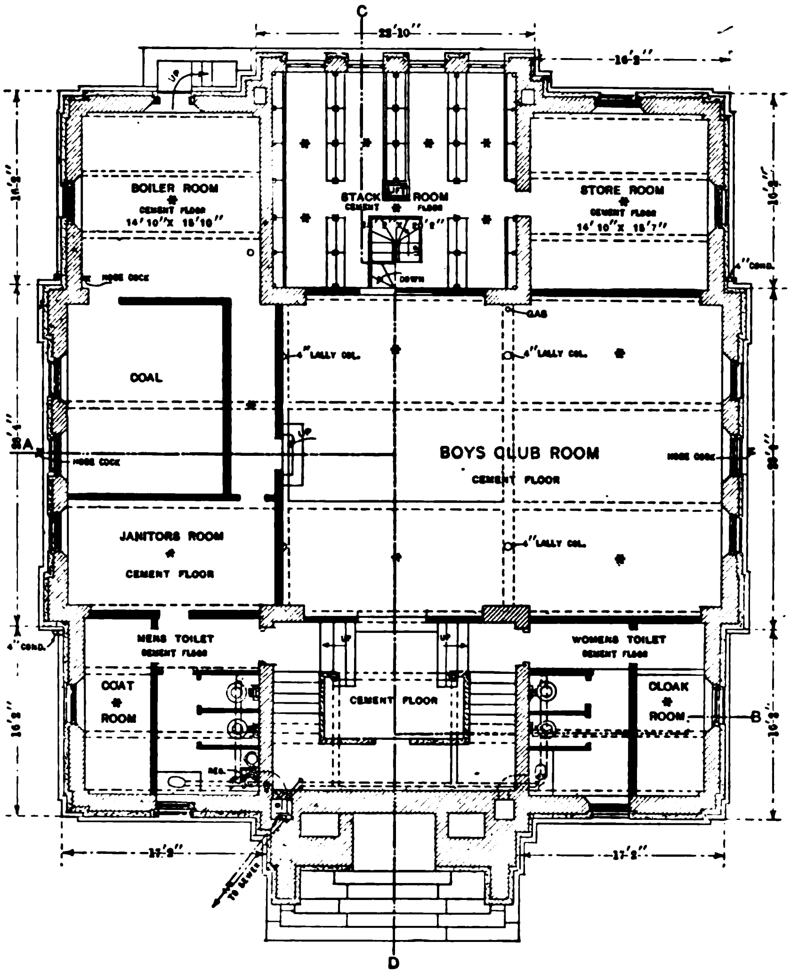
The floor joists are 2 x 12 in. for spans over 15 ft. and 2 x 10 in. for less than 15 ft., all placed 16 in. on centers. The partition studs are 2 x 4 in., placed 2 ft. on centers, while the partitions in the first story, which are of wood, are formed with 3 x 4 in. hemlock studs.

The front entrance doors are 1¾ in. thick, paneled and molded, with plate glass in upper panels. The doors are veneered with ash on a white pine core. All other doors throughout the building are of yellow pine, 1¾ in. thick, divided into panels and with glass in upper panels. All interior doors have 1¾-in. rabbetted frames of yellow pine. All the windows except those double hung in the basement have 2-in. white pine frames, with 2-in. sills. The main story windows have plain mullions and transom bars and molded cap molding under terra cotta lintels, all of white pine. All the sashes in the interior of the building in first floor and interior sashes each side of stairway at the main entrance, also the exterior doors, are glazed with American plate glass. The stackroom windows and seven large windows on the east and south sides, as well as all basement sash, are glazed with double thick sheet glass.

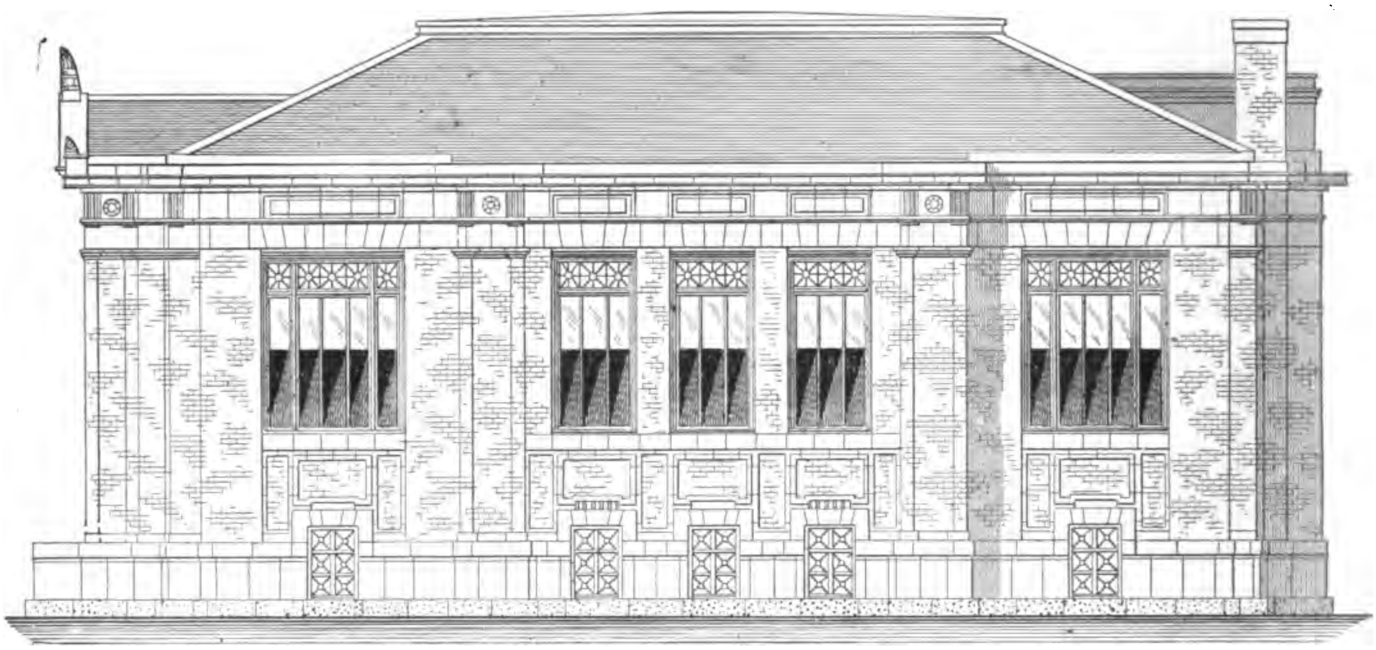
The building is equipped with bookcases placed where shown on the plans, the standards being of ⅞-in. stock and the shelves ⅞ in. thick and adjustable.

The plumbing fixtures are of the modern type, with nickel plated fittings. The building is wired for electric lighting and call bells, a two-wire system being used.

The heating is by steam, an American Radiator Company's Ideal cast iron sectional steam boiler, having a rated capacity of 1675 sq. ft., being used in connection with 21 cast iron



Basement Plan, Showing Boys' Clubroom, Stackroom, Cloakrooms, &c.
Scale, 1-16 In. to the Foot.



Side (Right) Elevation.—Scale, 3-32 In. to the Foot.

Free Public Library Building at Kearney, N. J.

ornamental radiators properly disposed. The work is installed in accordance with the rules of the New York Board of Fire Underwriters.

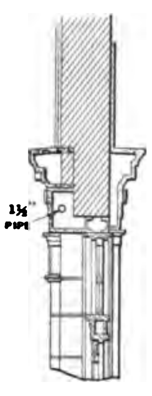
All exterior woodwork has three coats of white lead and linseed oil paint, with the exception of the woodwork at the front entrance, which has two coats of stain and two coats of Spar varnish. The copper leaders, gutters, ridges and hips were treated with a weak solution of salmoniac to turn copper green. All the standing interior finish, bookcases, &c., have one coat of oil stain and one stained oil paste filler finished with a dead gloss.

All the plaster walls on the main floor above the base, including the columns, have one thickness of book cloth or ceiling canvas and three coats of lead and oil paint. All the plaster walls above the dado and ceilings in the main story and staircase hall throughout have a coat of glue sizing tinted with "Moresco" to a uniform color. The cement finish at the sides of the staircase leading to the basement and under stairs is painted three coats of lead and oil. The ceilings and side walls of the boys' clubroom, toilets, coatrooms and passages thereto in the basement were coated with cold water paint to a uniform color, all other parts of the basement being whitewashed.

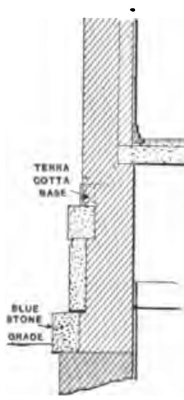
The library building, here shown, was erected in accordance with drawings prepared for the trustees of the Kearney Free Public Library by Herbert E. Davis, 1 Madison avenue, New York City, and Calvin Kiessling, 8 Beacon street, Boston, Mass., associated architects. The work was executed under the supervision of Mr. Davis.

The House Wrecking Business.

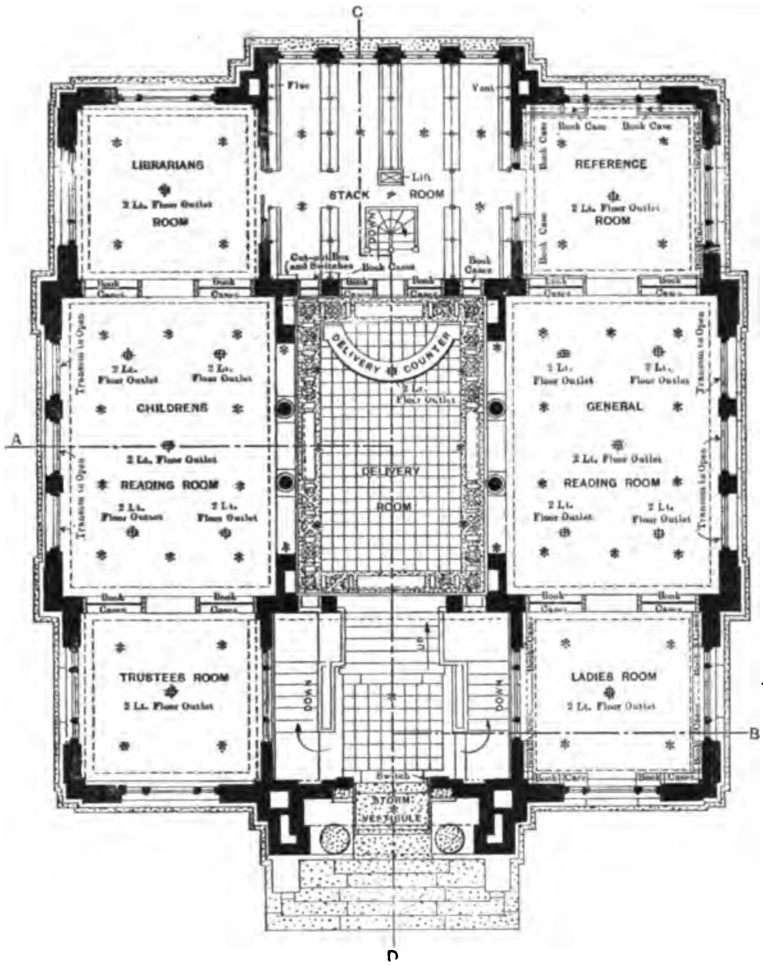
The wrecking of buildings has become an important branch of the building business. and those engaged in this work are generally enjoying much prosperity, for their business is necessarily regulated by the activity in the erection of new structures. Much capital is thus represented, and many large companies are organized that carry on the wrecking business with the most modern methods and perfected system, says a writer in a recent issue of the *American Contractor*. The wrecker meets with many serious problems, including expense, economy of time, safety of men and protection of adjoining property. He must carry insurance upon property and employees, obtain city permits, give bond for street and sidewalk privileges, and especially on work in the business section; protect adjoining property and the passing public from the ever present dust.



Section Through Wall Over Main Entrance.



A Typical Wall Section.



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

Free Public Library Building at Kearney, N. J.

Probably the only advantage the wrecker has over the builder is his freedom from the unions, as wrecking requires little if any skilled labor, and the cheapest help is employed. In the cities it usually becomes necessary to employ colored men and foreigners upon large jobs, as they seem to stand the dust and other disagreeable features of the work better than the white laborers. Of course the superintendent and foreman on a wrecking job must be familiar with all details of construction, that the materials may be wrecked to the best advantage and with the least danger of accident.

The brickwork is usually the largest item in the wrecking of buildings in a city. Second-hand brick usually find a ready market, for with them the builder can make quite a saving in the cost of his building. The brick are used for "backing up" and entirely in the inside walls where same are to be plastered over.

The average cost for wrecking and cleaning brick is $1.50 per thousand, provided they are laid in lime and sand mortar. If laid in strong cement mortar, then wrecking means but little, if any, profit, for it is almost impossible to entirely clean the brick.

The usual method of wrecking brickwork is to build a chute of 2 x 6 in. plank for the bottom, with 1 x 6 in. flooring boards for the sides. If properly braced, chutes of any needed length can be thus constructed, and as the work progresses, sections can be cut off.

Two men are usually placed on the walls at each chute, where they clean the brick as they remove them, feeding them into the chute, at the bottom of which a man removes the brick and throws them on the pile. Where there is plenty of room it is best to throw the brick on the pile, instead of placing them in straight rows, as they are more easily loaded, and the men must take the bats as they come, a thing it is hard to get them to do if the brick and the bats are separate.

The wreckers' method of loading brick is three whole brick and two bats at each throw, counting same as four brick. This gives 25 per cent. of bats, and where common soft brick are wrecked there are usually enough from the job to supply this percentage.

The average price received by the wrecker for second-hand brick is $4 per thousand on the ground, which includes help in loading.

In figuring on a contract the wrecker usually allows about $1 a thousand for the brick, $1.50 for wrecking and cleaning and about 25 per cent. waste. This leaves a fair profit for each thousand and on a large job is one of the most important items.

The greatest amount of débris comes from the brickwork, and costs on an average of $1 a load to dispose of. The common method of loading the plastering, brick dust and the small débris, is to shovel same into a four-sided chute, at the bottom of which is a wagon to receive it. This becomes necessary on work in the business sections of the city; and to further remove the dust nuisance the débris is well settled with water before being thrown into the chute.

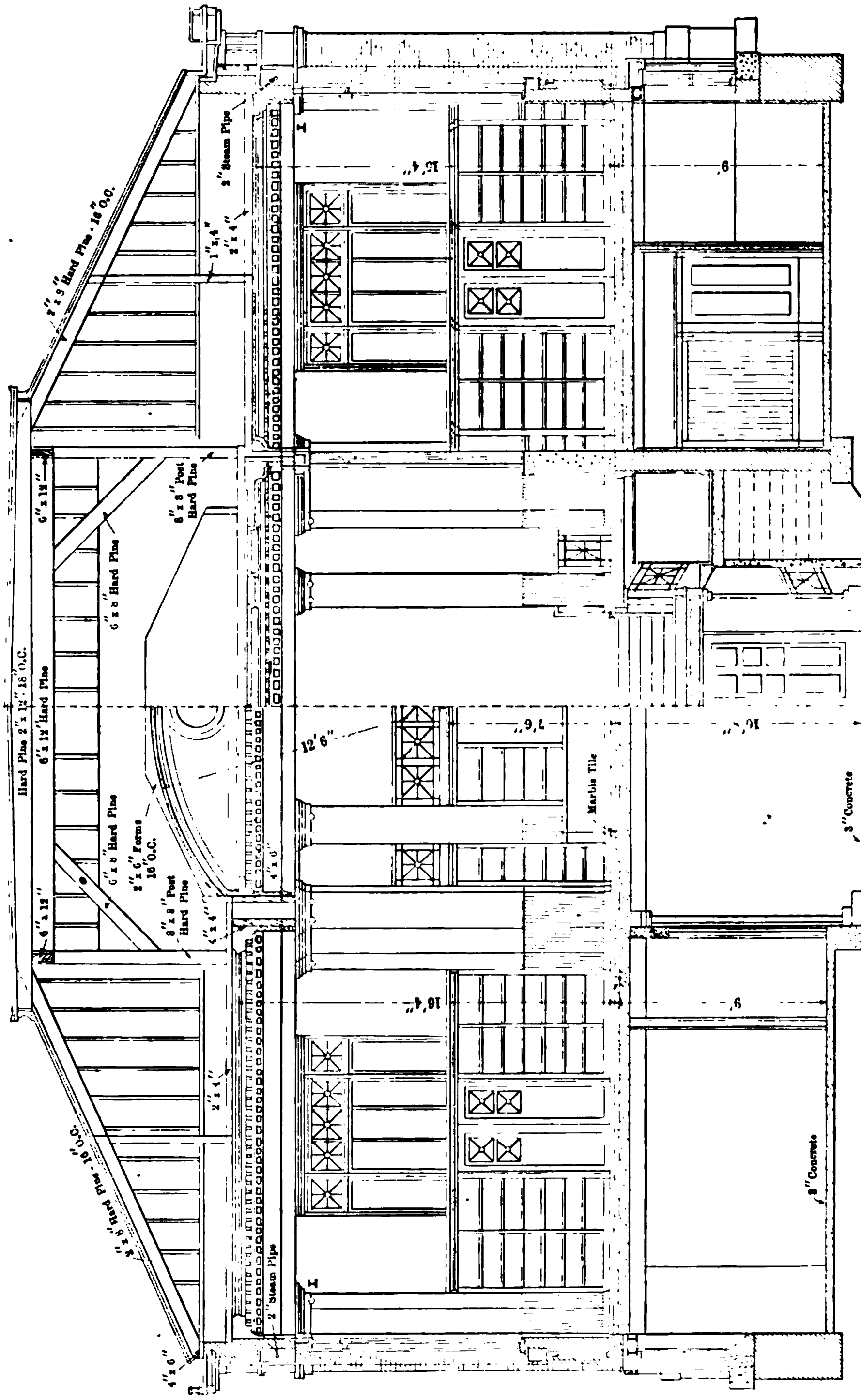
On the average business structure it is safe to pay from $3 to $6 a thousand for the lumber, but, of course, some buildings would not justify this price, while others would net a good profit even at much higher cost. The average cost for wrecking lumber is $3.25 per 1000 ft., which allows for the pulling of nails, this last item costing about 80 cents a thousand feet.

Special made bars are used for taking up flooring, and if same is in fair condition it can easily be taken up without much damage to the tongue and groove. Second-hand joist and all dimension stuff meets with a ready sale, for all is well seasoned, and if free from dry rot is almost as sound as the new material. This is especially true of white pine, joists of which have been taken from buildings erected 60 years ago and found to be sound in every respect.

The main objection to the use of second-hand lumber is the danger from nails that may be left in it. Let a carpenter dull a new, sharp saw on an old rusty nail and he is sure to be strong in his argument against the use of second-hand lumber.

Second-hand windows and frames from city dwellings are figured at from $1 to $3 a set. If the building is an old one the windows are generally odd sizes and are not desired for modern work. Such windows are only used in temporary structures or where cheapness is the main object.

Stock size doors and frames are more easily sold by the wrecker, and where refinished answer very well in many buildings, as they are well seasoned. Old glass is not easily cut without much waste on account of breakage, and it is therefore best to use it as it comes from the building. Heavy plate glass is easily sold to glass dealers and brings about one-half the market value.



Free Public Library Building at Kearney, N. J.—Transverse Section Through Building on Line A-B of the Plans.—Scale, 1/8 In. to the Foot.

The wrecking contractor always figures on being agreeably surprised with the junk he receives from his building. This usually consists of lead pipe, sheet copper, iron anchors and bolts and zinc lining. Old tin and sheet iron are of no value, and the wrecker is fortunate if he can get some sash weight foundry to haul it away free.

Stone work is usually the hardest material to dispose of, and then only brings comparatively low prices. Rubble foundation stone will bring on an average of 75 cents a perch, which little more than pays for the wrecking and loading. The wrecking contractor often gives the stone to the party who will remove it from the wall and haul it away.

Window sills and caps meet with a fair sale at an average of 75 cents each. Good designs in cut stone are often used again in new buildings, and there are several examples throughout the country where new stone buildings have been entirely built of stone from wrecked structures. The stone is either redressed or cleaned by compressed air and sand.

Slate, if much worn, only brings about $2 a square, and is used mostly for repair work. Roofing tile sells at an average of $5 a square, and if cleaned off answers very well on new structures.

The wrecker depends upon selling his material for use in the cheaper class of buildings or where old material will answer as well as new. In a city much of the second-hand material finds its way into the temporary and cheaper houses built in the subdivisions. The larger wrecking companies have their own sawmills and cut up the heavy timbers into studding and joist, which are more easily sold.

One of the most important and largest wrecking jobs in the country was that of the St. Louis World's Fair. It required the work of hundreds of men for over two years, and now the material can be found in all parts of the country. One hundred tons of staff, which sold at $1 a ton; 3,000,000 lb. of copper wire, 1,000,000 electric light bulbs, 45 miles of railroad iron, 90,000,000 ft. of lumber, miles of sewer tile and 25,000 bamboo poles are only a few of the items which show the great amount of material obtained from this, the greatest of all world fairs.

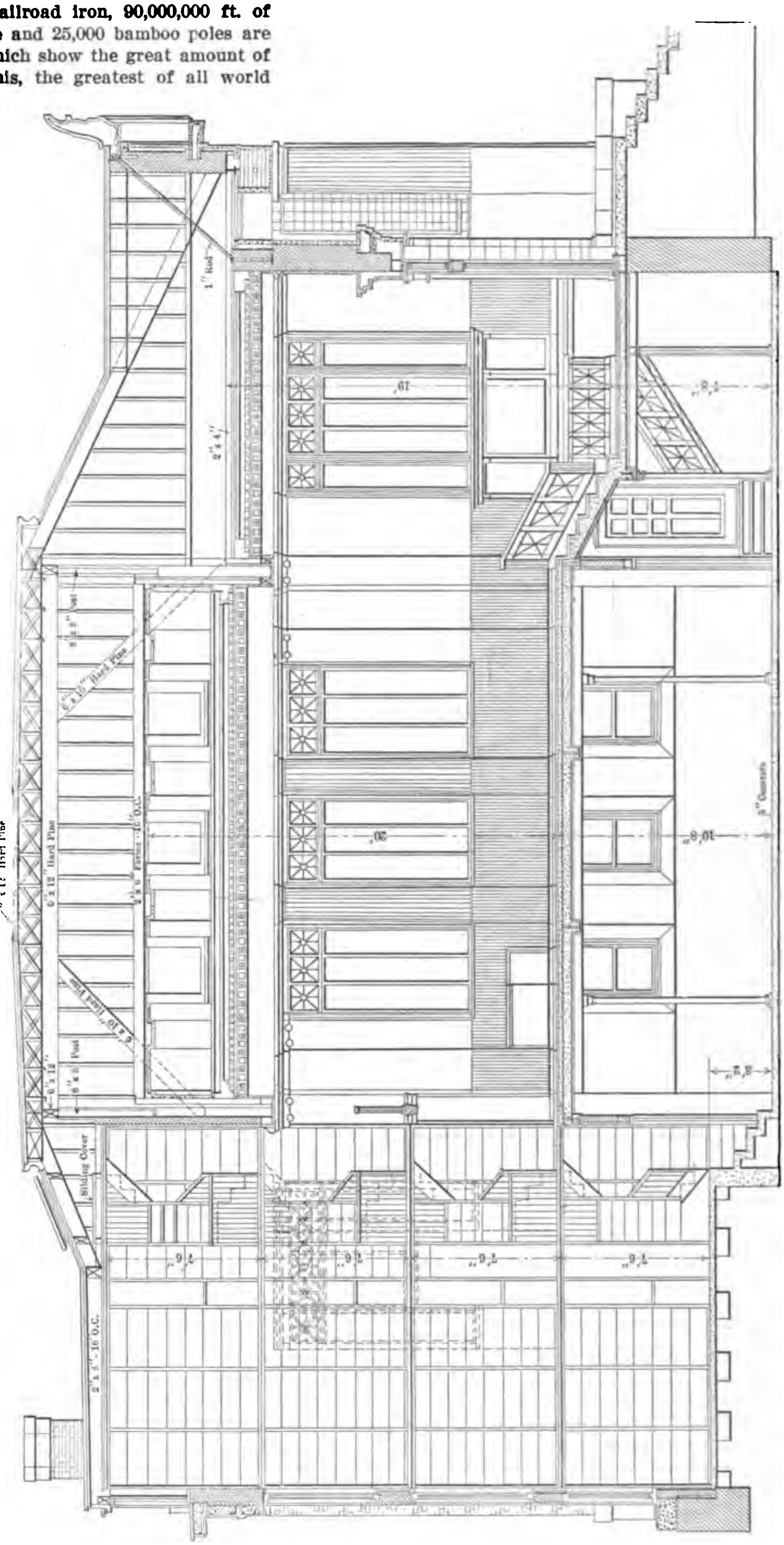
Laying of Ceramic Mosaics.

By C. J. Fox.

In laying ceramic mosaics the foundation and the cement mortar are prepared in the same manner as for ordinary tile. In fact, ceramic mosaic is merely vitreous or unglazed tiling in which the individual pieces or tesseræ, as they are called, are minute. The most usual shapes are squares, hexagons and rounds, and the dimensions are different fractions of an inch. In order to expedite the laying and to assure the proper composition of the delicate designs which it is possible to execute in mosaics the tesseræ are laid out in designs at the factories according to the cartoon prepared in the art department and are furnished to the tile contractors pasted on paper. The tesseræ are arranged with great regularity and can be readily transferred to the floors without interrupting the correctness of line and joints. The laying is a simple and rapid process as soon as the tile setter has become accustomed to the work.

A mosaic design generally consists of a field, border and margin. The border is the part which has to be laid most carefully, as any irregularity in it is very conspicuous. Any unevenness in the dimensions of the room should be taken up by the margin in the least conspicuous manner. The factories often ship with the tile a working plan giving the arrangement of the field, border and margin, according to the measurements of the floor which were previously sent in by the tile contractor.

Before actually setting the tesseræ in the cement the tile setter should lay out a section of the border and field in order to be certain that the design corresponds accurately with the surface to be covered. The border should in all cases be laid first, as it is an easy matter to get its lines perfectly straight by laying them against the guide strip. In laying the border the tile setter should start at the center of the room and work to the right and left so as to have an equal and symmetrical design, especially at the corners and where the different sec-



Free Public Library Building at Kearney, N. J.—Longitudinal Section Through Building on Line C-D of the Plans.—Scale, 1/8 In. to the Foot.

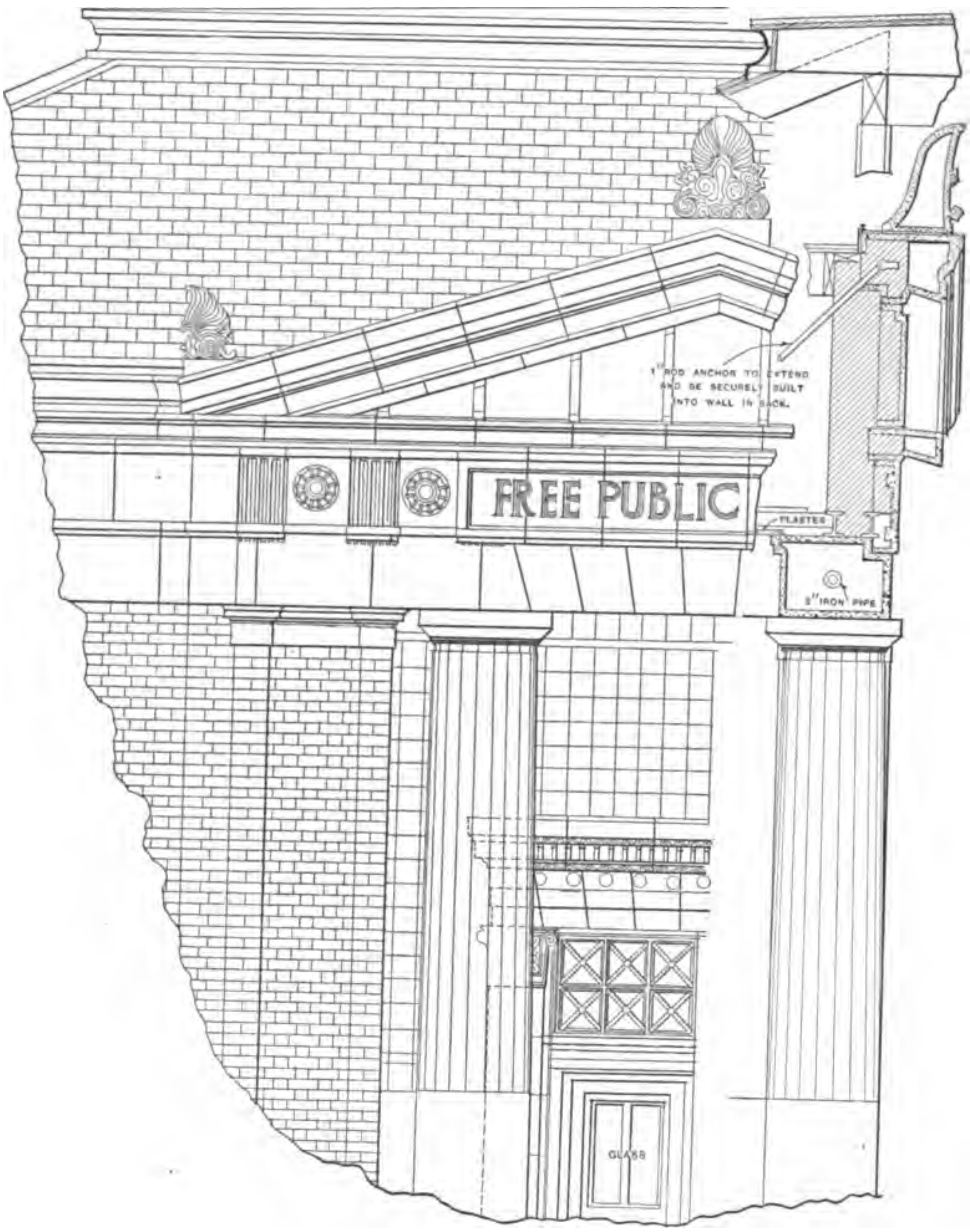
tions of the border are joined. For simple borders no extra corner pieces are furnished, but the corners can be adjusted with little trouble by the tile setter, by simply mitering the border, that is, tearing the border diagonally and fitting it together. It is often necessary to make a few corrections where the border turns a corner or where the two ends finally meet; but as the smaller borders are usually composed of repeating designs this operation is not a difficult one.

For wider and elaborate borders, the factories usually furnish independent corner pieces against which the border is fitted. In most cases an extra allowance of border is shipped in order to make up for the waste in mitering and otherwise arranging the corners. The proper cutting and matching of the different design sheets, especially in laying the border, is of considerable importance, because the manner in which it is done frequently determines whether the finished job is to look well. The mitering and fitting should all be done by cutting the sheets and laying them out correctly before the tile are set in the mortar. Nearly every border can be mitered with little trouble. It is only necessary that the design be cut symmetrically. The same is true of fitting a border in the center or at both ends except where the sheet must be cut at right angles instead of diagonally.

Mosaic tesseræ can be cut quite easily with a pair of nippers. The jaws of the nippers should be applied only to one edge of the tile and in the direction in which the cut is desired. These nippers should have replaceable jaws, so that they can be easily removed and sharpened.

Before setting the tile it is advisable to give careful attention to the cement mortar. One hour spent in leveling the surface of the concrete will save many hours in laying the tile. The mortar should be used fresh and should be mixed stiff. In no case should lime be used. The tile setter should wait until the moisture in the mortar begins to sink in before he lays his tile. This is a sign that the cement is beginning to set, and after this initial setting no more moisture or water will rise to the surface to interfere with the union of the tile and the cement.

The guide strips are first set and the mortar is spread evenly between them. The sheets are then laid carefully upon the mortar and the tile are pressed in, at first quite gently and then firmly. The tile are leveled by using the block and hammer and should be beaten down until the mortar is visible in the joints under the paper. The paper, however, should not be broken. After the tiles are well pressed into the mortar, the paper is thoroughly soaked with water and is removed from the tesseræ by pulling it off backward, starting at one corner. Any

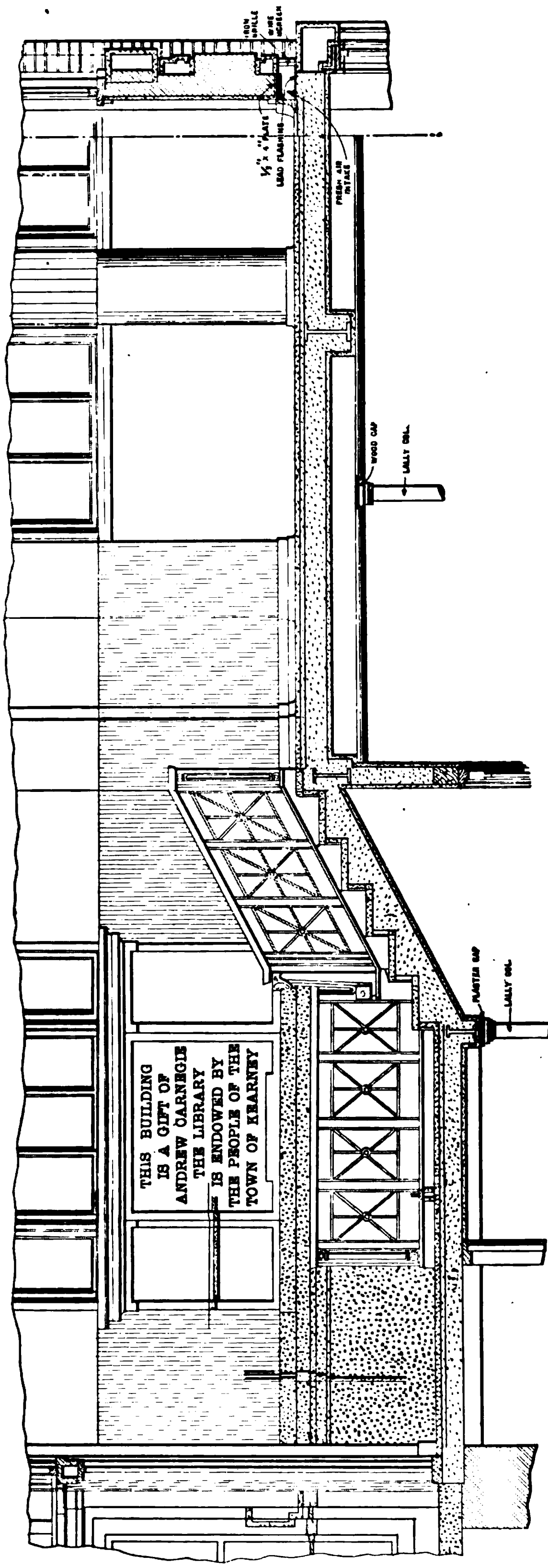


Detail Showing Partial Elevation and Section of Front of Building.—Scale, ¼ In. to the Foot.

Free Public Library Building at Kearney, N. J.

further corrections that are necessary in order to level the surface may now be done with the block and hammer.

The proper filling in of the joints and the cleaning of the surface of the mosaic floor is an important operation. The joints are filled or grouted with clear Portland cement mixed with water. The cement is forced into the joints with a flat trowel or by



Free Public Library Building at Kearney, N. J.—Section Through Main Entrance of the Building and Also Through the Window in the Central Portion of the Side Elevation.—Scale, ¼ In. to the Foot.

hand. A broom should not be used, as it scrapes the cement from the joints. After the joints are thoroughly grouted, the surplus cement is removed from the surface by drawing a piece of wet canton flannel over it. This cloth should be washed frequently in clean water. After the floor is cleaned in this manner, it is allowed to set for a day or two. It can be rubbed with sharp sand and a board of soft lumber or with a piece of gritty sandstone. Whenever possible it is preferable to remove the surplus cement in this manner rather than by washing it with muriatic acid, because the acid attacks the cement in the joints unless it is removed almost immediately by washing the floor with water.

Newly laid tile or ceramic mosaic floors usually become covered with a white scum, which during the first few days obscures the darker colors. This scum is due to the plaster of gypsum contained in Portland cement used in the mortar and concrete. After a short time this scum disappears.

Ceramic mosaic is now being used quite frequently as a wall covering. It is more durable than the ordinary glazed wall tile and it does not craze. These are the two principal considerations which have led to its adoption in place of glazed tiling for walls that are subjected to rough usage. The application of the ceramic tesseræ in wall work is virtually the same process as that of laying the ceramic mosaic floor.

There is no class of tile work in which the skill of the tile setter enters as such an important factor as in the application of ceramic mosaic. Consequently the tile-setters who are anxious to excel in their work, should give careful attention to those numerous details, unimportant in themselves, but which determine to a great extent whether the finished job is to be a first class one or not.

Apartment House in Fifth Avenue's Residential Section.

The new apartment house which is in course of erection at the corner of Fifth avenue and Fifty-first street, Borough of Manhattan, New York, is a noteworthy improvement in the reconstruction of what has long been regarded as an exclusive residential section of the city. Across the avenue are St. Patrick's Cathedral and the Union Club, while on the opposite corner of Fifty-first street is one of the twin Vanderbilt residences. Other dwellings in the neighborhood are those of such well-known people as D. O. Mills, Henry Clews, Mrs. Russell Sage and William P. Clyde.

The new building will, according to Architect A. M. Welch, rise to a hight of 150 ft. above the sidewalk, being 12 stories in hight, with basement and subcellar. It will be of fireproof construction, the exterior being largely of Indiana limestone. The entrance is in Fifty-first street, and so placed that the distance from the avenue gives it the appearance of an entrance similar to the private residences by which it is surrounded. A store will occupy the avenue corner, while the floors above will be for the use of families desiring large accommodations and facilities for housekeeping purposes. The arrangement of the upper floors is such that while there will not be less than one apartment on each of the floors, with additional accommodations elsewhere for the servants, two floors can be made into a single apartment if desired, or an apartment can be made to consist of one entire floor and half of another floor, according to requirements. The kitchens, parlors, pantries and servants' dining room and sleeping rooms are all located in the west end of the building; that is, away from the avenue end, and are thus kept entirely separate from the rooms which are for strictly family use. These suites have been modeled on the idea of the American basement dwelling, the entrance from the passenger elevator leading into a private hall which in turn opens into an outer vestibule connecting with a reception hall, from which runs a long wide corridor with doors opening into each of the various rooms of the suites. Every room in the building is lighted from exterior windows, as the building has three sides exposed for exterior light and air. The dining room, salon and library can all be thrown into one large room about 50 ft. in length, for reception purposes when desired.

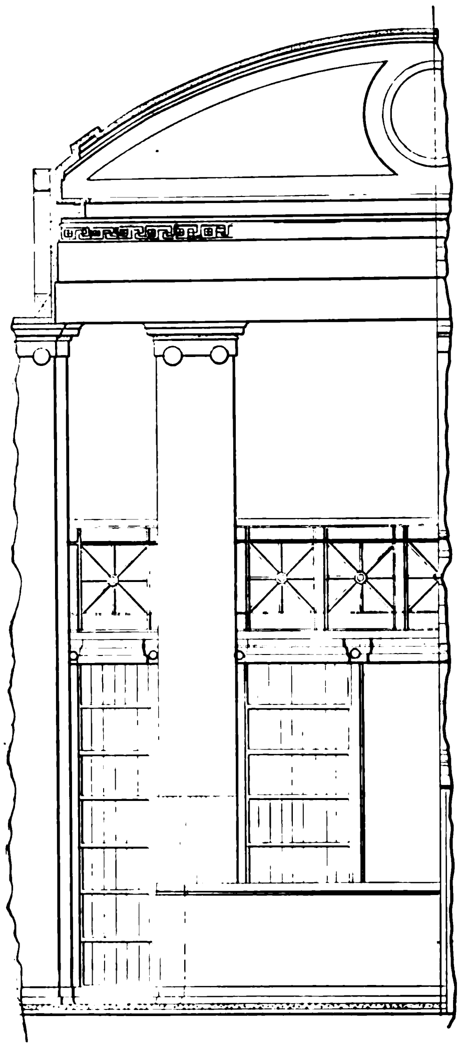
In the basement will be a modern laundry, also large trunk storage rooms, and in the subcellar an incinerator for the burning of waste, &c., an ice plant for the making of ice in the various apartments, the vacuum system for cleaning the apartments and other modern conveniences will be installed. There, too, will be located all necessary machinery, boilers, &c. Steam, hot water and electricity will be supplied from outside plants, the object being to reduce to a minimum the mechanical part of running the building and doing away almost entirely with the reception of coal and the removal of ashes.

Preserving Shingles.

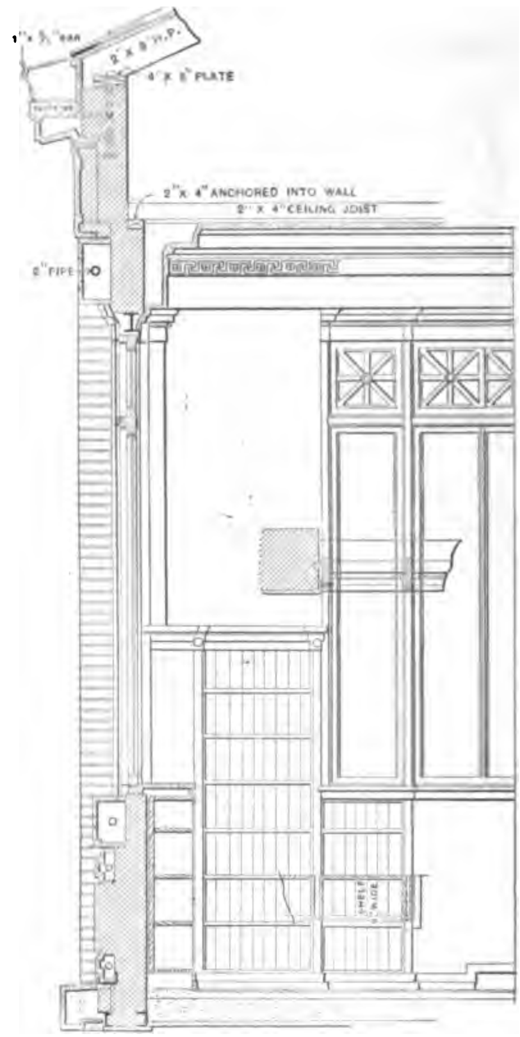
A bulletin issued by the Forest Service at Washington says that the service has been studying the shingle problem along with that of the preservation of farm timber. It is found that shingles treated with creosote by a special process which the service has invented, warp little and decay slowly because water is kept out of the tissues of the wood. One such roof will outlast two or three left in the natural state to curl, spring leaks, and fall to pieces. A roof of that kind costs a little more at first, but it is cheaper in the long run. Woods which are usually classed as inferior, such as loblolly pine, beech, sycamore and others which are quick decaying, readily take the preservative treatment, and are given a largely increased value. The preserving apparatus is neither expensive nor hard to operate. One outfit will serve several farmers. The main items are an iron tank (an old engine boiler will do), with preservative fluid in it and a fire under it, and another tank of cold preservative. The shingles or other woods to be treated are immersed for a sufficient time in the hot creosote, and then in the cold. Full details of the operation are given to applicants for information by the Forest Service at Washington.

Shingles are one of the most important lumber products in this country. Last year nearly 12,000,000,000 were made. Even this enormous number was a heavy falling off from the total of the year before. It is a significant fact that the chief source of shingle supply is now the forests of the Far Northwest, from which shingles are brought even to New York. The Eastern sources of supply are not able to meet the Eastern demand.

The Forest Service has also been experimenting with stains, and has found that stains may be carried into the shingles, along with the preservatives, by the new process. The coloring matter is mixed with the creosote, reaches every fiber which the creosote touches, and lasts as long as the creosote lasts—and that is a long time. Such a stain does not easily weather out, whether on walls, gables or roof.



Partial Interior Elevation at Delivery Room End.—Scale, ¼ In. to the Foot.



Interior Elevation and Section at Corner of Reference Room.—Scale, ¼ In. to the Foot.

Free Public Library Building at Kearney, N. J.—Miscellaneous Constructive Details.

Cleansing Brick Fronts of Smoke Stains.

It very often happens that the brickwork of a building is stained with smoke from fire, and the question naturally arises as to the best method of cleansing the brick so that it will appear as much as possible like the original. A question of this character came up recently in the *Painters' Magazine*, in reply to which the following method was suggested:

To 1 gal. of good soft soap, not too watery, add 2 lb. of powdered pumice, 00 or F., and 1 pint of liquid ammonia. The article sold as Household Ammonia will answer, though it will be all the more effective if a little stronger. First remove as much of the soot and dust as possible with a stiff broom or fiber brush, then apply the soap and ammonia mixture with an ordinary fiber wall brush or common white wash dip, let it remain for about 20 to 30 min., then with a good scrubbing brush rub it briskly, dipping the brush into clear water once in a while. Have a few pails of clear water handy and a large carriage sponge to go over the scrubbed surface and finally rinse with clear water. If convenient, use a hose with spray nozzle for rinsing. This will remove the most stubborn case of staining from fire and smoke.

Convention of Pennsylvania State Association of Builders' Exchanges.

THE annual convention of the Pennsylvania State Association of Builders' Exchanges, which was held at the City Hall in Wilkes-Barre, Pa., on January 7 and 8, was a most interesting and instructive meeting, with delegates present from Bradford, Sharon, Pittsburgh, Hazelton, Pittston, Scranton, Butler, Kittanning, Wilkes-Barre, Kane, Oil City, Beaver County, Berwick and Williamsport, Pa., and representatives from Cleveland, Ohio, and Orange, N. J. The convention opened with President E. J. Dietrick in the chair. After the transaction of some preliminary business, among which was a motion to open the sessions to representatives of the press, he delivered his annual address. Among other things he said:

This is not an age of scatteration, but of concentration. The builder of to-day who has an idea that he can control the conditions affecting the building trades without co-operation is as primitive as the man of olden times who was jack of all trades from necessity.

The policy of an employers' association should be in the interest and for the purpose of enforcing, if I may be permitted to use this word, fair dealing between one another and adherence to the principles laid down in the constitution of our national government.

Now in the spirit of equity and in the maintenance of the constitutional rights of the citizen could we not embody in a law or secure equal national control by the enforcement of the incorporation of organized labor? I would like to raise this point here that the incorporation of trades unions, would, beyond the question of a doubt, place responsibilities upon the officers of such organizations as would make them feel such a respect for the laws under which they are incorporated as to at least lessen their unreasonable demands and eliminate to a very large degree many illegal acts during the times of strikes.

Our State association does not seek to destroy, but to protect and encourage the building industry, and has no other purpose of existence. It seeks to secure for the investing public the best that can be secured for the fairest price. It seeks to maintain a fair day's wage for a fair day's work of a quality recognized as superior. It seeks to prevent and abolish a condition that compels a superior mechanic to do less work and inferior work to equalize the wage and labor of the inferior mechanic.

I would recommend that some action be taken at this convention to more effectively establish the principle of the open shop in the employment of labor among those affiliated with this association. The open shop doesn't mean nonunionism, but means the employment of labor without regard to trade affiliations and on the basis of the merit system.

Let us encourage the manual training of the boys at the public schools, so they may acquire a general knowledge of the use of tools and an aptitude to apply themselves to any trade that may suit themselves and their environments and better their condition and that may prepare them for a more perfect training, if desired, in the trade school. Let us encourage the trade school that we may make mechanics and tradesmen for our future work.

The address of the president was followed with close attention and was received with hearty applause. Owing to the lateness of the hour at which the morning session convened an adjournment was then taken for luncheon.

Afternoon Session.

During the afternoon session, which was called to order at 2 o'clock, Secretary W. T. Anderson presented his report, and was followed by Treasurer W. H. Dennis. The next order of business was the appointment of committees, as follows:

Resolutions: W. H. Shepherd, Wilkes-Barre; E. S. Williams, Scranton; B. P. Budd, Sharon; A. O. Ericson, Kane; C. E. Woodnutt, Williamsport; Benjamin J. Griffen, Pittston; D. H. Littel, Pittsburgh; J. H. Heilman, Kittanning; J. Rummel, Butler; W. H. Dennis, Bradford.

Press: George S. Boyle of Wilkes-Barre, and W. T. Anderson of Sharon.

Credentials: T. H. Snell, Pittston; H. J. Gunster, Scranton; W. L. Dykes, Kane; W. Carlyle, Sharon; M. R. Litch, Williamsport; F. O. Hane, Bradford; J. Rummel, Butler, and J. T. Crissman, Kittanning.

George S. Boyle, representing the Committee on Membership, presented a report, and upon motion it was decided to distribute detailed reports of the convention proceedings throughout the State and country.

At this point in the proceedings the privilege of the floor was accorded Alexander E. Pearson of Orange, N. J., who made a statement as to the necessity for such an organization as the national body, referred to its growth, and dwelt at some length upon the possibilities of the convention to be held at Washington in March.

He was followed by E. S. Williams of Scranton, who made a strong address in advocacy of the formation of builders' exchanges, declaring that there should be such an organization in every town where there is a Central Labor Union or a Building Trades Council, and that there are 572 of the latter in the United States. He prophecied that within three years the bricklayers would be affiliated with the American Federation of Labor, and told of steps taken at the recent Norfolk convention of that body to bring about a formation of a National Building Trades Council, which shall govern the building trades of the country as the Federation of Labor does union labor generally.

W. H. Shepherd of Wilkes-Barre discoursed in a most interesting manner for fully an hour, taking for his theme, "Side Lights on the Open Shop." He told of the open shop fight in Wilkes-Barre and of the conditions which brought it about, and of the progress that has been made, at the same time laying down a set of rules to be followed, gained from hard experience in attempting to establish the open shop in other communities. He urged the upbuilding of the State Association and an active effort to bring about the formation of builders' exchanges or the securing of representatives from every town of 5000 or more population. J. E. Patterson of Wilkes-Barre made a short address, in which he urged individual effort for the strengthening of the organization. The meeting then adjourned to meet the following morning.

Wednesday's Sessions.

The second day's deliberations opened with a motion by C. E. Woodnutt of Williamsport that a committee be appointed for the purpose of placing in nomination the names of officers for the ensuing year. The president then appointed as such committee W. H. Shepherd of Wilkes-Barre, W. T. Anderson of Sharon and E. N. Unruth of Bradford.

Reports from the various builders' exchanges were then received. Bradford, Butler, Kane, Williamsport, Pittsburgh, Berwick and Scranton reported the open shop in operation there. Wilkes-Barre reported open and closed shop firms in operation, and reports were also received from Kittanning, Sharon, Beaver County, Pittston, Hazleton and Oil City.

At the afternoon session W. H. Shepherd, chairman of the Committee on Resolutions, presented a report, during the progress of which the following resolutions were adopted:

Resolved, That the State Association indorse manual training in the public schools, use its influence with State educators and county superintendents of schools to bring about the introduction of this training throughout the public school system of the State, and that committees of three be appointed from each of the affiliated exchanges to secure the co-operation of boards of trade and other commercial bodies in urging the embodiment of this study in the public schools curriculum upon the educators of their respective localities

Resolved, That this convention now assembled reaffirms its sincere belief in the principle of the open shop and indorses heartily the work of the Manufacturers' Association of the United States, the Citizens' Industrial Association of the United States, and that of various exchanges of this State Builders' Exchange along the lines of the establishment of the open shop throughout the State and nation.

Resolved, Recognizing the importance of the press as an agency for the promotion and guidance of public opinion and appreciating the aid already given by many papers.

Resolved, That the Pennsylvania State Builders' Association in convention assembled appeals to the whole press of the State for broad and liberal treatment of industrial and labor questions.

Resolved, That the State Association heartily approves of the work already done by the National Association of Builders' Exchanges and hereby pledges its moral and financial support in the future building up of associations of employers in the building trade.

Resolved, That a cardinal principle of this association is the protection and defense of the individual member against the malicious attacks of organised labor or any other influence that may be arrayed against them unjustly, the damage of one being the concern of all; be it further

Resolved, That we pledge this association to the full extent of its powers to aid and defend any of its members who, either in their person or business, may be made the victim of the boycott and the malice of any person or organization.

Further, It has come to our knowledge that members of the Bradford Exchange, who are engaged in the manufacture of brick, have been put upon the unfair list because of their affiliation with the organization; therefore

Resolved, That the Executive Committee is hereby authorised and directed to take action on this and any such case as may be brought to its attention.

Mr. Mansfield of the Berwick Builders' Exchange asked for information as to the aims of the State Association and what it proposed doing that would benefit local builders. In response to this request President Dietrick called upon a number of the delegates to tell of their reasons for membership in the State Association and of the benefits derived from it.

An excellent paper on "The Builders' Exchange" was read by B. J. Griffin of Pittston, and another on "The Boycott," prepared by J. P. Melvin of Bradford, was also read.

At this point of the proceedings J. K. Turner of Cleveland was given the privilege of addressing the convention on "Industrial Education and the Future American Mechanic in the Building Trades." He expressed gratification that the association had at length taken up the question of industrial education and that it had recognized and given publicity to the recommendation that there are some features of union labor and union organizations which are commendable. He narrated some instances of union tactics which, in his opinion, had resulted in harm to the organization which they were expected to help, and quoting these as instances of the mistakes in leadership which have aroused antagonism to a movement which in itself has a good motive. He urged the elimination of such leaders from the labor unions. Among other things he said:

"The need for industrial learning is recognized by men in every walk of life. Even the labor unions are beginning to turn to this as the solution of the problem of supplying the skilled artisans for which there is so much demand. The manual training department of public schools do not absolutely solve the problem, for when the youths of this nation leave the schoolroom they find the shops of the country closed against them. It is, therefore, necessary to provide trade schools where they can get the experience denied them in the shops, and the growth of these show the great need for them.

"Unionism has done many good things, and we don't want to destroy it, for, after all, we are all union men. But when it comes to the stage that we have such organizations as the American Society of Equity, the farmers' union, is it any wonder that the necessities of life even are difficult to obtain at reasonable prices."

Officers Elected.

After Mr. Turner had been given a rising vote of thanks for his most interesting address, the Nominating Committee made its report, placing in nomination the following officers:

President, C. E. Woodnutt, Williamsport.
First Vice-President, B. J. Griffin, Pittston.
Second Vice-President, J. Rummell, Butler.
Treasurer, W. H. Dennis, Bradford.
Secretary, G. S. Boyle, Wilkes-Barre.

The following delegates to the convention of the National Association of Builders' Exchanges, to be held at Washington in March, were also elected: E. S. Williams of Scranton, C. E. Woodnutt of Williamsport and E. J. Dietrick of Pittsburgh. The following were named as alternates: W. H. Shepherd of Wilkes-Barre, W. J. Barriscale of Scranton and J. P. Melvin of Bradford.

The new officers and the delegates were introduced to the convention by President Dietrick, after which he retired from the chair in favor of C. E. Woodnutt, the new president. Both he and the new secretary and new treasurer made brief addresses, the latter moving that the retiring president be given a vote of thanks for his efforts as president of the association during the past two terms. Mr. Dietrick, in a few well chosen words responded, stating that while retiring from the presidency he did not intend to retire from the work of the association.

After considerable argument it was decided to leave the place for holding the next convention in the hands of the Executive Committee.

The Banquet.

The convention closed with a banquet at the Wyoming Valley Hotel, which was in every way a most enjoyable affair. There were present about 75 delegates and local exchange members, together with a number of invited guests. After the many good things provided had received due attention, W. C. Shepherd as toastmaster introduced Mayor Kirkendall, who made one of his characteristic addresses, in the course of which he complimented the local builders upon the many evidences of their skill, as shown in the erection of the massive buildings throughout the city. General Dougherty was next introduced, and spoke on "Good Citizenship," referring among other things to the great industrial possibilities of Wilkes-Barre and the Wyoming Valley, and then spoke of the manual and industrial training now being introduced into the public schools. Other speakers were E. J. Dietrick, the retiring president; Rev. Dr. C. E. Mogg, who responded to the toast, "Building," and Daniel Hart, who dwelt upon the industrial situation in the Wyoming Valley.

Selections by a male quartette were rendered at intervals during the evening, and a handsome souvenir was given out. containing the list of speakers, the pictures of three bank buildings recently erected in Wilkes-Barre and the *menu.*

The committee in charge of the entertainment consisted of I. M. Leach, Edward Eyerman, Henry J. Melan, George T. Dickover, Joseph M. Gaynor, W. H. Shepherd and George S. Boyle.

Are We to Have Strictly Fireproof Buildings?

At a recent meeting of the Up-To-Date Club of Youngstown, Ohio, the query, "Shall we ever get strictly fireproof buildings," came up for discussion, and among those who spoke in a most interesting vein was John M. Evans of the city named, who answered the question with some reservation in the negative. In his opinion he did not believe that buildings would be strictly fireproof until they were surrounded by other incombustible buildings. After explaining that the term "fireproof" as at present used denoted rather "fire resisting," Mr. Evans gave a list of the requisites of such buildings. These included fireproof foundations, fireproof floor construction, partitions, columns and protection for columns, fireproof ceiling and roof and fireproof finish of the interior.

G. H. Knowlson read a paper in which he pointed out that an absolutely fireproof building might be destroyed by the heat surrounding it, but not if that entire section of the city were fireproof.

H. E. White discussed the advantage of concrete over tile, while others explained the relative cost of wood and steel furniture.

THE highest church spire in St. Louis is being built in a novel way. Its pinnacle will soar 246 ft. above the ground. It is the first grille work spire in America, the entire steeple being constructed of stone lattice, giving free play to heavy winds. Engineering applications in the construction of this spire are novel, as every piece of stone used in the steeple has been cut at the base of the tower by tools run by compressed air, and the same agency has hoisted the stones to the several stagings of the work. Pneumatic tubing is carried up the derrick to the successive stages. Stones weighing 50 lb. have been shot through these tubes to the workmen above and held in place by the air until removed from the tubes. The whole spire will be crowned by a steel cap 17 ft. high, and several steeplejacks will be required to fasten it in place.

CONSTRUCTION AND COFFERING OF DOMES OR CUPOLAS*.

BY J. C. McCARTHY.

THE next phase of the subject which we shall consider relates to the manner of determining the divisions of an ellipsoidal vault. We show in that portion marked No. 1 of Fig. 9 the plan of a dome, while No. 2 represents its transverse and No. 3 its longitudinal vertical sections. The position of the circles o P, o' P', o'' P'', &c., on the vertical line are found as in the cases already described, and the divisions on the transverse profile of the dome are obtained by the intersection of the tangents. In order then to find the divisions on the longitudinal section draw the circumscribed parallelogram R S U T of No. 1 and indicated by the dotted lines. Draw the diagonals R U and S T. Draw the divisions from the profile No. 2 to the transverse axis A C of

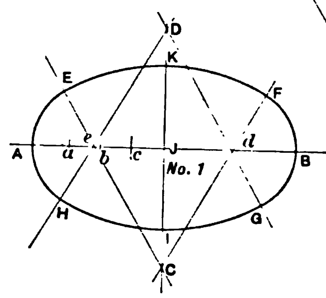


Fig. 10.—Describing an Ellipse.

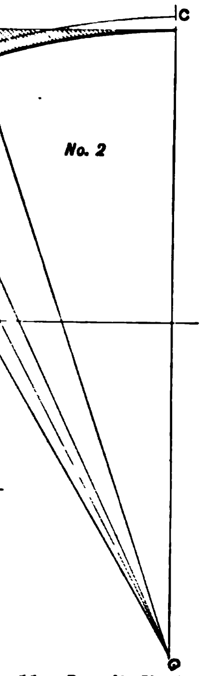


Fig. 11.—Longitudinal Profile of Vault.

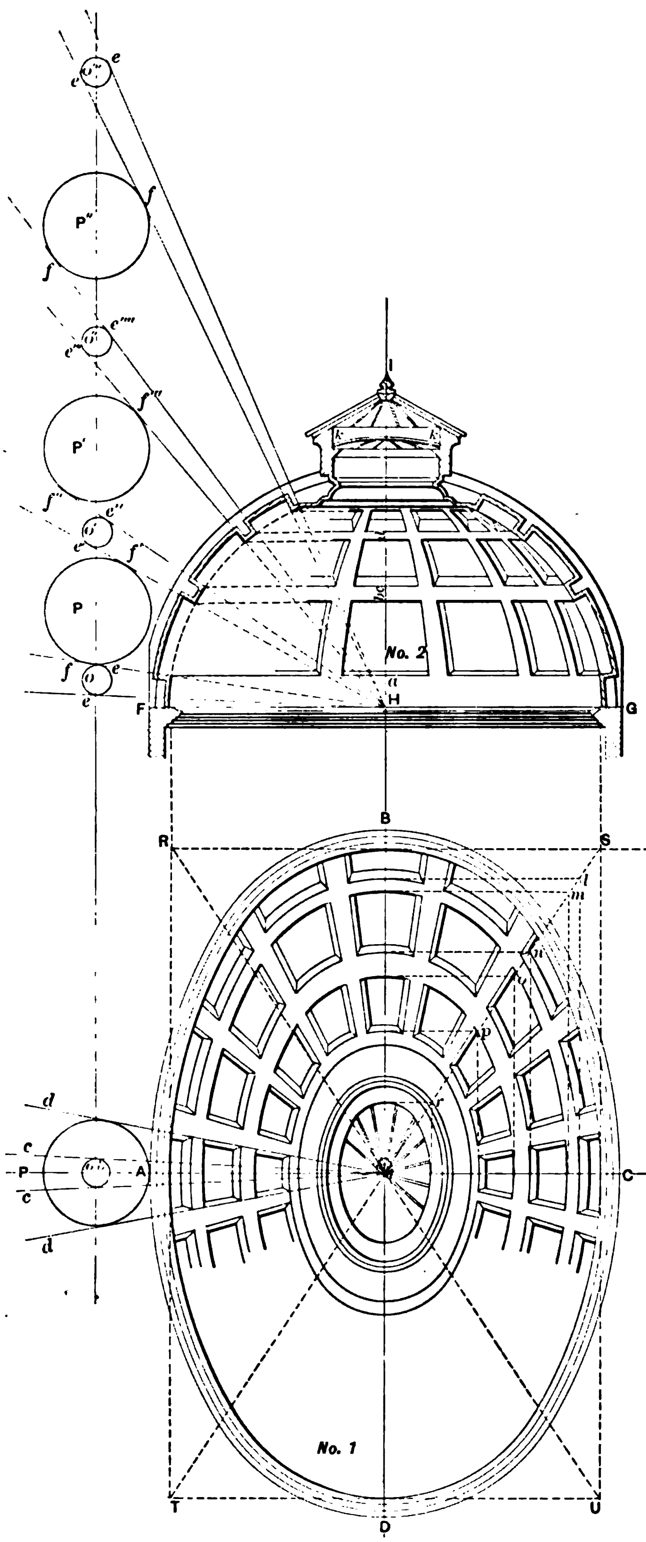
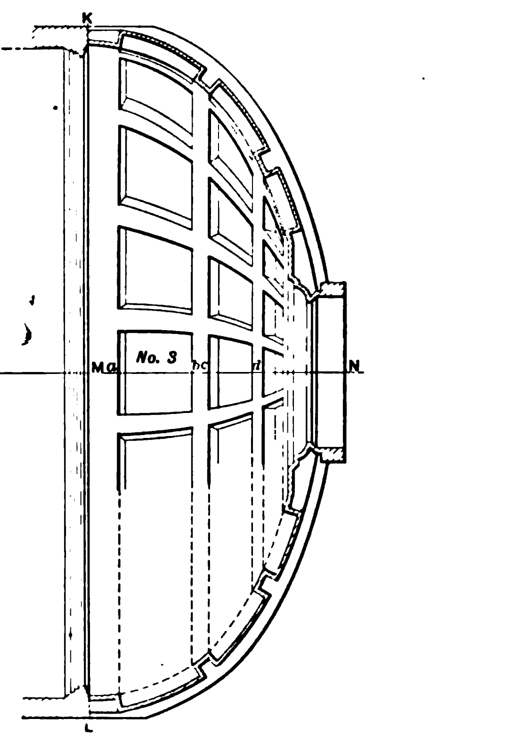



Fig. 9.—Plan and Sections of an Ellipsoidal Vault.

Construction and Coffering of Domes or Cupolas.

* Concluded from page 13, January issue.

In the description of the method of dividing a conical vault on page 12, in the second column, second paragraph, fourth line, a slight typographical error occurred. The sentence beginning, "Now with F on the line b' F as a center describe the circle k l, making it equal to f g, cutting the side of the cone at h," &c., should read, ". . . . making it equal to f g and tangent to it draw the line k o, cutting the side of the cone in h."—C. J. McCARTHY.

No. 1, cutting the diagonals in the points *l, m, n, o, p, r*. Through these points draw lines parallel to A C, and the points wherein these intersect the major axis B D give the divisions on the longitudinal profile, No. 3.

In Fig. 10 is shown the manner of describing the ellipse forming the plan and longitudinal vertical sections of the vault described above. Let A B represent the major axis and I K the minor axis. Now with I K as radius and B as center describe the arc, cutting the major axis in *c*. Divide A *c* into three equal parts, and with two of these parts as a radius and J as a center describe the arcs at *e* and *d*. Upon these points erect two equilaterial triangles, *e* C *d* and *e* D *d*, and produce their sides indefinitely. With *e* as center and *e* A as radius describe the arc H A E. Now with *d* as a center and the same radius describe the arc G B F. Next, with C as center and C K as radius, describe the arc E K F. Next, from D as center and with the same radius as before, draw the arc H I G. Referring now to Fig. 11, which is the longitudinal profile of the vault, the diagram shows the manner of obtaining the lines forming the radial section of the ribs. The lower arc A B of the rib is described from the center *e*, to which point the lines of all the divisions below B have to be drawn. The upper arc is described from the point G, to which all the divisions in the arc have to be drawn.

To determine the horizontal divisions of the radial panels in a cylindrical vault we draw the angle A C D in Fig. 12, representing one of the vertical divisions of panels, and by means of the arc *c d* and the arcs inter-

Sometimes the panels of a dome are diminished in depth as they ascend, thereby diminishing the girt of the moldings. When this is the case a circle corresponding to the width of each member must be described from each center on the vertical line and corresponding tangents drawn. The depth of the members are found by shifting centers as on a horizontal line drawn through E in No. 2, Fig. 8, or the springing line of the vault.

To demonstrate the correctness of the system of circles and tangents employed in the foregoing figures in determining their divisions it only requires a little study of the diagrams presented in Fig. 15. Here No. 1 represents the plan of an ellipsoidal solid which it is desired to divide into a certain number of radial planes, these planes to be a certain fixed distance from each other. No. 2 represents a vertical section of the figure taken on its longest diameter, while No. 3 is a section on its shortest diameter. When the point *a* is fixed for the first division take half the width of the chord *a b* of No. 1 as a radius and the point *a* of No. 2 as a center and describe the arc *b*, cutting the profile of the figure A B C. From this point draw lines to the foci E and F, and through the same point draw the line *c d*, cutting the vertical line in the point *e* and the axis B D produced in *d*, and bisecting the angle formed by the lines drawn from the foci. Now with *e* as center and a radius equal to that of the circle

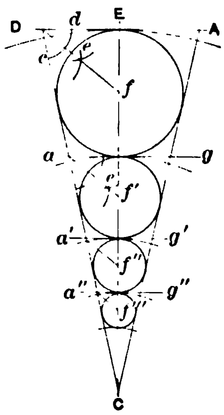


Fig. 12. — Determining Divisions of Panels in a Cylindrical Vault.

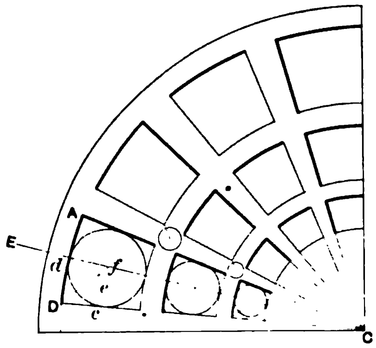


Fig. 13.—Appearance of Panels.

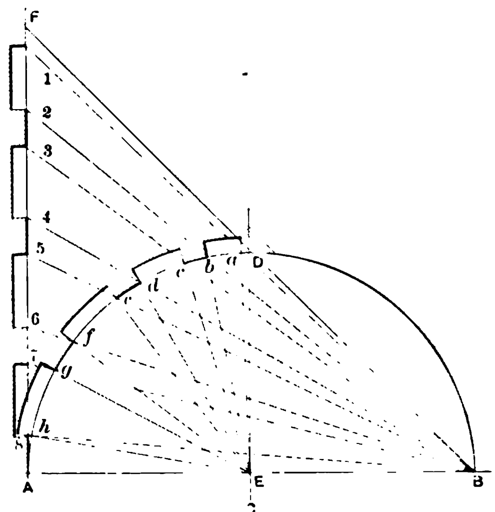


Fig. 14.—Manner of Dividing Panels in Soffit of an Arch When It Is Desired to Diminish Them in Width as They Ascend.

Construction and Coffering of Domes or Cupolas.

secting at *e*, draw D *f*, bisecting the angle A D C. Here *f* is the center of the circle which gives the size of the panels running horizontally. Through the point of intersection of the circumference of the circle with the center line E C draw *a g* parallel to D A, bisecting *a g* C as before, to find *f'*, the center of the second circle, and so continue until all centers have been found. The circles so found represent the divisions for the radial paneling in the vertical ends of the vault, all as clearly indicated in Fig. 13 of the drawings. In Fig. 14 is shown the manner of dividing the panels in the soffit of an arch when it is desired to diminish them in width as they ascend. Referring to the diagram, draw the springing line A B, and perpendicular to it the axial line C E D, cutting the springing line in the point E. Now with E as center describe the circle A D B, representing the profile of the soffit and cutting the axial line in the point D. Tangent to this circle and parallel to the axis C E D draw the line A F. Now from the point B and through D draw the line B D F, cutting the line A F in the point F. Divide the line A F into as many panels and mullions as required, making the point F the center of the highest mullion. If it is desired to have panels at the crown of the arch, make the point F the center of a panel. From these divisions draw the radial lines B 1, B 2, B 3, &c., cutting the profile of the arch in the points *a, b, c, d, e*, &c. The radial lines *a* E, *b* E, *c* E, *d* E, &c., will then determine the radial planes of the sides of the panels.

e of No. 1 describe the circle *e* of No. 2. Draw the line *f d*, cutting the profile in the point *a*, the hight of the first division. From this point again draw lines to the foci E and F, and the line *g h* through the same point, bisecting the angle formed by the lines drawn from the foci. Next draw the line *i h* and also draw lines from the foci to the point where they cut the profile. Proceed in this manner, drawing circles and tangents until the work is completed, making sure to always draw lines from the foci to the last point found on the profile and bisecting the angle formed by them with the next like until all the divisions are found. The circles and tangents in No. 3 have been explained in connection with former diagrams.

It will readily be seen that if No. 2, with its vertical line, circles and radial tangents were placed in position standing vertical on the line A B of No. 2, the centers of all the circles in No. 2 would stand vertical over the center *e* of the circles in No. 1. If then the circles *e l m n o p* of No. 2 were revolved on their centers so that their diameters would stand perpendicular to the vertical line G H, as seen in No. 4, the circles in Nos. 1 and 2 being the same size, the tangents in No. 2 would consequently stand vertical over the tangents in No. 1. The points *r k* of No. 2 would stand directly over *r k* of No. 1 and *r s* of No. 2 over *r s* of No. 1.

It will also be found that *r k* and *r s* in Nos. 1 and 2 are equal, showing that all the divisions in each radial section of the figure when measured at the profile will be the same length at their sides as at their greatest width. In other words, *r s* of No. 2, the hight of the division, is equal to *r s* of No. 2, its greatest width.

The above explanations also apply to No. 3. The diagram shown in No. 4 represents a vertical projection of the radial tangents and circles of No. 2.

The Percentage Basis in Planing Mill and Contracting Work.

We continue to hear quite a lot about what is called the percentage basis in planing mill work and contracting work generally, and along with the reports of work being done this way there is occasionally a word to the effect that it is the coming thing, and that the chances are decidedly in favor of much of the building work of the future being done on what is termed the percentage basis. What we would like to know and to have specific information on is, what people generally regard as a fair percentage, says a recent issue of the *Woodworker*. The general plan, as we understand it, is for the contractor or planing mill to figure on doing any given job of building, using the best practical efforts to keep the cost down to a reasonable basis, then charge in addition to the actual cost of the material and work a certain percentage as profit for the contractor or planing mill. It will be recalled that some such basis of figuring as this entered into the proposition that was up some time ago to have the Panama Canal dug by contract.

Evidently the magnitude of the job should have something to do with the percentage charged. We would like to get straightened out on these things if this method is to become popular and general. To figure work on a percentage basis presents certain advantages, and probably, on the other hand, an equal number of disadvantages. In case of fire or some occasion where it becomes decidedly important to have estimates for rebuilding immediately, the percentage basis readily furnishes a short cut to letting the contract and getting the work started. All the contractor needs do is to get a rough estimate of the probable cost, then make agreements as to the percentage he is to be paid above the actual cost, after which he can get busy and frequently have the work pretty well under way by the time it would take him and other contractors to get at their competitive bids through figuring all items in detail. On the other hand, of course, it puts the man who gets the work done into position where he gets to know exactly what the planing mill will make in the form of profits, and practically eliminates the chance for big profits on the job.

There is, of course, some recompense in that while curtailing the chance for big profits, this percentage basis practically eliminates the chance for loss. In other words, it puts the planing mill work and contracting on what might be termed a more positive basis, like loaning money out at a certain per cent.; you know beforehand what your returns will be, and at the same time you know that you cannot make what might be termed excessive profits. However, what we are after at the present time is not so much a pro and con discussion of the possible merits of the percentage basis system, as to seek information on just what percentage is considered

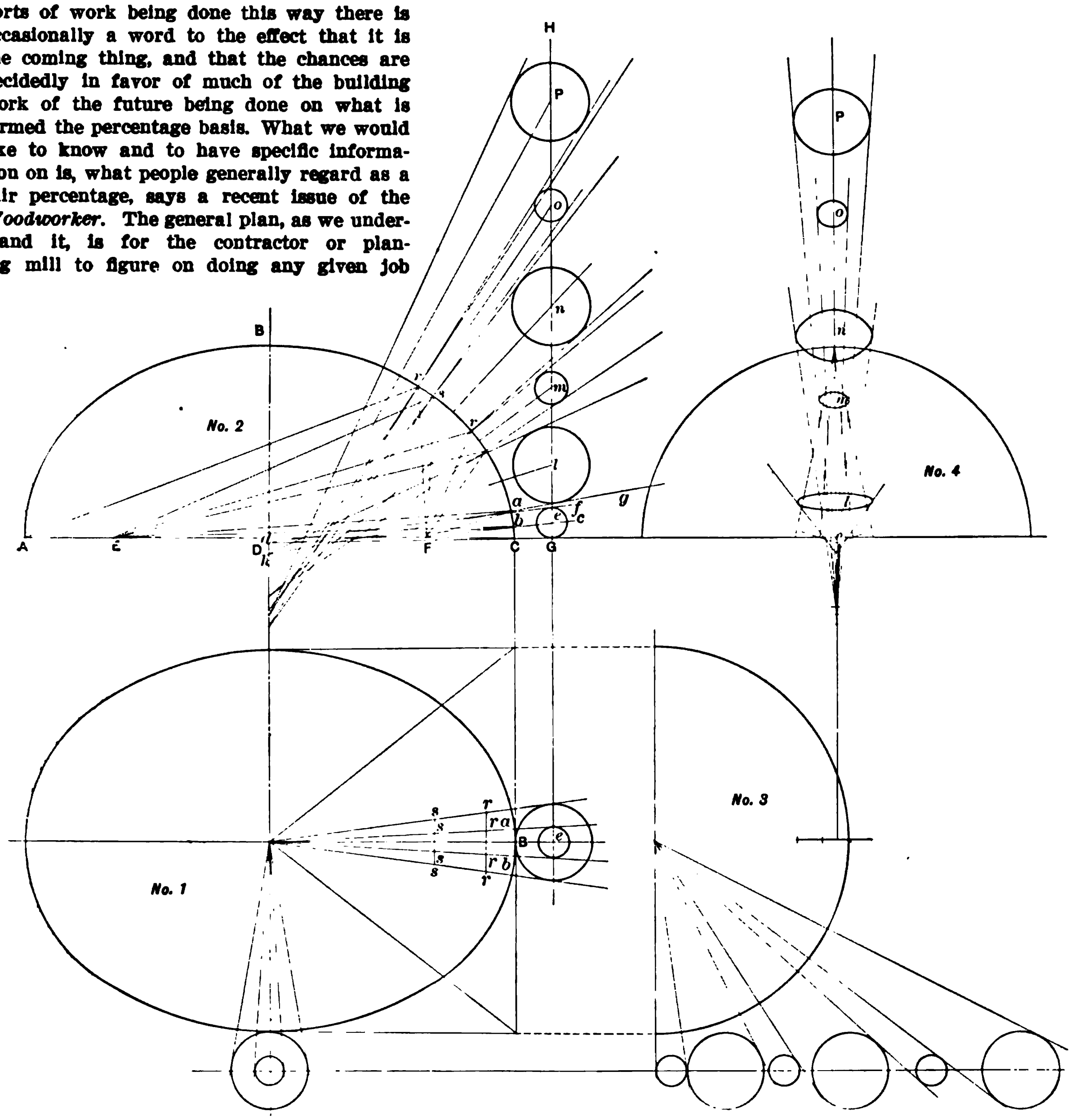


Fig. 15.—Diagrams Demonstrating Corrections of Circles and Tangents Used in Previous Figures.

Construction and Coffering of Domes or Cupolas.

about right on jobs of a given size, and other essential details, to make clear the idea of doing planing mill and contracting work on the percentage basis.

A Vanderbilt Skyscraper.

The latest improvement contemplated for the residential section in the vicinity of the old Park Avenue Hotel, Borough of Manhattan, New York, is a 21-story store and office building for which the plans were filed a short time ago by Architects Warren & Wetmore, and which is estimated to cost in the neighborhood of $1,000,000. It will be located on Park avenue between Thirty-third and Thirty-fourth streets, with a frontage of 197½ ft. on the avenue and 80 ft. on the side streets. It will be of Italian renaissance type of architecture, with façades of brick trimmed with limestone for the first six stories and terra cotta and brick above. The avenue front will be adorned with seven lofty tiers of bays, and will have a loggia covering the entire front at the three topmost stories, with balustrades and a row of Ionic columns and pilasters supporting a roof cornice.

The first story will be fitted as stores, the next four floors as lofts for heavy manufacturing, while the remaining portion of the building will be devoted to offices. The total hight of the building will be 300 ft. above the sidewalk, and the structure will have a slag roof with cast iron, copper and glass windows with steel frames. The building is being put up for Alfred G. Vanderbilt, and will occupy in part the site of the old Cornelius Vanderbilt home.

THE question of regulating the hights of buildings has recently been agitated to such an extent that a number of large cities of the country have passed ordinances bearing upon this point, and we understand that the Secretary of the Treasury, who has control of the erection of Federal buildings in various States, has recently taken the matter under investigation with the result that the Government will not erect any unusually high office buildings, and that the limit observed in the National Capital for Government buildings will probably be observed elsewhere.

Convention of Minnesota State Association of Builders' Exchanges.

ACCORDING to programme, the sixth annual convention of the Minnesota State Association of Builders' Exchanges was held in Stillwater on December 11, a date just a little too late in the month to allow of even a brief report of the proceedings to be published in our January number. The meeting was unquestionably the largest and most successful which has been held since the association was organized, all parts of the State being well represented. The meeting opened with O. H. Olson, president of the Stillwater Builders' Exchange, in the chair, and in a short address he welcomed the visitors to the city. Vice-President W. A. Elliott was then called to the chair to preside, in the absence of President Corning, who was unable to attend the meeting. Committees on credentials and resolutions were named, and while they were deliberating Secretary A. V. Williams of St. Paul read the report of the last annual meeting at Faribault.

After the formation of a number of other committees the secretary read the annual address of President Corning. The report covered the work of the association during the past year and presented a number of suggestions and recommendations along the line of mutual benefit for the master builders, the manufacturers and the dealers in building materials throughout the State. What the president had to say was followed with deep interest and at the conclusion of its reading by the secretary was greeted with hearty applause.

Next in order was the report of Secretary and Treasurer Williams, which showed the workings of his office for the past year, and the association to be in a flourishing condition. The report of the chairman of the Legislative Committee was also read by the secretary, after which it was accepted and filed.

Numerous resolutions were adopted, among the number being one reaffirming the position for the "open shop"; one regarding the National Association of Manufacturers; another recommending the revision of the Standard Contract to provide for greater harmony between owner and builder, and another favoring trade schools. It was unanimously voted to again ask the State Board of Control to open and read all bids for public work at the time and place advertised for such opening and in the presence of the bidders. A resolution of thanks was extended to the Builders' and Traders' Exchange of Stillwater for the courtesies extended the State Association and its members.

As president of the St. Paul Builders' Exchange, William Rhodes extended to the organization an invitaion to hold the next annual meeting in that city, which invitation was accepted.

The election of officers resulted in the following choice:

President, J. W. L. Corning, St. Paul.
First Vice-President, W. A. Elliott, Minneapolis.
Second Vice-President, H. A. Hall, Duluth.
Third Vice-President, A. H. Hatch, Faribault.
Secretary-Treasurer, A. V. Williams, St. Paul.

EXECUTIVE COMMITTEE.

A. P. Cameron, St. Paul. C. Thompson, Stillwater.
N. W. Nelson, Minneapolis. E. Zauft, Duluth.
John P. O'Neil, Faribault.

The convention adjourned to meet in the Twin Cities at such time and place as the president might elect for a special session to discuss such live topics of the day as might be of interest to members of the association.

The Banquet.

Contrary to the custom which prevails at many conventions the banquet was held in the middle of the day instead of in the evening. The large dining room of the Sawyer House was crowded to its utmost capacity, and after full justice had been done to the good things provided, O. H. Olson, as toastmaster, introduced the several speakers. The first was Judge J. C. Nethaway, who extended a most hearty welcome to the delegates on behalf of the citizens of the city. He referred to the builders as the people who did things, referring at some length to the cordial relations existing between contractors, builders, material men and others identified with the building business .

Vice-President W. A. Elliott responded, expressing appreciation of the royal reception which had been accorded the delegates and for the efforts put forth for their entertainment. President William Rhodes of the Builders' Exchange of St. Paul, made some appropriate remarks, which were well received, and he was followed by George M. Gillette of Minneapolis, who, among other things, expressed the view that when the next legislature convened would be an opportune time for introducing and having passed a bill which would give equal rights to the employer and employed. C. E. Evans of Duluth gave a brief account of some of the complex conditions existing in that city among the contractors and their workmen, after which J. P. O'Neil of Faribault extended greetings from his association and expressed the hope that at some future time it might again have the pleasure of entertaining the State organization in his city.

After the banquet the delegates visited various points of interest throughout the city.

Meeting of Retail Lumber Dealers' Association.

The Kentucky Retail Lumber Dealers' Association will hold its annual meeting February 17 and 18 at the Seelbach Hotel, Louisville, Ky. President C. W. Roark states that the programme will be a very interesting one, and that Governor Wilson has accepted an invitation to attend the banquet on the evening of the 17th. Manufacturers and jobbers desiring display space will make requisition to Secretary J. Crow Taylor, Masonic Building, Louisville, Ky.

THE ART OF WOOD PATTERN MAKING.—II.

By L. H. Hand.

We will now refer briefly to some of the more important features of the pattern making shop and the tools which are necessary for use in making the patterns. It may be stated without fear of contradiction that the art of pattern making is more "ancient than the golden fleece or Roman eagle," more honorable than the "star and garter," and a hundred times more important to the welfare of the race than either of them. The man who has made the patterns for some great piece of labor saving machinery, whereby the world's work is rendered easier and the hours of labor shortened, has purchased from the future for the rank and file of humanity, a few minutes more time in each day to spend with his family, or to devote to improving the mind and bettering the chances for a quiet and pleasant old age.

The vocation of pattern making is probably the most fascinating study known to the woodworker's craft. The shop may and should be clean and pleasant; the bench a piece of furniture finished in hard oil; the lathe a "thing of beauty and [illegible] forever," and the remuneration usually sufficient for [illegible] reasonable expenses of a family of moderate requirements. The pattern shop even for a small factory should be equipped with every facility for quickly and satisfactorily getting out a pattern. There should be suitable shelves provided for storing patterns and a regular index kept for reference. Every pattern and its core boxes should have a shop number, and in the index a drawing should be made sufficiently correct to designate the form of the part required should some one not familiar with the stock have occasion to look for a pattern by number.

It frequently occurs in a small repair shop that an engine or other piece of machinery running into thousands of dolars is sold to be delivered at a certain date. A defective part may be found only a few days before the date of delivery. We then see the value of a convenient shop, as the making of a pattern quickly may represent the entire cost to the firm of the pattern shop equipment.

As a rule, a pattern shop is like the farm—"there is more in the man than there is in the land." One time, when engaged with a concern in rebuilding a private coach, there were absolutely no conveniences provided for making patterns. There was no lathe and the workbench, built of warped and twisted rough timber, sagged in the middle from the weight of a rough iron vise, which was provided for the use of the pattern maker. The freight car men screwed old castings in it, while the boiler makers used it for knocking out broken hammer handles, &c. Many people have worse vises, but for pattern making it was a fraud. The bench was covered with dirt and grease, and frequently served as a receptacle for scrap iron, old pipe fittings, bolts, nails and other miscellaneous junk.

There was a rip saw in the shop which had been built there, and through some means had been finished to a point where the saw would turn around, but there was no guide and no device for raising or lowering the table. One day the writer saw the pattern for a grate bar leaving the shop for the foundry with the lug on which it revolves finished light and the remainder black. This, of course, would have instructed the molder to cast the piece with a hole in it instead of a projection upon it. The attention of the superintendent was called to the mistake, which was remedied. He then asked the writer if he ever did any pattern work, and was told that he had, in a pattern shop. The result of this was that in a few days a number of improvements were inaugurated with a view to rendering the outfit better adapted to meet the requirements of the shop. A good, stout saw guide, arranged with parallel bar adjustment, was built of wood, which was conveniently available, and having no lathe a rough face plate and rest was made, and the emery stand put into use for turning up packing rings, bushings, oil cups, core prints, &c. The superintendent gave his consent to the construction of a first-class pattern lathe, which proved an important addition to the equipment. This was during the time the writer was finishing the coach already referred to.

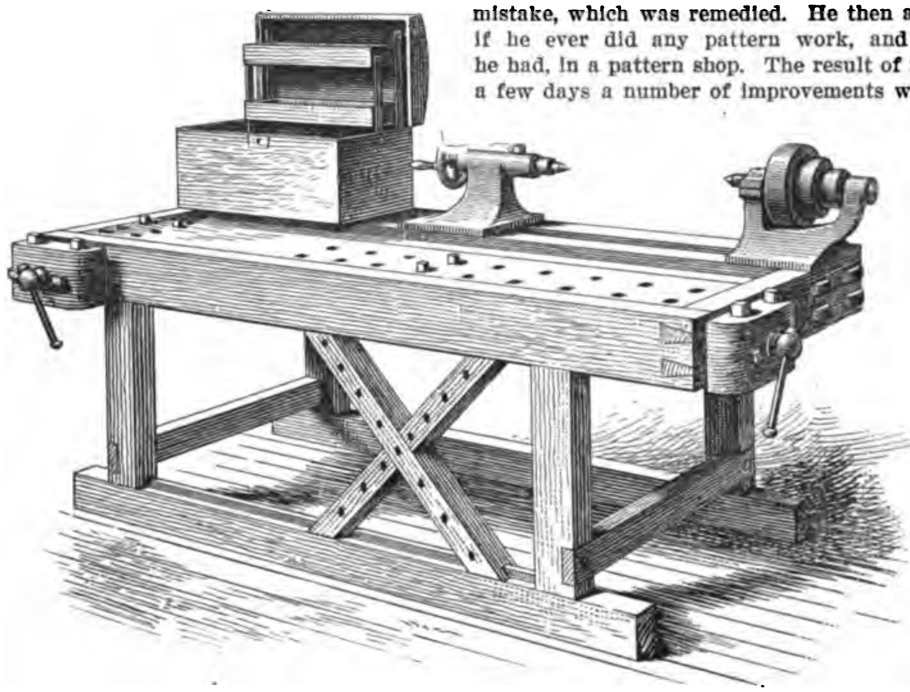


Fig. 13.—Patternmakers' Combined Lathe and Bench.

The Art of Wood Pattern Making.—II.

Being now in a place to use a good bench I designed and built the most convenient one I could devise. I found that the man in charge of woodworking machinery had plenty of spare time, so I gave him a bill of materials and details of a bench, most of which was gotten out of oak pieces thrown aside when getting out car stuff. I worked nearly four years on a 12-ft. lathe bed, and never recollect having to use the full length, so I decided to make an 8-ft. bed for this lathe, taking chances on patching out the bed should occasion require, rather than to occupy shop room with something seldom if ever needed. For the lathe bed there was selected a straight dry oak track tie 5 x 8 in. in cross section and 8 ft. in length. This I ripped in halves. The rest of the top frame was made of 2½ x 8 in. car stuff. This material was all dressed and framed by the machine man at odd times. For a top we picked good plank out of 1¾ x 8 car flooring material. The vises were 2¾ x 7 — 19½. I was not hampered in any way, so I made the very best throughout. The mortises and tenons were all machine made. I have never seen a lathe and bench which suited so well and is well worthy of illustration, a general view of it being shown in Fig. 13, with a sectional view of the high vise in Fig. 14.

The frame is painted a jet black and the top finished with shellac in the natural wood color. In the estimation of the writer, the possessor of such a bench and lathe is on the road to success in pattern making. The bench stops are square hardwood pins neatly fitted, so that a slight blow with a hammer will set them up or down. There are two to each vise and two for the bench. It will be noted that any shaped piece of lumber can be firmly held on the bench without scarring or bruising it, and is the only kind of a stop used by pattern makers of my acquaintance.

The next thing in order was a high vise. This was made of 3 x 6 oak timbers, the machine man cutting it out complete on a band saw in a very few minutes. It was made to fit between the guides of the vise and slotted from the bottom up to the bench screw. It can be removed almost instantly by simply taking out the pins A and B shown at the bottom in Fig. 14. This is one of the greatest conveniences I have ever seen and did not cost 25 cents actual outlay, as it was sawed out between jobs from a scrap that might have lain around for years or gone to the junk pile. It had no smoothing up from the band saw, but looks very pretty finished in black shellac varnish.

The tool box has the trays hung on parallel bars that lift out when the lid opens, thus placing every tool in the chest where hands can be laid upon it without moving anything. When through with the tools they can readily be placed in their proper position, and at night all that is necessary to do is to close the lid. The pattern maker's box should be either trunk shaped or the shape of a suitcase, as it can then be checked as ordinary baggage. A real good tool box for bench work is a great time saver. Cross sections through both of the shapes of boxes in question are presented in Figs. 15 and 16, these showing the arrangement of the trays and how lifted by raising the lid. I think the suitcase form the best, as a neat little box can be made which will yet carry a full sized steel square.

The pattern makers' tools are the tools of the cabinet maker, wood turner and wood carver, but for work in an ordinary locomotive or heavy machinery shop about all that would be absolutely necessary are half a dozen very fine high grade firmer chisels, nothing but the best is good enough, as much of the work required consists in paring across the grain of soft pine, which necessitates a perfect edge. There should also be a brace and bits which will bore a perfectly smooth hole, a good extension bit, bench planes, rabbet planes, three or four round bottom planes of various radii or a plane and bits of different radii with false bottoms to suit. I have seen several of these, but think the pattern maker made them himself on account of economy of space in the tool boxes. As this plane is one of the most convenient tools I have ever seen, and appears to have been devised especially for pattern makers' use, and as it is not for sale by the trade so far as I know, and not difficult to make, I illustrate its construction in Figs. 17 and 18. I will take up the method of making the pattern for the metal frame later on in the work where it most naturally belongs.

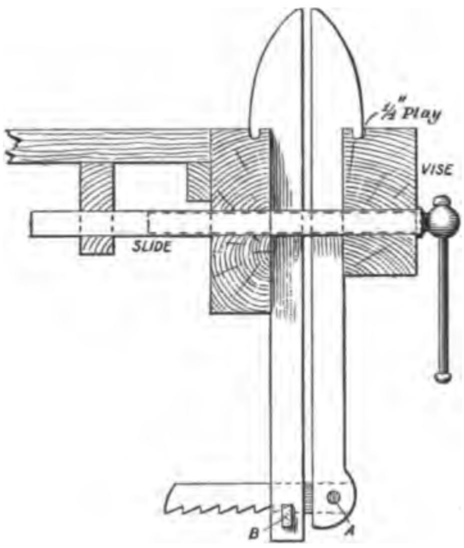


Fig. 14.—Sectional View of High Vise.

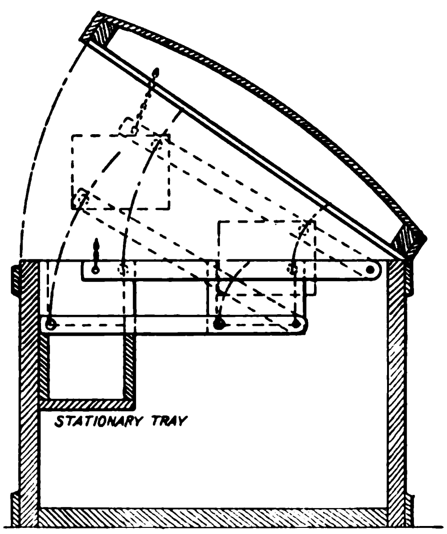


Fig. 15.—Cross Section of Trunk Shaped Tool Box.

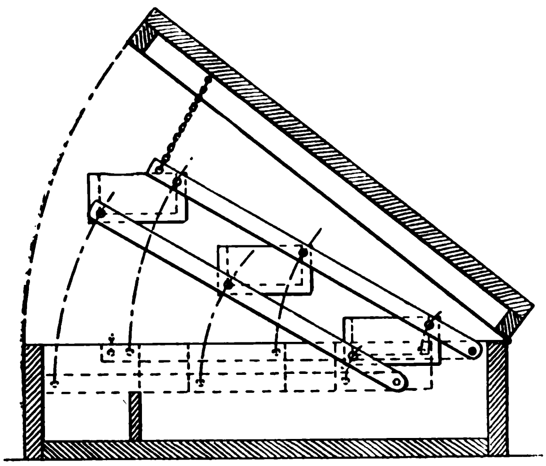
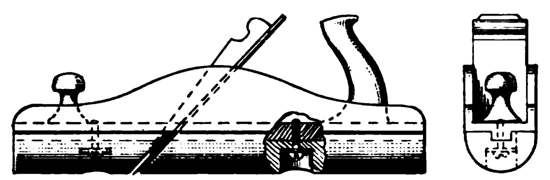
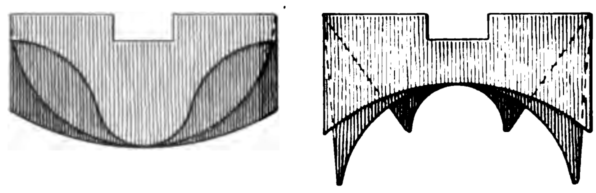


Fig. 16.—Cross Section of Suit Case Tool Box.



Figs. 17 and 18.—Patternmakers' Hollow and Round Plane.



Figs. 19 and 20.—Shapes for Plane Bottoms.

The Art of Wood Pattern Making.—II.

This plane works equally well, however, with a wood stock, using stout round head wood screws, as shown. The bottoms are grooved to snugly fit upon the tongue of the plane stock, and have key hole slots, so that by a turn of the screw the bottom is loosened, and can be slid forward and taken off. In Figs. 19 and 20 are shown some of the forms which may be attached. The bits are plain pieces of 3/32 x 1½ in. tool steel. It is an excellent plan to have a blank bit and bottom, properly fitted up, which can quickly be shaped for special work. Part of the lathe tools, such as turning gouges and plain paring wood turners' chisels, are for sale at most of the first-class hardware stores, the others are easily made if one can temper edge tools or find a man who can. I temper all my own heating to a cherry red. I dip in cold water and draw the temper down to just the point where the color begins to turn from yellow to blue. If the steel

wheel. A cross section of such an oil stone is represented in Fig. 25.

The greatest of all the tools, however, are the lathe and band saw, which are generally bought ready to run. However, the patternmaker will usually be obliged to manufacture his own screw center for small rosettes, core prints, &c., and large wood face plates to which to fasten the larger sizes of work. In addition to this the outside face plate should be fitted with a disk and spindle sander. (See Fig. 26.) This is an important addition to shop equipment, as upon the spindle sander all circular edges can be cleaned quickly and more perfectly than by hand. The draft can be put into a bolt hole or other small opening by simply boring a proper sized hole in the pattern and holding it a few seconds upon the tapered spindle. With the disk sander many patterns can be made up hurriedly with no draft, and the proper amount of draft put in by the way the work is held to the sandpaper.

I find a small grindstone with round or oval edge

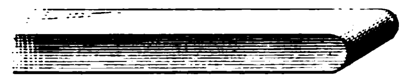


Fig. 21

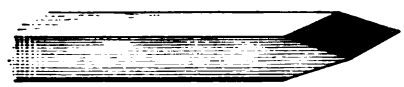


Fig. 22.

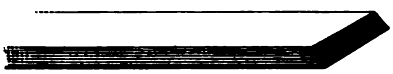


Fig. 23

Fig. 21.—Bull Nosed Chisel.
Fig. 22.—Diamond Pointed Chisel.
Fig. 23.—The Bending Tool.

Fig. 24

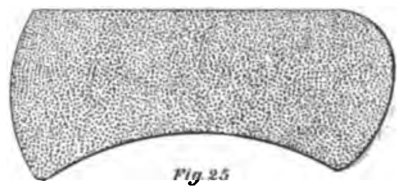


Fig. 25

Fig. 24.—The Parting Tool.
Fig. 25.—Cross Section of Oilstone.

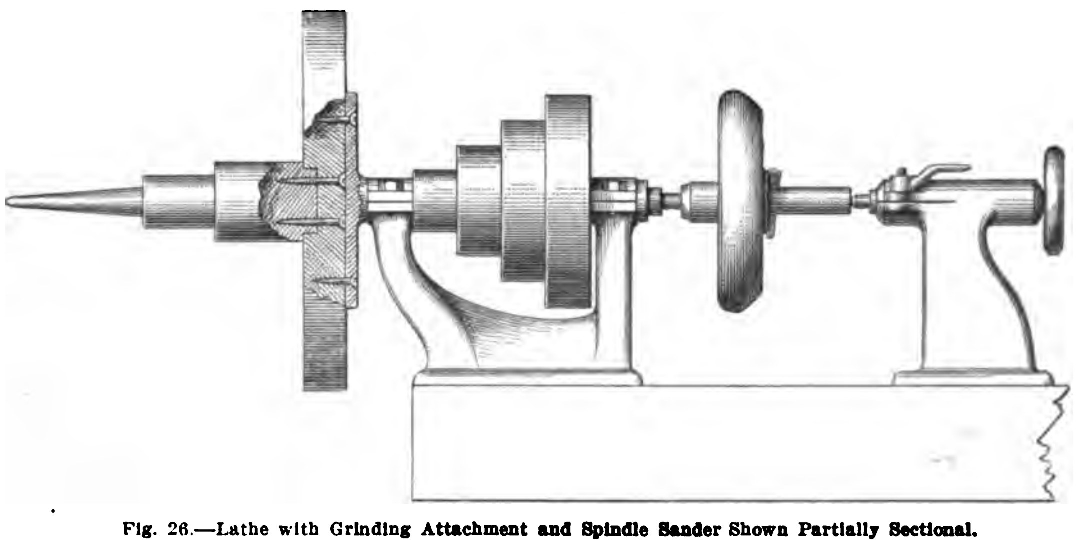


Fig. 26.—Lathe with Grinding Attachment and Spindle Sander Shown Partially Sectional.

The Art of Wood Pattern Making.—II.

is very high grade this may be drawn until the color is the same as a cock pigeon's breast. Two or three turners' gouges of different sizes will be plenty for most work. A large and a small paring chisel will be all that is required, the former being 1½ in. and the latter ¾ in. There should be one bull nosed chisel, such as that shown in Fig. 21; a diamond pointed chisel as indicated in Fig. 22; and beading tool, Fig. 23; and a parting tool, Fig. 24. With this outfit of lathe tools little difficulty will be experienced in doing any wood turning required in connection with ordinary work. Several firmer gouges should be provided, the ones which are beveled on the inside being the hardest to procure. These should be long and of very fine temper, as they are very important, so much so that they are usually called in the trade "pattern makers' gouges." If no more than three are used they should conform closely to the curves indicated in Fig. 20.

A very important tool is the oil stone. Slips of various shapes can be had at the hardware stores, but I prefer an oil stone which can be dressed up on the emery

hung upon a wooden spindle, and arranged to place between the spur and tail centers of the lathe a very great convenience for gouges and hollow plane bits. In the writer's opinion there is no place in the world where it pays better in dollars and cents to have every thing in order than a pattern shop.

SOME very rapid work has been performed in connection with the erection of a 12-story building which is being put up at Pacific avenue and Fifteenth street, Seattle, Wash., and which when completed will weigh, it is estimated, in the neighborhood of 600,000 tons. It is expected that the building will be finished within a period of 70 days. It is stated that 65 per cent. of the material used will be concrete and the remainder steel, there being no wood used. The walls on three sides of the building will be 14 in. thick and on the fourth side 13 in. thick, there being no windows on that side. The work is being done by the Western Engineering Company, of Seattle, Wash.

Carpentry and Building

WITH WHICH IS INCORPORATED
THE BUILDERS' EXCHANGE.

DAVID WILLIAMS COMPANY, - - PUBLISHER AND PROPRIETOR
14-16 PARK PLACE, NEW YORK.

(Entered at the New York Post-Office as Second-Class Mail Matter.)

FEBRUARY, 1908

The Contract Labor Laws,

A movement is on foot to amend the contract labor laws with the purpose of restricting their interpretation by more sharply defining their limitations. It is stated that there have been so-called abuses under the clause which permits the importation of skilled workmen if unemployed labor of a like class cannot be found in this country. It is contended that this proviso was originally embodied in the law with the intention of permitting the bringing of skilled labor from abroad under contract only to assist in the establishment of new industries, and the purpose of the movement referred to is so to amend the act that its interpretation shall be restricted to this very narrow limit. The law as it exists, while doubtless working toward the immediate welfare of one class of the industrial community, does not always operate without hardship to employers of labor, and indirectly to their employees. It permits, among other conditions, the existence of unions so hedged about by rules as to apprentices that the classes of labor included are so sparsely represented in the community that even a slight increase in industrial activity beyond the normal produces a serious scarcity of the workmen in question. The injury caused by such restrictions is not merely that the wages of men in the restricted trades are extraordinarily high, but that more, when needed, are not to be had at any price, as so few youths have been trained in those specialties. This is only one form of industrial handicap that has followed the enforcement of the contract labor law in its stricter meanings, or would follow if no latitude whatever were given the authorities in its operation. It could not have been the intention of those who drafted the contract labor law that it should restrict in any way the development of American industry. Probably the large majority of employers, with certain exceptions where private interests are benefited by the contract labor law, are of the opinion that Congress should incline toward loosening its application rather than toward tightening it. The argument is made that labor would be better served by placing no obstacles in the way of the immigration of specialized workmen, who would act not only as producers but as instructors, and whose utilization would promote the employment of many less skilled men.

Industrial Education in Elementary Schools.

Apropos of the comments which appeared recently in our editorial columns relative to industrial education in Massachusetts and the steps which were being taken by the Commission on Industrial Education looking to the actual establishment of schools of the character indicated, it is interesting to note the experiment which is about to be made in the city of Albany in connection with industrial education in the elementary schools. The Board of Education has committed itself to this idea and an initial appropriation has been made by the Board of Estimate with which to make a beginning in one of the schools of the city. The plan is to establish eventually several elementary industrial schools, with an industrial high school to crown the system. While it is a fact that manual training has for some years past had a place in the schools of Albany, the new plan is more fundamental and far-reaching and may be described as "manual training with an avocational purpose." The present educational system is planned in general with a view to preparation for high school and college entrance, the statistics showing that about two-thirds of the children drop out of the public schools at about the age of 14, beginning about the fifth grade before the end of the elementary period, and never reach even the high school. The figures show that in the enrollment for the present year there are about 1600 in the fourth grade, 1300 in the fifth, 1100 in the sixth, 700 in the seventh and 500 in the eighth. The school in which the experiment indicated is to be tried is already equipped with a shop. Woodworking is to be instituted first and eventually the equipment will be augmented by apparatus for metal working, molding, forging and casting. The courses in industrial training are to be elective to pupils 14 years old who have completed the fifth school-year. Mathematics, geography, history, science and English will be taught, as required by the development of the industrial work and from the point of view of the industries. While shop work for boys and the domestic arts for the girls will constitute the first industrial course to be introduced, these may be regarded as only the first step in a comprehensive programme covering all of the leading industries of that particular section of the country. The present progress of this experiment in preparing the youth for the industrial trades has been largely due to the persistent agitation of the subject, extending over a period of two years, led by Dr. J. DeBarks, principal of the Teachers' Training School.

Room Air Circulation.

Every little while an inquiry comes to hand which indicates that the writer has a very vague idea regarding the action of air delivered and exhausted from a room in connection with the heating system. That the problem is often a troublesome one can be attested by a good many experts who have found how perverse air can be; when inlets and outlets are placed in accordance with some preconceived notion of what will happen when the system is in operation; smoke tests of the actual installation, or the more exacting tests of occupants, prove much to the contrary. When it gets the chance freshly delivered air seems to have a preference for the ceilings or for the walls, and finally the floors, especially if the outlets are at the floor line, leaving an undisturbed stagnant central space in the room, and resulting in the draftiness accompanying the flow along a floor of air chilled by outside walls and windows. Ordinarily a heating system depending on a supply of hot air to accomplish the warming comprehends an inflow of air at a sufficiently high velocity, although this may not necessarily be great, and at a relatively high temperature, so that the air tends to reach the upper portions of the room. There, spreading out and being displaced by the continuous incoming supply of fresh air, it descnds in strata with a suggestion of current, defined principally by the location of the outlets, and finally reaching the lower levels of the rooms more or less laden with impurities and bereft of the heat transmitted through the walls and used in warming leakage air. Various modifications of this idea of circulation are applied, such as the attempt in schoolrooms to restrict the circulation of the fresh air to the breathing level of the pupils. If a multiplicity of inlets and outlet openings is permissible, the scheme of circulation can be very much varied, and of course more nearly positively controlled. The difficulty is that for commercial reasons the number of these openings must usually be minimized to the greatest extent. Discomfort from defective room air circulation usually asserts itself in draftiness, and if conditions are studied to obviate troubles of this nature much dissatisfaction can be prevented. So far as possible the effort should be to avoid a sweeping along the floor of relatively cool air, not that the draftiness is felt because of the cool air, but that air in motion at a given temperature seems cooler than air at the same temperature without motion. In churches troubles of this description are aggravated by the large windows and the relatively large roof surface. Wherever possible the sheets of cool air descending from the roof and along the outer walls should be counteracted by upward currents of hot air. It is out of the question to lay down general rules, for the proportions and size of the structure, and indeed the amount of money available, restrict the problem to no inconsiderable extent. If some of the fundamental considerations, however, are kept in mind complaints will be greatly lessened.

Meeting of Society for the Promotion of Industrial Education.

An important gathering of representative people interested in promoting industrial education and efficiency will be the meeting to be held at the Art Institute, Chicago, on January 23 to 25, inclusive, by the National Society for the Promotion of Industrial Education, of which Dr. Henry S. Pritchett of the Carnegie Foundation for the Advancement of Teaching is president, and C. R. Richards of Columbia University is secretary. The programme of the meeting, which has just been issued, indicates widespread interest in the subject of industrial education, the speakers being prominent in the industrial and educational world. Among them may be mentioned Hon. Carroll D. Wright, who will discuss "The Apprenticeship System as a Means of Promoting Industrial Efficiency"; President James W. Van Cleave of the National Association of Manufacturers, who will discuss "The Aims of the National Society for the Promotion of Industrial Education"; Wesley W. Miller, principal of the Pennsylvania School of Industrial Art, will speak on "The Necessity for Apprenticeships"; Theodore W. Robinson, first vice-president of the Illinois Steel Company, will discuss "Industrial Education as an Essential Factor in Our National Prosperity," and Hon. Horace E. Deemer, Justice of the Supreme Court of Iowa, will deal with "The Place of the Trade School in the Industrial Education"; Charles F. Perry, director of the Public School of Trades in Milwaukee, Wis., will speak on "The Trade School as a Part of the Public School System"; Dr. Graham Taylor, director of the Chicago Institute of Social Science, will give his views on "The Effect of Trade Schools on the Social Interests of the People"; Dr. H. S. Pritchett will address the meeting on "The Wage Earner's Benefit from Industrial Education"; M. W. Alexander, vice-president of the society, and connected with the General Electric Company at Lynn, Mass., will discuss "Methods of Promoting Industrial Education." Many other addresses will be made, and the subjects will be discussed by representatives of leading industries.

The annual meeting of the society will be held on the afternoon of January 25, when reports of the president, secretary and treasurer will be presented; officers will be elected for the ensuing year, resolutions will be passed, and general routine business transacted.

An exhibit of the work of the industrial schools of the country, organized by a local committee, will be shown in the exhibition hall of the Art Institute. Photographs, charts and specimens of work will be on view.

Chicago's New Type of School Building.

At a meeting held about the middle of December by the Building and Grounds Committee of the School Board of the city of Chicago, a new type of school building was finally adopted as the standard for elementary schools to be erected within the next two years. In place of the standard building of 26 rooms, accommodating an average of 1300 pupils, the new structure will have 40 rooms, each building including a kindergarten room and an assembly hall with a capacity ranging from 850 to 1000 persons.

The new type of schoolhouse will be built in three sections. There will be a central section of 20 rooms, containing the assembly hall and all the other rooms necessary for a complete school equipment, and two wings of 10 rooms each. The most radical feature of the new building will be the complete elimination of the basement. Toilet conveniences will be placed in "tower rooms" on each floor.

It is stated that the average cost per room of the new building will be $8000, as against $11,000 for the old type.

Officers of the Northwestern Cement Products Association

At the recent convention in Chicago of the Northwestern Cement Products Association, the following officers were elected for the ensuing year:

President, Martin T. Roche, St. Paul.

Vice Presidents: Lee Stover, Watertown, S. D.; O. A. P. Turner, Minneapolis; Henry E. Murphy, Manitowoc, Wis.; A. H. Laughlin, Lisbon, N. D.; O. U. Miracle, Minneapolis, Minn.

Secretary, J. C. Van Doorn, Minneapolis.

Treasurer, J. M. Hazen, Minneapolis.

The reports presented during the sessions of the convention showed the association to be in a most flourishing condition, both as regards finances and membership. The meeting occurred at the same time as the first annual cement show, held under the auspices of the Cement Products Exhibition Company, and in his report retiring Secretary Roche explained in detail the reasons for holding the meeting simultaneously with it.

Arbitration in the Local Building Trades.

The report of the General Arbitration Board of the Building Trades Employers' Association and the unions covering the year just brought to a close presents some rather interesting statistics. It shows that 433 labor disputes were settled under the arbitration plan, 133 by the secretary of the board, 49 by the General Arbitration Board as a body, four by special committees and 247 by the Executive Committee of the board, consisting of six employers and six union men.

There were comparatively few strikes and none of them was of unusual importance. There were 52 cases of violation of the arbitration agreement, principally on the part of independent employers, who are not under the arbitration plan. Most of them were won by the unions through the protection of the General Arbitration Board.

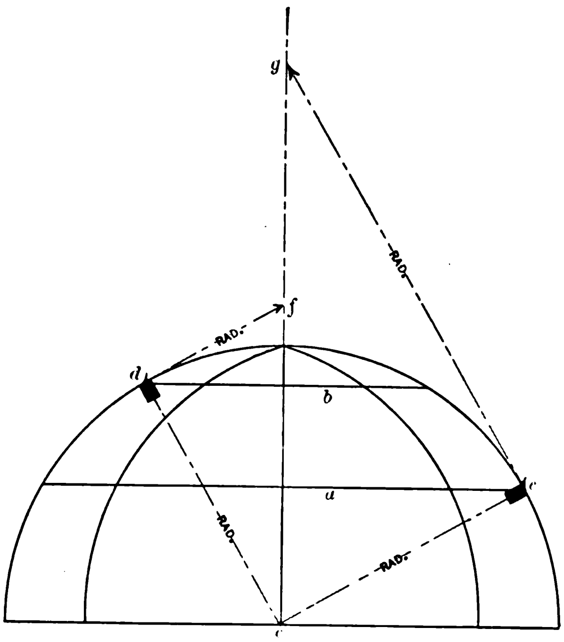
SOME time ago we referred in these columns to the moving of the old Montauk Theatre Building in Brooklyn to its new site, pointing out some of the more notable features in connection with the undertaking. The operation was completed on November 16, the work having required just three months to move the structure 300 ft.

CORRESPONDENCE.

IN connection with the reply to the inquiry of "S. C. P." relative to the "Design of a Truss for a Flat Roof," and published on page 23 of the January issue, the name of C. Powell Karr was inadvertently omitted at the end of the article.

Framing a Spherical Shaped Skylight.

From A. E., Hartford, Conn.—In the October issue of the paper I notice that a correspondent signing himself "F. F.," Berwick, Pa., presents a problem in the



Framing a Spherical Shaped Skylight.

framing of spherical shaped skylights, and as no answer appeared in the November issue, I wish to submit the following: In the accompanying diagram the bars *A* and *B* are shown to run horizontally between the vertical ribs, and their sides and edges should be worked to two different curves. First take the radius of the sphere, as *C D* or *C E*, and work the outer and inner edges to that curve. In order to find the radius of the other curve draw a tangent to the arch from the points where the bars are located, as *D* and *E*, extending it until it intersects with the center line of the sphere, as shown at *F* and *G*; then *E G* will be the radius for the lower and *D F* for the upper bar.

The bars may then be worked to the desired thickness and depth and shaped for the glass. This method may not be considered scientific, but it will be found to be near enough for most practical purposes.

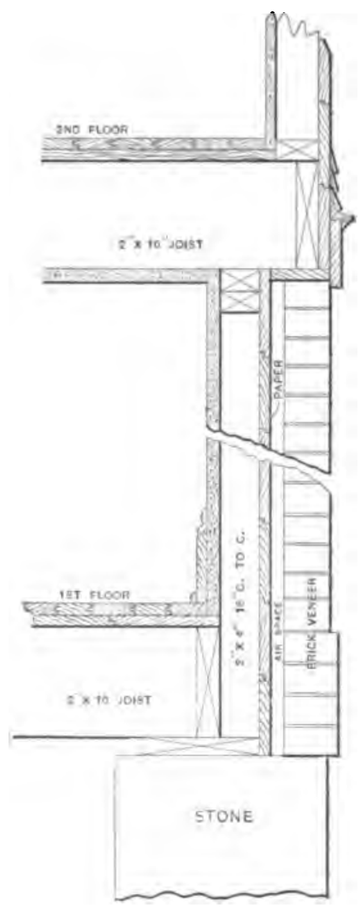
Brick Veneer for Residence Construction.

From A. S. O., Kansas City, Mo.—Some little time since the question came up as to the merits of brick veneer for residence construction, and while arguments have appeared pro and con, I desire to add my testimony to those who are of the opinion that dwellings constructed in this manner are entirely satisfactory in every way. At the outset I would state that the structural part of the house is entirely of wood frame work, the brickwork being merely an envelope around the first story, as our city ordinance prohibits any hight greater than 11 ft. If the walls are properly sheathed and papered and all connections made as they should be, with an air space between the brick veneer and the frame, the first story will be much warmer in winter and cooler in summer than where some other form of construction is employed. Of course the temperature of the second story will largely be governed by the temperature of the first story. The accompanying detail will, I think, clearly explain the manner of construction. A point, of course, to be considered is the fire risk, and concerning it I would state that the rate of insurance for brick veneer construction is about a medium between all frame and all brick structures.

Finding Side Cut of Valley Rafter in Roof of Unequal Pitch.

From Kese, Westover, Pa.—Through my carelessness I failed to give the correct figures for the cuts of valley rafters on a roof plan which you published for me in answer to a correspondent, and in the January issue "A. E.," Hartford, Conn., has called my attention to the error. I desire to thank "A. E." for his courtesy in the matter, and by way of explanation would say that in my hurry one evening to finish the sketch in season for the morning mail I carelessly filled in the figures which I now admit were wrong, but will endeavor to set the matter right. The figures I gave were for a roof where both gables are the same width.

These figures go with the roof plan in question. For



Brick Veneer for Residence Construction.

each foot run of common rafter on the main roof measure 16.97 in. on the rafter; total length, 15 ft. 6.67 in.

For every foot run of common rafter on the annex I measure 15½ in. on the rafters; total length, 117¼ in., nearly.

I find the seat of the valley rafter by first finding the lengths of the seats of the two common rafters to be 14 ft. 2.55 in. I then resolve this into inches as a basis and taking the rise of the roof in inches, 132 as a perpendicular, find the length of the valley to be 17 ft. 11.66 in. I then obtain the cuts of the valley rafter by dividing the seat or run of the valley in inches, 170.55, by the rise of the roof in feet, which is 11, this giving a cut of 12 x 15½ in., nearly, on the point and the reverse on the heel of the valley.

I drop the small fractional parts of inches that would not be practical to consider on the work.

Construction of a Carpenter's Hand Tool Box.

From C. D. G., Auburndale, Mass.—The request of some of the readers of the paper for descriptions of tool boxes suitable for carrying about easily by the carpenter or building mechanic leads me to think that a device I am using may be of interest to others. It is often necessary to carry a few tools from place to place on the cars or in the hands where a small, neat box is wanted. We all know that while there is nothing better than a "hand box" on the job, it is a most awkward thing to carry from one place to another, besides there is no way of protecting the tools left in it at night. My box embraces these two qualifications, and incidentally just fills the space between the saw racks and tills in my tool chest when moving the whole rig.

The box, Fig. 1, is about 8 x 8 x 30 in. when closed, and opens in two equal halves, as clearly shown in Fig. 2 of the illustrations. It is provided with a lock and handle for carrying, these, however, not being shown in the drawing. To make the "hand box" I arrange the handle as indicated in Fig. 3. Two strips of sheet metal are bent as there indicated, and the lower end slipped between the halves of the box when partially open. It may be necessary to make some notches to get room if the hinges work close. The other end of the strip is inserted in the round handle, as clearly indicated in Fig. 3 by boring a hole about 2 in. deep and cutting out a kerf on the lower side. Two pieces of the shape shown in Fig. 2 are made and slipped in position as shown, these being made to strain the strip tight.

These pieces should be of ⅞-in. stuff, which will not easily split. A small hole bored through the top of these pieces into the handle and a nail inserted—not shown in the sketch—will make everything rigid, yet it is but the work of a moment to change from one rig to the other.

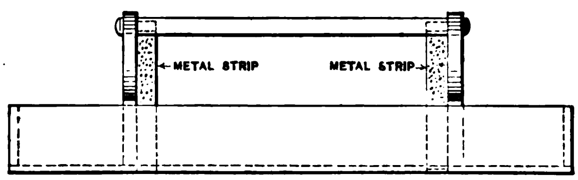


Fig. 1.—View of the Box.

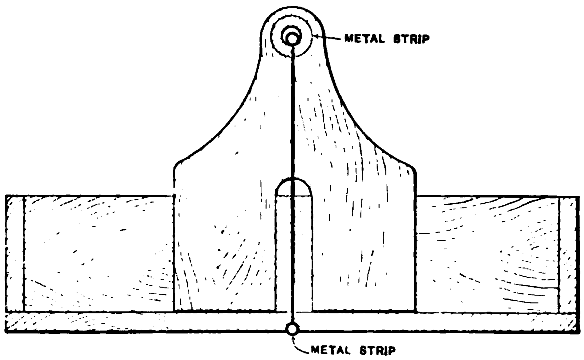


Fig. 2.—The Box as It Appears When Open.

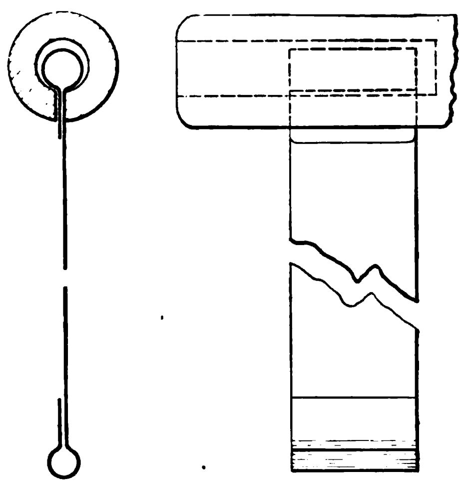


Fig. 3.—Details of Handle and Strip.

Construction of a Carpenter's Hand Tool Box.

Ventilation of a School House.

From T. H., *Pennsylvania*.—I wish to submit a matter to the patrons of the paper, and would like to have a free and open unbiased opinion on a system of heating and ventilation in a 14-room school building. I will not mention the name of the parties who constructed it from their own plans.

The building consists of 14 schoolrooms. I will deal with only one-half, both parts being alike. The building is of three stories and basement. There are three rooms on each of the first and second stories and a large assembly room on the third floor. The building is heated by six large furnaces. Of the coal consumption I will not say. It is of the ventilation I want to speak of most particularly, as it is a well established fact that without a good air circulation in an indirect heating system there cannot be a proper heating, and the coal bins must be more heavily drawn on to make up the deficiency.

Now as to the ventilation. The partitions between the rooms are of brick. A wall built outside of the partition wall and a space of 8 in. is left between the two walls. The walls are punctured and registers placed therein. The air is taken into this space and conveyed down to the ceiling in the basement and conveyed from the wall to a ventilating stack at a point about 2 ft. *above* a small stack heater holding about 1 bushel of coal. The stack on the plan shows an opening of 6 ft. 4 x 4 ft. 2 in. A chimney flue takes out in one corner a space of 20 x 24 in. The ceilings of two upper rooms are probably within 15 ft. of the top of the stack.

I should have said two of the rooms adjoin the assembly hall. The assembly hall, on the third floor, is ventilated by puncturing the *stack* and placing a register therein on the floor line, as is the case in all other ventilating registers, and possibly 25 ft. from the top of the stack. I would like to have a thorough, unbiased opinion and advice as to how it can be somewhat improved. I have given an opinion, which I will not state, believing that my opinion will be sustained. If not I will stand the criticism here and learn something.

What might be well expected on a zero day, under conditions mentioned? A number of opinions would be instructive.

Barrel Used as a Septic Tank.

From M. D. H., Mt. Vernon, Ill.—I have been a reader of *Carpentry and Building* for a number of years, and wish to say that it is the best paper in every way I have ever taken. I have subscribed to a number of other journals, but usually stop them at the end of the year on account of their not giving the satisfaction I desire.

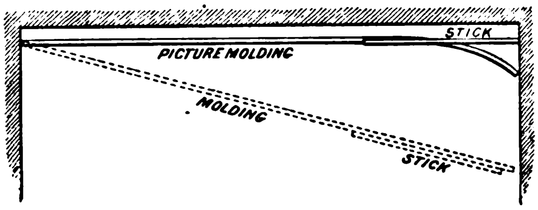
I would like to have "C. A. R.," Corning, Cal., furnish, with full descriptive particulars, a picture of the 50-gal. barrel referred to on page 388 of the December issue of *Carpentry and Building*, and which he employed as a septic tank. I am greatly interested in this particular matter, and I have no doubt that what he might have to say regarding his use of barrels for septic tanks would be welcomed by many others other than myself.

Design Wanted for Four-Family Flat-House.

From H. G., Walkerville, Mont.—Please publish a design for a four-family flat house arranged with three rooms to a family and adapted for a lot not to exceed 45 ft. in width by 86 ft. in depth. I want wall beds in the four front rooms. The kitchens to be furnished with gas ranges only, small compact pantries with tables, shelves and bins, bathrooms and all modern conveniences.

The building should be heated with furnace in the basement. There should also be a set of two-part laundry tubs, with hot and cold water; also a small room finished off in the front of the basement.

The front entrance to the building should open into a common reception hall, with a stairway leading to the upper floors. There should also be a flight of stairs leading to the upper floors at the back of the house. The house should be of frame construction, with cement basement, and well lighted throughout.



Ascertaining Correct Length of a Molding.

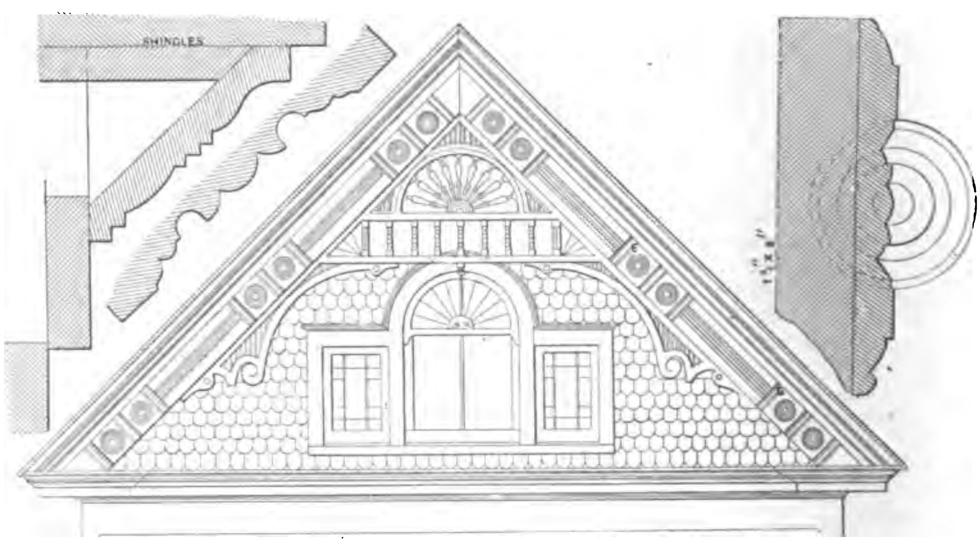
Note.—We shall be glad to have our architectural friends furnish for publication designs of flat houses meeting the above requirements.

Ascertaining Correct Length of a Molding.

From J. J. P., Cleveland, Ohio.—In nailing on picture mold, base mold, carpet strip, &c., the carpenter often finds the piece he is nailing too long, and in reducing it to a suitable length he sometimes cuts it three or four times, fearing he will make it too short, which he occasionally does. Here is a quick method of determining the exact amount to cut off: Hold the molding flat against the wall as near as can be to the corner you want to fit. Then set a suitable stick or rule against the corner and mark the opposite end on the molding, as indicated in the upper part of the accompanying sketch. Now swing the molding away from the wall until the long end is free, as indicated by the dotted lines. Set the stick to the mark and that part of the molding which projects beyond the stick is the portion to be cut off.

Details of Gable Finish.

From J. F. W., Danville, Pa.—I send herewith a blue print of a front gable with a few details, which may prove of interest to some of the many readers of *Carpentry and Building.* The details at the right and left of the elevation are to a scale of 3 in. to the foot, or one-quarter full size. Referring to the drawing, the detail at the extreme left is a section through the gable cornice, while the section at the right of it is a detail of one of the spindles directly over the central window in the gable. The detail at the extreme right of the drawing is of one of the circular blogks as E, running up on either side, and of which 12 are shown in the illustration. The drawings so clearly show the general construction employed that extended comment would seem to be un-necessary.


Details of Gable Fnish.—Scale of Elevation, ¼ In. to the Foot.—Details, 3 In. to the Foot.

Some Questions For Discussion.

From J. S., Pittsburgh, Pa.—I have been a reader of *Carpentry and Building* for six years and now wish to submit the following questions for answer through the Correspondence columns of your valuable paper. Is there any chemical that will turn galvanized iron green, the same as old copper or bronze, without injuring the metal in any way? Will wood coated with sand, same as galvanized iron is sanded, be subject to rot sooner than if painted in the regular way?

I would like to see an article in the columns in regard to the installation of speaking tubes and electric annunciators for apartments.

I trust that my brother wood butchers will respond in their usual prompt manner.

A Reader's "Opinion of Carpentry and Building."

From C. F. D., Lead, S. D.—I have taken *Carpentry and Building* for the past 20 years and consider it the best and only publication of its kind issued at the present day. I have taken a great many different kinds of publications issued in the interest of carpenters and contractors, but consider this the best of all. I have had single numbers that have saved me many times the price of the yearly subscription.

Veneered versus Solid Doors.

From W. F. S., Hermitage, Tenn.—Will some of the readers of *Carpentry and Building* kindly tell me through the Correspondence Department if a veneered door is better than a solid one for outside use? I want some oak doors for a church entrance, each of the double doors to be 2 x 8 ft. and 2¼ in. thick. Any light which experienced readers can throw on the subject will be greatly appreciated.

Matched Sheathing Boards for Tin Roofing.

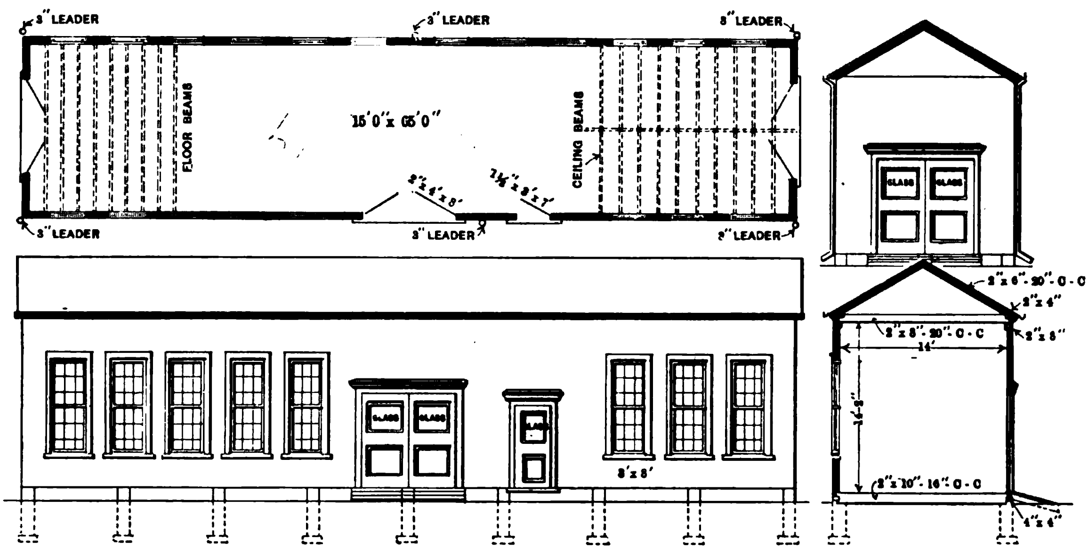
From C. J. A., Penn Yan, N. Y.—In the October issue there was an inquiry from "H. & B.," regarding the advisability of using matched sheathing in connection with tin roofing. Without regard as to whether or not it is desirable to have openings in the sheathing to allow a chance for any moisture that there might be to escape, would say that where the region is one that may have some pretty heavy hailstorms, matched sheathing has shown itself to be of considerable value. Where tin is placed on boards which have some spacing between them, the tin is driven into the wide cracks by the hail, sometimes to such an extent that the sheets are pulled out of the seams. There are a large number of tin roofs in this vicinity which have been laid on matched sheathing, and with careful watch to have the roofs painted whenever necessary, have lasted for a good number of years. If properly laid in the beginning, it does not seem that there should be any need for making provisions for drying the tin out, so to speak, on the under side.

Design for a Workshop.

From E. R. H.. Elmira, N. Y.—Will some interested reader kindly tell me through the Correspondence columns if the following data is correct or suitable for a workshop 65 ft. long and 15 ft. wide, coated with cement mortar on the exterior and no plastering on the inside; neither is there any ceiling? Will sills 4 x 6 in., resting on brick pillars 8 ft. apart, using 2 x 4 for the framing studs and 2 x 8 for the floor joists, serve the purpose? Will 15 ft. be too wide apart for this size of joist? The ceiling joists are 2 x 4 and the rafters are of the same dimensions.

Answer.—In a workshop of the dimensions above given and finished as stated the cement should be applied to wire lath attached to 2 x 4 studs placed 16 in. on centers. The roof may be of tin nailed to hemlock sheathing boards resting on 2 x 6 in. rafters placed 20 in. on centers or 2 x 4 placed 16 in. on centers. The plate should be 2 x 4 in. Since there is to be no plastering, but the interior sealed with ⅝-in. boarding, the ceiling beams should be 2 x 8 in., placed 20 in. on centers.

The floor beams to be 2 x 10 in., placed 16 in. on centers, will each carry 1120 lb., or a load of $\frac{1120}{15 \times 1\ 1\text{-}3}$ = 56 lb. per square foot of floor surface if uniformly distributed.



Design for a Work Shop.

If a heavier load than the above is to be carried a girder or stringer should be placed along the center or longitudinal axis of the building, in which case the load may be increased to 112 lb. per square foot.

The girders would then have to carry 8 × 7½ × 112 lb. = 6700 lb.

A girder 8 ft. span, 10 in. deep and 1 in. wide would safely carry a load of 1040 lb., and to carry 6700 lb. the width would have to be $\frac{6700}{1040}$ = 6.4, but as the longest commercial size is 8 x 10 in., we would use an 8 x 10 girder, the capacity of which for the span given is 8320 lb., which will allow a safe margin for cutting and framing. The bars may be of concrete, with footings as shown in the sketches presented herewith. C. POWELL KARR.

Concrete on the Farm,

Much that is of suggestive value to farmers and others residing in the rural districts who desire to be up to date in their construction work is contained in an article contributed to an exchange by Frank L. Risley. We quote as follows:

"Cement is an excellent material for the farmer who wishes to construct good, durable and modern structures in a lasting manner—such as foundations, steps, watering troughs, chimney caps, cisterns, well curbs, root cellars, box stalls, culverts and silos. I have so many useful and ideal structures made from it on my place that I believe nothing is better or more practical.

"To make a hog pen, excavate a trench first, about the exact size desired for the finished pen, 1 ft. wide and below frost. Fill it with concrete—4 parts clean, coarse sand and 8 parts broken stone. On top of this foundation build a wall 4 in. thick and 4 ft. high—proportions of cement, 3 parts clean, coarse sand, 6 parts broken stone—we used small pebbles from a brook and they gave perfect satisfaction.

"While arranging this building it is desirable and easy to make troughs. A bottomless box 6 ft. long, 12 in. broad and 12 in. deep is about the right size. From a 2-in. plank saw out two triangles with a base 12 in. and a hight of 8 in. Put them 5½ ft. apart, nailing a plank 1 in. in thickness on each side of the triangle.

"Place the inverted V-shaped trough made inside the bottomless box, placing small triangular strips all around the edges to make a square edge. Fill in the space left with concrete—1 part cement and 3 parts clean sand or sandy gravel. Pound down hard, evenly and smooth to the top edge of the box. Allow all to dry. In about one week or possibly less time remove other forms and paint over with pure cement of a cream thickness, turn blocks over, remove inner form and paint inside.

"If a round bottom trough is more desirable, make an inner form a log by sawing it the right length, removing all the bark and splitting it in half. Put this in the bottomless box as previously described, flat side down, grease thoroughly and work along as with the triangular trough above described.

"A chicken house may be made proof against weasels, rats and skunks by using cement."

Some Comments on Shortleaf Pine.

Shortleaf pine, used extensively for structural, finishing and building material, is found in pure and mixed stands from Staten Island, N. Y., southward to northern Florida, and southeast to the Appalachian States to northeast Texas, over southern Missouri and Kentucky and central West Virginia. The densest stands of this timber occur in southwest Arkansas and the adjacent territories of neighboring States. Northern Arkansas, southern Missouri, northeast Mississippi and northern Alabama also contain heavy stands.

Timbers of this species of pine generally contain considerable sapwood which decreases their durability when used in exposed structures. The presence of sapwood, however, facilitates their efficient treatment with creosote and other preservatives, and with the development of wood preservation the utilization of shortleaf pine for structural timbers will probably increase.

The material upon which the following tests were made was furnished by the leading shortleaf pine manufacturers in Arkansas, and was cut about 15 miles south of Malvern, Ark. The material reached the laboratory at Purdue University, Lafayette, Ind., in a green condition and was tested while thoroughly green. The bending tests were made on pieces ranging in size from 8 in. x 12 in. x 16 ft. to 8 in. x 16 in. x 16 ft.

The modulus of rupture and the modulus of elasticity quoted in the following table are factors which represent, respectively, the total breaking strength and the stiffness of the material:

STRENGTH OF GREEN SHORTLEAF PINE.

48 bending tests on select and merchantable grades.
Sizes 8 x 16 in., 8 x 14 in., 8 x 12 in.—16 ft. long.

	Aver.	Max.	Min.	Average highest 10 per ct.	Average lowest 10 per ct.
Rings per inch.....	12.0	23.0	7.0	10.8	7.5
Weight per cubic foot in pounds:					
Green	44.9	60.2	35.5	55.1	37.0
Oven dry.......	30.6	37.2	24.9	35.7	26.1
Modulus of rupture, pounds per square inch	5,550	7,730	4.050	7,274	4,254
Modulus of elasticity, 1,000 lb. per square inch	1,470	2,069	1,041	1,917	1,121
Horizontal shearing stress at maximum load, pounds per square inch......	313	450	204	413	221
Number of shear failures	11	...	...	2	2

143 tests in compression parallel to grain.
Sizes 6 x 6 x 24 in. and 5 x 8 x 24 in.

	Aver.	Max.	Min.	Average highest 10 per ct.	Average lowest 10 per ct.
Crushing strength at maximum load, pounds per square inch	3,435	4,950	2,150	4,354	2,488

The large number of beams failing in horizontal shear emphasizes the importance of considering this factor in design. Of the 17 select beams, 8 failed in horizontal shear and of the 31 merchantable beams 3 failed in the same manner. The beams failing in shear showed no checks or shakes before testing, and in both grades developed about the same strength values as the beams not failing in shear.

The green weight per cubic foot of shortleaf pine varies from 35.5 lb. to 60 lb. with an average of about 45 lb. The oven dry weight (dried at 212 degrees F.) per cubic foot varies from about 24 lb. to 37 lb., with an average of about 30.6 lb.

Other tests of large sized timbers by the Forest Service may be found in circular 115, "Second Progress Report on the Strength of Structural Timber." The shortleaf pine with a modulus of rupture of 5550 lb. per square inch is practically equal to loblolly pine, with a modulus of rupture of 5580 lb. Shortleaf pine is, however, not as variable in characteristics of growth and structure as loblolly. Shortleaf and loblolly are both inferior in strength to longleaf pine, whose modulus of rupture is 7160 lb. per square inch for partially air dried material. The strength of shortleaf is about 85 per cent. of that of Douglas fir. Eastern tamarack is about 20 per cent. weaker than shortleaf, and Norway pine about 30 per cent. weaker. All these comparisons, except for longleaf pine, are based upon large timbers of commercial grades tested green.

Comparative Cost of Frame and Brick Construction.

In the every day practice of the contracting builder he is frequently confronted with the question as to the relative cost of frame and brick construction, and with a view to throwing some definite light upon this particular phase of the building question, we present herewith figures furnished by an experienced contractor in the city of Minneapolis, Minn., which are likely to prove of unusual interest just at this time. The figures indicate the comparative cost of frame construction, brick veneer construction and solid brick construction in the average residence under prices and conditions as they now prevail in the city named:

FRAME CONSTRUCTION.

Per yard of wall:	
Plastering	$0.24
Lumber—18 ft., 2½ cents	.45
Siding—12 ft., 3½ cents	.42
Painting, per yard, two coats	.17
Paper, per yard, put on	.03
Back plastering	.20
Total, per yard measure	$1.51

BRICK VENEER CONSTRUCTION.

Per yard of wall, using face brick costing $18 per thousand.	
Plastering	$0.24
Lumber—18 ft., 2½ cents	.45
Paper, per yard, put on	.03
63 face brick, at 3 cents	1.89
Total, per yard measure	$2.61

The above does not take into consideration the cut stone item, says the *Journal of Modern Construction*. It is customary to use cut stone for windows and door sills, at least, and often for window caps, though big arches can be used. The cost of stone varies in different localities and usually runs from $1 to $2 per lineal foot, depending upon the amount of cutting and the kind of stone specified, &c.

SOLID BRICK CONSTRUCTION.

63 pressed brick	$1.89
126 common brick at $10 M	1.26
Furring walls	.06
Plastering	.24
Total, per yard measure	$3.45

The above estimate, as in the case of veneer construction, does not include cut stone item, which is relatively the same as in veneer construction. In addition to the door and window sills and caps, the water table, at least, should generally be of stone. This can be but the one course laid just above grade line, or it can be on top of the foundation wall, which is more satisfactory and permanent to be of stone than of brick. It is also quite desirable, in a brick house especially, to use more or less stone work about the porches, at least for the underpinning, &c., so that these items will have to be figured on as an addition in estimating the cost of a brick residence over that of a frame structure.

It must not be considered that the total cost between these different forms of construction is the relative percentage of difference worked out by the above quotations, for it must be remembered that the figuring covers only the wall construction, and that is the item where all the increase takes place. The interior of the house, all the finishing—plaster, woodwork, doors, windows, staircases, fittings and the floor construction—are the same, and, striking a general average, one would say that brick veneer construction will cost about 25 per cent. more, on the total cost, than frame construction, and solid brick construction about 40 per cent. more on the total cost.

Lumber Production in 1906.

According to the figures contained in the United States Forest Service circular No. 122, the lumber production of the United States in 1906 was 37,550,736,000 ft., with a mill value of $621,151,388, the largest quantity ever reported for a single year, and by far the greatest value. In addition there were produced 11,858,260,000 shingles, valued at $24,154,555, and 3,812,807,000 lath, valued at $11,490,570. The total value of the lumber, lath and shingle production reported in 1906 was thus $656,796,513. Making a fair allowance for incomplete reports, it is safe to say that at present the annual lumber cut of the United States approximates 40,000,000,000 ft., and that the total mill value of the lumber, lath and shingles annually produced is not less than $700,000,000.

AT the second annual meeting of the National Veneer and Panel Manufacturers' Association, held in Chicago in December, the following officers were elected for the ensuing year: President, Burdis Anderson; first vice-president, J. A. Underwood; second vice-president, D. W. Williamson; third vice-president, L. P. Groffman, and secretary and treasurer, E. H. Defebaugh.

ELEMENTARY PERSPECTIVE DRAWING.—VI.

By George W. Kittredge.

The application of the operations illustrated in Fig. 9 to the representation of cylindrical objects in perspective is but a short step, if what has been said relative to those operations is perfectly understood. If, for instance, a circular tower is to be drawn, it is necessary to first locate the hight of the planes of the several circles included in the design, such planes being considered for the time being, as horizontal squares, and then to inscribe within each square the required curve, or as much of it as would be visible in the finished structure. In putting the squares in perspective, the positions of the vanishing points become of first importance. So far as the representation of the circles is concerned, one point quarter of a circle back of X E, and drawn from the same center, X, but not shown in the plan, to meet the receding side of the building, shown by X G of the perspective plan. An inspection of the elevation will show that the widest part of the tower is the porch cornice, which is represented in the plan by the semi-circle E K E¹. About this, for the purposes of perspective, is drawn the half square E J L E¹. In putting a rectangular subject into perspective, it is most convenient to bring its near corner against the picture plane as has been already explained. Since the tower itself has no plane surfaces or angles, it may be considered at first as being rectangular, the half square just mentioned being

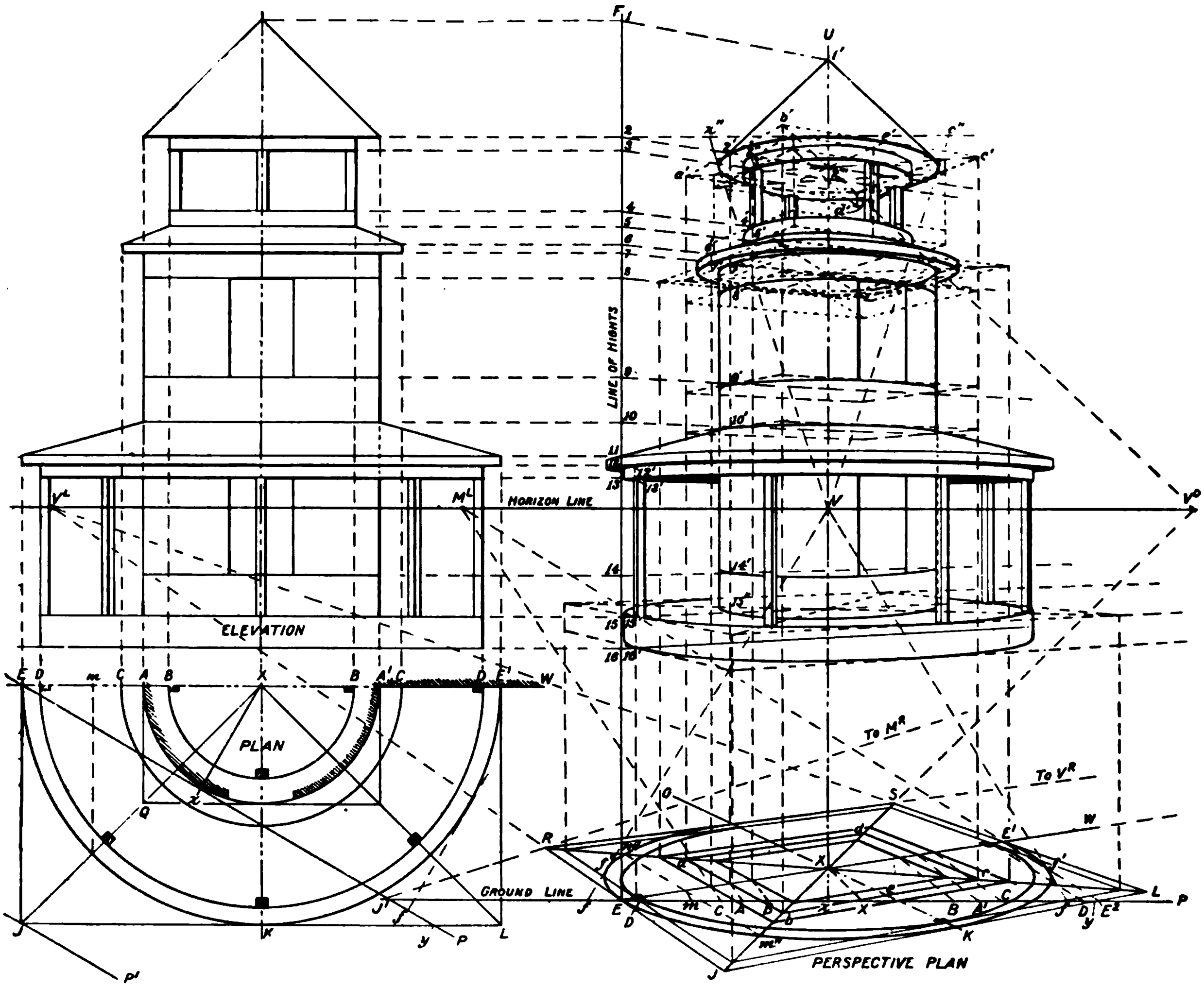


Fig. 12.—Perspective of Cylindrical Tower as Part of Another Structure.

Elementary Perspective Drawing.—VI.

of view will produce the same result as another, provided the tower is placed opposite the point of sight, or nearly so, as has been shown in Fig. 9; but since a tower is usually designed as part of another structure, the squares should be so drawn as to vanish to the same points as the sides of the rectangular part of the building. Should the tower then be located otherwise than in the center of the field of view, this method will bring all of the circles into proper and corresponding perspective, which, as has been hinted, will be somewhat different from what it would be if the subject occupies the center of the picture.

As a subject for treatment, we show in the left side of Fig. 12 the elevation of a round tower in a simplified form, and below it a half plan, in which the line A¹ W may represent a portion of the front wall of the building of which the tower is a part. The plan of all that portion of the tower except that of the upper part, which is completely circular, may be supposed to contain three-quarters of a circle that is to extend through another its plan. In that case the picture plane can be drawn through one of the near corners, as J, at the desired angle, as shown by J P¹, just as though J L and J E were the plan of two sides of a square tower. Any other point, as Q, the corner of the square drawn about the circle A A¹, which represents the body of the tower, can just as well be assumed for that purpose. With any such point assumed as a starting point, the student should be able by the method explained in connection with Fig. 6, to locate the several squares within which the circles are to be drawn, and then to draw those circles, that is, their representations, in the manner illustrated in Fig. 9. Since, however, the line E E¹, one of the center lines of the plan, represents a plane which is a continuation of the front wall of the main building of which the tower is a part, it will be found advantageous and quite as simple to select this as a suitable working plane upon which to locate the widths and hights of the various parts of the tower. Through one of the points

E or E^1, the line of the picture plane may therefore be drawn across the plane as shown by E P at the desired angle, after which the point of sight may be fixed and the vanishing points and measuring points located in the usual way. In the present instance the point of sight may be supposed to be assumed at a point exactly opposite the center or axis of the tower, therefore from X, draw a line at right angles to E P locating the point *x*, when, after fixing the hight of the horizon, we are ready to begin the perspective drawing.

Draw first the ground line of the perspective plan as far below the horizon line as convenient, and at any convenient position, and crossing the same draw a vertical line, *x* U, representing the axis of the tower. To the left of this axial line, at a distance equal to E *x* of the plan, locate upon the ground line the point E of the perspective plan, from which point draw the line E W toward V^R, representing the bottom line of the working or central plane of the tower. Next set off on the ground line, from E to the right, all of the distances between the points on E E^1 of the orthographic plan, as shown by corresponding letters between E and E^2. From these points lines are now carried toward toward M^L to cut E E^1, as shown, on which line, though not shown for

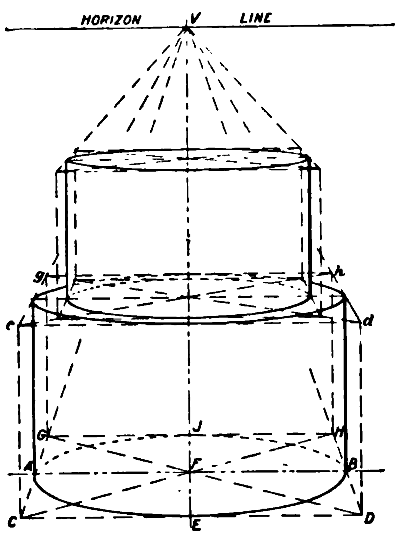


Fig. 13.—Simplified Method, Applicable to Cylindrical Object in Isolated Position.

Elementary Perspective Drawing.—VI.

lack of space, they may be known by the same letters as on E E^1.

In distinguishing between the two plans in Fig. 12, that at the left is properly termed the orthographic plan, while the one at the right is the perspective plan, and the several points in the one are designated by corresponding letters in the other. By this method any point in either plan can be located in the other, and the drawings are thus made in a great measure self-explanatory. Now set off from E to the left on the ground line, a distance equal to E J of the orthographic plan, as shown by E J^1, and from J^1 draw a line toward M^R to meet a line drawn through E toward V^L. This intersection, R, locates one of the points of the large square not shown in the first plan, it being back of the central or so-called working plane. A line drawn from R toward V^R, to meet a line from E^1 drawn toward V^L, will locate the farthest point, S, of the large square. Having now the further half of the large square and its central point X, we have only to draw the diagonal S X and continue it forward to meet the line R E, also extended forward at J. This locates the nearest corner of the square J in the perspective plan, after which the point L is obtained without difficulty.

Another method of obtaining this square in perspective without the use of the point J^1 suggests itself, which is perhaps more simple than the foregoing. Since the line E P of the orthographic plan represents the picture plane, the position of any points or intersections which may occur thereon may be transferred by measurement from E directly to the ground line; therefore, its intersection with J L at *y* may be located upon the ground line, as shown at *y* of the perspective plan, through which point a line can be drawn from V^R to meet at J a line drawn from V^L drawn through E. This gives the point J, from which the diagonal may be drawn through X and extended to meet at S the line from E^1 to V^L. From the points thus obtained the remainder of the square can be easily drawn.

If the other diagonal R L be now drawn we have the means of obtaining quite easily the plans of the several squares to be used in delineating the other or inner circles. Through the several points D, C, A and B on both sides of X, previously obtained on E E^1, lines can now be drawn toward V^L to intersect the diagonals, both forward and back of E E^1, shown in one case by *a b* and *d c*, after which the corresponding intersections on the two diagonals may be connected by lines drawn toward V^R in both the near and the farther halves of the plan, all as shown, *a d* and *b c* being one pair, thus giving in the perspective plan, the squares within which can subsequently be inscribed the curves representing all of the circles shown in the center of the orthographic plan.

Having got into our perspective plan all of the squares necessary for the various circles in the view, we have now to lift each one, as it were, to its proper hight above or below the horizon line. These several hights will, of course, be derived from the elevation either by measurement or by projection, as shown in Fig. 12. Therefore, from E of the plan, which represents the intersection of the working plane with the picture plane, erect a perpendicular as shown by E F, upon which set off the hights of the several planes in which circles are to be represented as shown by the figures 2 to 16, and from each point thus obtained draw a line toward V^R, cutting the axial line X U of the tower. Each of these lines will represent one of the center lines of a circle, or its inclosing square in the perspective—that is, a line exactly above E E^1 of the plan. Lines erected now from points D, C, A and B on E E^1 of the plan to cut the lines 2 to 16 just drawn, as shown by 2′, 2″, 3′, 4′, &c., will then give one side of each square at its point of tangency with the required circle. The other center lines of the squares (those transverse to the ones drawn from points on E F) may now be drawn through the intersections just obtained on X U, toward the other vanishing point, V^L. Lines drawn through the points 2′, 2″, 3′, &c., toward V^L will give one side, respectively, of each square, which sides can be terminated by lines brought up from the angles of the corresponding square of the plan, all as shown.

The design of the tower has been simplified to the extent that the three inner circles of the plan represent in that view all the circles indicated in the body of the tower in the elevation, while the two outer circles represent all of those in the portico, the entire number indicated being 19, which are designated in the perspective by the figures 2′, 2″, 3′, 4′, &c., to 16′. In constructing the perspective plan it is not necessary to draw therein the circles shown upon the orthographic plan, the perspective plan being constructed only as a matter of convenience and accuracy, as explained in connection with Fig. 9. The square indicated in the plan by A A^1 on E E^1 incloses an imaginary circle, which represents at once the extreme projection of the conical roof at the top, of which the line beginning at 2 on E F is the center line, and the several circles in the body of the tower, whose center lines are indicated by the figures 7, 8, 9, 10, 14 and 15. A line from A on E E^1 of the plan is therefore erected to cut lines drawn from the several numbers mentioned on E F, as shown at 2′, 7′, 8′, 9′, 10′, 14′ and 15″. In constructing the square whose center line is drawn from 2 on E F, lines are first brought up from *a* and *b* of the plan to intersect the line drawn through 2′, as shown at *a′* and *b′*, from which points lines are drawn toward V^R. The end of this square at the right may be determined either by a line brought up from *c* of the plan to cut the line from *b′*, as shown at *c′*, or by means of a diagonal drawn from *b′* through the center 2‴, to cut the line drawn toward V^R from *a′*, as shown at *d'*. The line from *c'* to *d'* being, of course, drawn toward V^L, either point can be determined from the other.

Since the diagonals of the squares are available, as has been shown, in determining additional points on the circles or curves to be inscribed, it will be of great convenience to locate the vanishing point of whichever diagonal comes nearer the center of the picture. This can most easily be done by continuing the line J S of the plan to intersect the horizon line, as shown at V^D. All of the diagonals which are parallel to J S, and, of course, directly over it, will then vanish to this point, and they may therefore be used to verify the positions of points obtained by other means. The opposite diagonals (*a' c'* being that of the uppermost plane), having also been drawn where their presence will be desirable, they may then be employed as a means of locating additional points on the curves to be drawn, all as explained in connection with Figs. 8, 9 and 10, which operations are omitted in Fig. 12 to avoid confusion of lines, one only being located as an example—viz.: The crossing of the outermost circle of the orthographic plan with the diagonal J X is projected onto the center line, as shown at *m*. Its position is then located on the ground line at *m*, whence it is carried into perspective to cut the diagonals X J and X R of the perspective plan, as shown at *m'* and *m''*, which points can then be carried up to cut the diagonals of the proper plane in the perspective.

The use of the diagonals in locating points upon the desired curves is most useful in those planes which are farthest from the horizon line. As the horizon is approached, however, the circles necessarily appear more and more flattened, when it becomes a matter of greater importance to know exactly how far the curve will extend to the right and left of the center—that is, to locate the points at the extremes of the long diameter of the ellipse. These can be determined by a very simple operation, which is in reality part of another system of perspective, further details of which will be given later. But as all systems which are correct must produce the same result, there need be no fear of clash or confusion. The operation consists in finding the perspective of two lines drawn tangent to the required circle and at right angles to the plane of the view.

The Picture Plane.

As has been explained, the ground line of the perspective plan is the plan of a vertical plane called the picture plane or plane of the view; consequently any measurements taken directly from the elevation upon lines representing horizontal planes, can be transferred from their positions in the elevation to corresponding lines crossing the picture plane. In illustration of this, take, for instance, the largest circle of the plan shown in part by E K E^1 of the orthographic plan. E P of that view represents the picture plane, and a tangent to the said circle would meet it at the point *f*. Now, as before explained, the vanishing point of any line in the perspective view is determined by drawing a line from the point of sight parallel to said line to cut the picture plane, whence it is projected into the horizon line. Since in Fig. 12 the point of sight has been taken opposite the center of the tower, as shown by X *x* of both plans, the vanishing point of the receding lines referred to must ultimately fall at V. Therefore, take the distance *x f*—that is, the radius of the circle in question—and set it off both ways from *x* of the perspective plan, as shown at *f* and *f*, and from these points draw lines toward V, to cut the long diameter of the ellipse drawn through X, as shown at *f'* and *f'*. This operation can be applied to a circle at any hight in the view, as shown, for instance, by the circle at the eave of the tower roof, whose radius is X C of the orthographic plan. The line drawn from the elevation to point 2 on E F is first extended to cross the axial line U X of the tower, and thus becomes a line in the plane of the view. The radius of this circle may now be set off to the right and left of the axial line, as shown at *x''* and *c''*, and lines drawn from these points toward V, as shown. In drawing the ellipse, which is circumscribed by the square *a' b' c'd'*, the limit of the curve at the right and left is obtained by drawing it tangent to the lines just drawn from *x''* and *c''* toward V, as shown.

In actual practice it will seldom be necessary to construct a square for every circle to be represented. When two circles appear very close together, as is the case with those whose center lines are designated by the figures 6 and 7, it is advisable to construct the square for the one that comes most into view first. In this case the square for the outer circle on line 7, and designated by 7', should be constructed first, since more than one-half of that circle appears in the view. Then inside of this on the same diagonals the circle designated 7'' can easily be formed, after which the circle 6' can be drawn almost by eye parallel to 7' first drawn. Although in most cases only a portion of the circles appear in the finished view, it is advisable to construct the full square in perspective and sketch in the full circle, in order that those parts which do appear shall be correctly drawn. In drawing the outlines of the slanting or conical roofs it will be observed that they are drawn tangent to the curves of the top and eaves of the roof. Thus, the line of the uppermost roof is drawn from 1' tangent to the curve at 2'. This feature is well shown by the line 6' 5', which joins the two circles constructed upon the lines 6 and 5.

Perspective of Cylindrical Object.

In drawing the perspective of a cylindrical object in an entirely isolated position, the system last referred to can be applied in an extremely simple manner, without the use of an orthographic plan or even fixing the distance away of the point of sight, all as shown in Fig. 13. Draw first the axial line, then at any suitable distance below the horizon draw a horizontal line, A, B, representing the long diameter of the lowest circle, determining its length by scale in accordance with known dimensions. Upon this line an ellipse may be first sketched in a manner to simply satisfy the eye. Through its lowest point E draw the horizontal line C D, to be terminated by lines drawn from V (the vanishing point) through A and B, as shown. Now draw the diagonal C F and continue it to meet the line D V at H and draw H G. The ellipse can now be accurately drawn through the points A E B and J, obtaining intermediate points on the diagonals, as previously explained, if desired. The square for a circle at any desired hight above the base, as for instance that shown by *c d*, can be constructed by erecting lines from the corners C D H and G to the desired hight, and its sides drawn to the vanishing point, as shown by *c g* and *d h*. Squares to contain circles of greater or less diameters can be constructed upon the diagonals, all as shown in the upper part of the figure, and as explained in connection with Fig. 12.

In making the preliminary sketch for a cylindrical object to be drawn according to the method just described, it is understood that the nearer, also the higher up, the point of sight is taken the wider from E to J will be the ellipses representing those circles below the horizon line, and conversely, the lower and more distant the point of sight the flatter will they become. If then the ellipse A J B E is drawn of such proportions as to give a satisfactory representation of the object under consideration, it is a matter of minor importance to know the exact distance away of the point of sight. Whatever be the assumed proportions of the ellipse representing the lowermost circle of the design, this method of procedure insures the apparent flattening of those circles lying in other planes, in correct proportion as they approach the horizon.

FOR PAINTING GALVANIZED IRON the Government, it is said, has recently adopted specifications compelling the use of vinegar for washing the surface preparatory to painting. This is to corrode or roughen the surface, thus giving the paint better opportunity to adhere.

A FINE SPECIMEN of a "scold's chair" is among the remaining contents of Sherfield Manor, Basingstoke, England. It dates from 1723, and is in oak, and is elaborately carved in high relief in bold scroll ornament. The seat is worked by a lever from behind, and the sitter is locked in by falling arched bars in front.

WHAT BUILDERS ARE DOING.

THE closing month of the year witnessed a continuance of the shrinkage in building operations which has been such a marked feature of the industry for some time past. Reports from the leading cities of the country show the effects of the recent financial stringency and it is only here and there that an increase in the value of operations in December as compared with the same month the year before is noted. One of the most striking reports is from St. Louis, where the shrinkage was particularly heavy. The average decrease for the country is approximately the same as noted in November, although last month the reports were more unanimous in showing a shrinkage.

Taking the records for the entire year there is shown to be a falling off of about 15 per cent. as compared with 1906. Where gains are shown over the year before they are for the most part in the smaller cities of the country.

While it is yet too early to form any well defined ideas as to the immediate future of the building business, many sections are hopeful of a resumption of activity upon an approximately normal scale, while some go so far as to predict a volume of operations in 1908 greater than was the case in the year just past.

Atlanta, Ga.

A number of interesting statistics appears in the annual report of City Building Inspector Ed R. Hays. Among other things, the figures show that the number of permits issued last year were 4169, as against 3741 the year before, and the average cost of each dwelling increased from $1739.85 in 1906 to $1840 in the year just closed. The total cost of buildings constructed last year was $4,554,771, as compared with $5,156,149 in the 12 months of 1906. The difference is readily explained when it is remembered that among the permits issued in 1906 was that for the Candler Building, costing in the neighborhood of a million dollars, and the Louisville & Nashville freight terminals, involving several thousands of dollars.

In December last, there were 188 permits issued for buildings, costing $126,360, as against 201 permits for buildings costing $339,219 in December, 1906. The feeling among builders is that the volume of operations in 1908 will show up fully as well as in the year just closed.

Efforts are being made to organize a Builders' Exchange, which will include all the leading concerns interested in building. Thus far about 100 firms, some of which are among the best established in the city, are said to have signed the agreement. It is contemplated to have in connection with the Exchange an exhibit of builders' materials.

Baltimore, Md.

The Inspector of Buildings shows in his annual report that the estimated cost of new buildings and improvements during the year 1907 was $6,386,530. An interesting feature of the statistics is found in the fact that the great majority of the dwellings are two-story houses with an increase in one-story structures of the bungalow type, which is so popular just now in many sections of the country, especially in the West.

Permits were issued during the year for 2358 dwelling houses, estimated to cost $3,455,552; for 79 manufactories and warehouses, estimated to cost $1,340,582; for six office buildings, to cost $447,700; for 41 stores, to cost $278,035; for one car barn, to cost $70,000; for a private school, to cost $60,000; for a railway station, to cost $40,000; for six churches, to cost $76,478; for five hospitals, to cost $186,200, and four apartment houses, to cost $99,000.

The members of the Builders' Exchange held their quarterly meeting in the rooms of the organization on the evening of December 18, and after routine business matters had been considered they sat down to an excellent dinner. Addresses were made by President Theodore F. Krug, who spoke on the proposed new building code; by City Water Engineer Quick, who traced the history of municipal water plant development in Baltimore, and by Secretary I. Herbert Scates, who showed that the organization was in excellent condition, and that the membership was slowly but surely gaining in numbers. After the addresses an entertainment was provided in the way of music and vaudeville.

Buffalo, N. Y.

As a general thing builders are looking forward to a good volume of business, nothwithstanding the cost of materials and labor is maintained upon a rather high plane. This feeling of optimism is based in large measure upon a decided improvement to be expected in the financial situation, and an absence of complications in the labor world.

In December, according to Deputy Building Commissioner Henry Rumrill, Jr., there were 159 permits issued for building operations, estimated to cost $493,600, while in December, 1906, there were 181 permits taken out for buildings costing $451,000. From this it will be seen that the work projected in December last was somewhat more pretentious than was the case the year before.

The figures for the 12 months of 1907 show a slight falling off as compared with the year before, but the difference is so slight as not to be significant. There were 3039 permits taken out last year for building improvements estimated to cost $8,411,000, while in the 12 months of 1906 there were 2867 permits issued from the Building Commissioner's office involving an outlay of $8,686,030.

Chicago, Ill.

Considering the nature and extent of adverse influences that developed during 1907 the final casting up of totals in building operations shows results which, under the circumstances, may be regarded as highly satisfactory. Moreover, these totals do not include the generous proportion of notably large buildings that characterized those of 1906, and therefore indicate a better distribution of building. At the same time when compared with the results of that year the decrease shown for 1907 amounts only to about 8½ per cent. In 1906, permits were granted for 10,447 buildings, having a frontage of 276,770 ft., and a total cost of $64,298,330, as against 9338 buildings, 253,993 ft., and cost of $59,065,080 in 1907.

The figures for December, 1906, show permits for 568 buildings, 16,257 ft. frontage, and $3,108,650, as compared with those of 1907, which are 255 buildings, 7883 ft. frontage, $5,464,900. The large increase in cost figures for December, 1907, over the corresponding month of the previous year, was due to two permits issued near the close of the month for the LaSalle Hotel and the University Club, which aggregated $3,600,000. A comparison of permits issued in 1907 and 1906 is shown by months in the following table:

	1907.			1906.		
	No. bldgs.	Feet frontage.	Cost. $	No. bldgs.	Feet frontage.	Cost. $
January....	484	14,022	3,285,800	495	14,824	2,830,200
February...	552	15,164	3,338,750	611	17,301	4,507,200
March	1,083	28,158	5,906,400	926	25,053	4,267,650
April	1,077	28,361	5,836,950	1,105	28,267	12,139,875
May	1,002	27,522	6,120,750	1,035	27,737	6,252,720
June	896	25,858	7,043,850	1,092	28,151	6,491,500
July	923	24,681	5,376,500	934	28,558	4,849,960
August.....	872	23,027	4,492,275	991	25,887	5,439,175
September..	798	21,048	5,523,605	1,085	24,609	4,579,200
October....	900	25,198	4,960,150	945	25,820	5,219,900
November..	496	13,121	2,205,150	740	19,426	4,561,300
December...	255	7,883	5,464,900	568	16,257	3,108,650
Totals...	9,338	253,993	59,065,080	10,447	276,770	64,298,330

In view of the large amount of building actually contracted during the year it may be assumed that while the costs of labor and material reached a hight that was in some measure restrictive of building it was not as potent an influence as it was generally regarded. A substantial decline in prices of some lines of material, including lumber, cement, and fabricated material, has taken place within recent months, although there has as yet been no reduction of labor costs. Since agreements between the labor and building trade organizations do not expire until April 1, it is not likely that existing schedules will be disturbed until that time. On what basis the new agreements for 1908 will be adjusted cannot be foretold, but much will, doubtless, depend upon the condition of the labor market at that time. Present indications point, however, to a harmonious settlement of these questions when they arise.

A project is on foot for the erection of a skyscraper in the downtown district, to be used as the headquarters for general contractors, builders, and those connected with allied industries. It is understood that the building will be 20 stories high, of modern steel construction, and thoroughly up to date in all respects. The organizations which have joined in the movement are The Builders' Club, Mason and Contractors' Council, Building Contractors' Council, Master Plumbers' Association, Carpenters and Builders' Association, Sewer Pipe Association, Mason and Builders' Association, Concrete Contractors' Association, Lumbermen's Association.

One of the features of the new building will be a floor reserved for the club rooms of the various organizations.

Cincinnati, Ohio.

One might naturally infer from the statistics of building operations for the year just brought to a close that the city had been enjoying something of a boom in this line of industry, notwithstanding the handicap brought about by the recent financial disturbances throughout the country. The effect of the latter is perhaps most noticeable in the returns for December, when only 64 permits were taken out for new buildings costing $199,470 These figures compare with 281 permits in December, 1906, for buildings costing $260,821.

When the figures for the year are considered the application of the statement in the first sentence is apparent. For the 12 months of 1907 there were 2325 permits taken out for building improvements, estimated to cost $16,854,342, while in the year 1906 there were 4087 permits issued by the Building Department for improvements costing $7,111,-866. While the decrease in the number of permits issued is somewhat marked the increase in the value of the improvements is much more so.

If the high cost of labor and materials has affected building operations during the past year it is not apparent in the total figures. There is a feeling that operations for the ensuing year will be upon an even more liberal scale than was the case in 1907. There are a number of large improvements in prospect, and unless the present money stringency continues and the tendency to contract business grows as time goes on, 1908 should see a great improvement in Cincinnati.

Cleveland, Ohio.

All former building records in Cleveland were broken last year when permits were issued by the building inspector's office for buildings estimated to cost $15,887,406. During 1906 the permits, which showed a large gain over the previous year, amounted to $12,972,974. While the financial stringency came so late in the year it did not seriously interfere with building operations, yet it caused some projected work to be put off until spring. Although there was a large total increase for the year the records of the building inspector's office show considerable decrease in the number of frame buildings erected. This decrease is attributed to the extension of the city fire limits during the year, the erection of frame buildings being prohibited in a much wider territory than formerly.

Architects at present have considerable work on hand, and the present indications are that the year will be a good one in the building lines in this city, although the amount of new construction will depend considerably on industrial conditions during the next few months.

The officials of the Builders' Exchange recently received a request from Building Inspector Lougee that the exchange appoint a committee to co-operate with the inspector in the preparation of a new electrical code to govern the installation of electrical work in the city. Acting upon this suggestion the president has appointed C. C. Bateson, F. C. Werk and P. McNerney, three well-known electrical contractors to serve upon the committee.

The Christmas party of the Builders' Exchange Social Club held on Saturday evening, December 28, at the Chamber of Commerce Hall, was a most enjoyable affair in every way. In fact, the Executive Committee fully realized its desire to make it the banner gathering of the series, and the members of the club were treated to a number of pleasant surprises.

A number of changes have been made in the exhibits at the rooms of the Builders' Exchange, among which may be mentioned the Moore Paint Company as installing an attractive display of finished woods. The Cleveland Steam Fitting & Supply Company has placed in operation on one of its heaters an automatic damper and regulator, which keeps the room at an even temperature. A. B. Lovett is exhibiting an electrical hoist, while several other concerns have made improvements and additions to their displays.

Columbus, Ohio.

The annual meeting of the Builders' and Traders' Exchange, which occurred at the rooms of the headquarters in the Brunson Building on Monday, January 6, was among the most successful ever held. The exchange kept open house and good fellowship prevailed. The polls were open from 11 a. m. until 8 p. m., and the election resulted in the following choice:

President, William Watson.
First Vice-President, P. B. Gould.
Second Vice-President, A. Mulby.

BOARD OF DIRECTORS.

Thomas T. Swearingen,	John Conard,
Herbert R. Kuhn,	Adam Pitts,
David Krouse,	Bert Walters,

John D. Evans.

At 5 o'clock a bounteous luncheon was served and after the good things provided had been duly considered the balance of the evening was devoted to musical and elocutionary entertainment, the results proving that the members of the exchange are adepts in other branches than building and trading.

Denver, Colo.

The shrinkage in building throughout the city during the month of December was very marked, as compared with the year before, the decrease being principally in apartment houses, of which only one was projected. The report of Building Inspector Robert Willison shows 105 permits to have been issued in December for buildings costing $205,365, while in December, 1906, there were 215 permits issued for improvements involving an estimated outlay of $528,025, thus showing for the month a decrease of over 50 per cent. Prominent among the improvements in December last were 50 brick residences to cost $101,600, 5 business buildings involving an outlay of $18,500, 1 apartment house to cost $15,000, a factory to cost a similar amount, while $27,000 was the cost of additions, alterations and repairs.

For the 12 months of the year just closed 2509 permits were issued for buildings to cost $6,349,604, and for the 12 months of 1906 there were 2461 permits taken out for buildings estimated to cost $7,000,996. The largest permit issued during the year was that for the Denver Auditorium Building, in which the National Democratic Convention will be held, and which is estimated to cost $450,000.

The prospects for large building operations in the spring of this year are considered very good, and those who are well qualified to judge of the situation expect to see a heavy volume of orders for building improvements the first six months of the year.

Detroit, Mich.

The past year's record for building is the highest ever reached in Detroit. Value of permits issued during 1907 is $14,225,000, which is practically $2,000,000 in advance of 1906. The city has been growing wonderfully, and in the last three years there have been erected new buildings to the value of more than $36,000,000, an average of $1,000,000 a month for thirty-six months. The new year has started even better than was expected, although no permits for exceptionally large buildings have so far been taken out. Home-building will be the feature of the construction business the coming season. The outlook for large structures in Detroit is not promising at the present time, although it may develop later.

Officers for the Builders' and Traders' Exchange were elected during the first week in January for the ensuing year as follows:

President, John L. Austin, plastering contractor.
Vice-President, Richard Porath, paving contractor.
Secretary, C. L. Batchelder, stone contractor.
Treasurer, George D. Nutt, mason contractor.
Superintendent, George Wallace.

The following, with the above, were elected directors: John S. Haggerty, brick manufacturer; John F. Putnam, mason contractor; A. C. Goodall, plastering contractor; J. C. Candler, roofer; William Malow, builder. The exchange now has 83 members.

Recent bids submitted to the Department of Public Works, Detroit, show great reductions, in comparison with last year. An average reduction of $2 per thousand feet is made in lumber. Cement bids were 30 cents per barrel cheaper and the lowest price quoted is $1.15½ per barrel. The city expects to save $20,000 on the price of cement alone.

Evansville, Ind.

At the annual meeting of the Builders' Exchange held in the rooms of the organization on December 19, the following officers and directors were elected:

President, S. G. Rickwood.
Vice-President, W. B. Lensing.
Secretary, W. H. Moss.
Treasurer, H. C. Kleymeyer.

DIRECTORS.

R. M. Milligan, H. Lohse. R. F. Fairchild, Jac. Detroy, Harry Newman, Jac. Reisinger.

Hartford, Conn.

The figures compiled in the office of Building Inspector Fred J. Bliss present a rather interesting study, showing as they do the steady development of the city. In looking over the returns for December last, it is found that 27 permits were taken out for improvements costing $68,700, while in December, 1906, only 16 permits were taken out, but for buildings involving an estimated outlay of $70,080.

For the year 1907 there were 731 permits issued for building improvements costing $4,026,970, while in the corresponding 12 months of 1906, there were 652 permits taken out for buildings costing $3,732,915.

Holyoke, Mass.

At a recent meeting of the Master Builders' Association the following officers were elected for the ensuing year: President, Frank H. Dibble; vice-president, George H. Thorpe; secretary and treasurer, A. M. Cain, and sergeant-at-arms, L. P. Trowbridge.

The Board of Directors elected consisted of Frank J. Curley, Louis Carreau, John F. Shea, Joseph Lalibertie and George L. Thorpe; State deputies F. F. O'Neil, L. T. Beaulieu and A. M. Cain.

Indianapolis, Ind.

Notwithstanding the marked depression in the building line during the last month or two of the year, the impression exists in well informed circles that the volume of operations the current year will at least equal that of the year just closed. The high prices of materials probably checked operations to a slight extent, but in the total for the 12 months this is hardly appreciable. In December, there were 101 permits issued for new buildings costing $79,808, while in December, 1906, there were 200 permits issued for buildings involving an outlay of $315,163.

In spite of this evidence of a tendency toward marked contraction the total for the year is considerably greater than that of the year previous. In 1907 there were 3903 permits issued from the office of Inspector of Buildings Thomas A. Winterrowd for new buildings and improvements involving an estimated outlay of $5,893,725.80, while in the 12 months of 1906 there were 3825 permits issued for buildings costing $5,530,971.80.

Kansas City, Mo.

A study of the annual report of Superintendent of Buildings F. B. Hamilton, shows that the volume of building operations during the year just closed was appreciably less than that of the year before. While the decrease in the total number of permits issued last year was only 50, there was a falling off of 6671 ft. frontage and a little more than $1,000,000 in the estimated cost of the projected improvements as compared with 1906. The reason for the falling off is explained by the fact that 1906 was a year of big buildings in the city. The permit for the Commerce Building alone, issued in December, 1906, offset the decrease.

The total number of permits issued last year was 3943, calling for an expenditure of $9,611,922, while in 1906 there were 3993 permits taken out for buildings costing $10,765,480. In April, May and July last year, the value of the building improvements for which permits were issued exceeded a million dollars each, while in 1906 the months in which the value of the improvements exceeded one million dollars were April, June and December. The months of August, September and October of last year ran over $900,000 each, but in December, the value of the improvements for which permits were issued was only $164,530, while in November the value is $591,280, and in October, $951,710.

Knoxville, Tenn.

The record established by the city during the year just closed, at least so far as building operations are concerned, was the third largest in its history. The total value of the improvements for which permits were issued was $1,110,243, as compared with $1,240,852 for the 12 months of 1906, which was the banner year. In 1905, the value of the building improvements was $1,148,293. During the past year the largest permit ever issued in the city was taken out for the 10-story office and banking building being erected at the corner of Gay street and Clinch avenue, estimated to cost $150,000. The biggest month of the year was in August, when the total of new work was valued at $292,467, this by the way being the second largest building month in the city's history. November and December showed very light operations.

Louisville, Ky.

The year has closed with a record considerably below that of 1906, so far as building operations are concerned, the falling off in volume amounting to almost 50 per cent. The figures show that whereas in 1906 building improvements to the value of $5,116,917 were undertaken, the value of the improvements last year shrunk to $3,032,548.

The members of the Builders' Exchange held their annual New Year's open house reception on December 28, the reception being from 11 a. m. until 1 p. m. Some of the leading architects of the city were special guests, as were also many of those largely interested in building operations. The committee having charge of the affair, which was followed by refreshments and a programme of entertainment, consisted of E. G. Heartick, chairman; Al. Bourlier, Carl Gilmore, Joseph H. Ingram and Arvid Norall.

The Committee on Nominations of the Builders' Exchange has made its report and two unusually strong tickets have been named. Under the constitution of the exchange one-half the number of the members of the Board of Directors is elected each year to serve a term of two years. The tickets will be voted on at the election held between 11 and 4 o'clock on January 13.

Memphis, Tenn.

Notwithstanding the conditions which have existed during the past month or two in all branches of industry and the tendency to curtail operations to a very conservative basis the feeling here as to the future of building is good. In December there was naturally a falling off in the number of permits issued from the office of Building Commissioner Dan. C. Newton, together with a slight shrinkage in the value of the improvements projected. In December, 1906, there were 160 permits issued for buildings valued at $277,961, and these figures shrunk in December last to 95 permits valued at $245,992.

For the 12 months of last year there were 2592 permits issued for new buildings, additions and alterations involving an estimated outlay of $4,957,999, these figures comparing with 2549 permits for building improvements estimated to cost $4,346,767 for the 12 months of the year before. The feeling seems to be general that the high cost of materials and labor has not appreciably influenced operations.

Milwaukee, Wis.

More money was invested in building improvements in the city during the year just closed than in 1906, although there was a slight falling off in the number of permits issued, probably due to the effect of the new tenement house law during the last six weeks of 1907. The records compiled in the office of Chief Inspector of Buildings Edward V. Koch show that last year 3625 permits were taken out for building improvements costing $10,771,244, whereas in the 12 months of the year before 3782 permits were taken out for buildings costing $9,713,284. It is interesting to note that the annual record of the department shows that permits were issued for 618 private dwellings, 544 two-family houses, 6 flat houses, 135 store buildings, 56 factories, 21 warehouses, 6 churches and 147 stables and barns.

The conditions were such in December last that only 86 permits were taken out for building improvements costing $271,715, while in December, 1906, there were 180 permits valued at $775,951.

It is expected that building operations for 1908 will be equal, if not better, than was the case in the year just closed.

Minneapolis, Minn.

In reviewing the building conditions of the year just closed it is gratifying to note that the volume of operations is somewhat in excess of that for 1906, notwithstanding the obvious check which was sustained in the closing months of 1907 by reason of the financial stress existing at that time in all parts of the country. Another source of gratification is found in the fact that according to Inspector of Buildings James G. Houghton, 1907 was the greatest, so far as building operations were concerned, in the history of the city. The high cost of material and labor does not appear to have affected building activity to any great extent, except it may perhaps have been reflected in some small degree in the building of dwellings of moderate cost.

According to Mr. Houghton there were 169 permits issued in December last for building improvements costing $403,390, as against 180 permits for buildings costing $482,710 in December of the year before. For the 12 months of 1907 there were 4960 permits taken out for new buildings, alterations, additions, &c., involving an estimated outlay of $10,006,485, while in 1906 the number of permits issued was 4724, and the value of the improvements $9,466,150.

Notwithstanding the strenuous times at present existing and the check which has unmistakably been given to industrial enterprises, builders are taking a very hopeful view of the future, and expect that 1908, although a Presidential year, will give a good account of itself.

The members of the Builders' and Traders' Exchange held their annual meeting at the headquarters in the Kasota Building, on January 7, when the following officers and directors were elected:

President, W. A. Elliott.
First Vice-President, S. G. Tuthill.
Second Vice-President, James Tyler.
Secretary, Eugene Young.
Treasurer, Harry B. Cramer.
Sergeant-at-Arms, H. C. Christenson.

There were three directors elected, consisting of H. N. Leighton, M. Schumacher and S. G. Tuthill, while six members of the old board held over for another year.

The past year has been a very prosperous one for the exchange, and at present there are 260 members in good standing. During the year 467 plans for buildings outside of the twin cities were placed on file in the rooms of the exchange and were figured on by over 2000 persons. There were held in the exchange rooms 176 meetings of different crafts connected with the building trades. The exchange is equipped with a library and prominent magazines and trade papers are kept on file for the use of the members.

At the annual and regular meetings of the exchange a *buffet* luncheon is served to the members preceding the formal business meetings, this scheme having been found of great assistance in bringing about a large attendance of members.

Some time this spring the exchange will move into larger and more commodious quarters, where it will have 8500 sq. ft. at its disposal.

Newark, N. J.

Notwithstanding the financial disturbances at the close of the year the amount of building in the city in December showed only a very slight falling off as compared with the same month in the year before. In fact, there were about 50 permits more issued last December than in December, 1906, although the value of the improvements fell away a trifle over $50,000.

The extent of the new construction during 1907 is indicated by the records of the Building Department, which showed 2540 permits to have been taken out for improvements costing $9,466,265.99, while in the 12 months of 1906 there were 2600 permits issued for new buildings and alterations costing $10,742,198. April last was the banner month, not only for last year but holds the record for several years past. In this month improvements were projected estimated to cost $1,281,000. November suffered the greatest loss as compared with the same month of the year before, the shrinkage being in the neighborhood of $350,000, and was largely attributable to the financial stringency.

New Orleans, La.

In the report of the Board of Trade just issued there are figures compiled by the Contractors and Dealers' Exchange showing that building operations in the city have been on an unusual scale during the past year, and it is estimated that there are in course of completion, contracted for, or recently finished, structures aggregating a valuation of more than $15,000,000. Some of those under construction are the Audubon Hotel, $1,500,000; the new court house, $1,000,000; American sugar refinery, $5,000,000; Commercial Hotel, $300,000, and residences ranging in cost from $50,000 down. Many of the buildings upon which work is soon to be commenced are the City Hall annex, to cost $250,000; the new post office building, $1,200,000; the Delgado Memorial, $200,000, and the Touro Synagogue, $75,000.

New York City.

It is not particularly surprising that building operations in the city the last month of the year should have shown a slight falling off, as compared with the amount of work which was done in the closing month of 1906, but that there was not a greater shrinkage is probably due to the fact that operations were at a pretty low ebb at this season in 1906. It is, however, with the figures for the entire year that the building community is more intimately concerned. The annual report of Building Superintendent E. S. Murphy of the Borough of Manhattan shows that last year new buildings were projected in that borough to the extent of $74,939,900, while the estimated cost of the building improvements projected in 1906 was $107,977,515. Of last year's total $27,081,500 was involved in the construction of tenement houses, $21,116,500 went for office buildings, a little over $11,000,000 was for stores, $3,361,000 was for places of amusement and $2,394,000 for stables and garages. Last year $16,783,899 was expended for alterations, while in 1906 there was $18,098,050 expended for the same purpose.

In the Borough of the Bronx the building industry showed a general falling off last year, as compared with the year before in every branch but one, the redeeming feature being the continued boom in two-family houses. More houses of this class were erected last year than in any preceding 12 months. According to the figures available permits were issued last year for improvements costing $20,784,699, while in 1906 permits were issued for building improvements costing $27,622,730. Last year there were 802 permits issued for frame buildings costing $4,191,005, as compared with 1090 frame buildings in 1906 costing $5,312,760. There were also 417 permits issued last year for brick dwellings costing $2,822,300, while in the year before 282 permits were issued for such buildings costing $2,196,900. The shrinkage in flat house construction or tenements is shown by the $8,334,200 estimated cost last year, against $15,865,700 for the year before.

The building movement which conspicuously developed in the Borough of Brooklyn in the latter part of 1904 reached its climax in 1906, since which time it has gradually subsided, and now appears to be at a low ebb. This, however, does not mean that builders are not hopeful of the future, for, with conditions normal and mortgage money readily obtainable, great activity is expected in many districts. The total value of the building operations for which permits were issued last year is not very much less, considering the aggregate capital involved, than it was in 1906, the figures being respectively $64,150,107 and $65,066,325. The number of permits for last year and the year before were 8478 and 8584. A vast amount of money was expended for buildings intended for dwelling purposes. According to the figures of the Bureau of Buildings permits were issued for brick dwellings costing $12,721,600, while in the year before the amount of work of this kind projected was valued at $10,346,400. Frame dwellings last year were almost equal in number to those projected the year before, their cost being $5,757,502 and $6,676,785, respectively. Permits last year were issued for brick tenements to cost $26,995,100, as compared with $29,679,800 in the 12 months of 1906. A feature of last year's operations was the appreciably increased number of brick store and two-family buildings, 860 permits having been issued for such structures to cost $5,523,475, while in the 12 months of the previous year 561 permits were taken out for such buildings to cost $3,325,150. A trifle more was expended last year in schoolhouses than the year before, there having been 12 permits for such structures to cost $2,599,000, as against 11 in 1906 to cost $2,135,000

At the time of going to press the majority of the unions in the various branches of the building trades in Greater New York had come to an understanding with the associated employers regarding the wage scale for the ensuing year.

Omaha, Neb.

The financial conditions which have recently prevailed throughout the country appear to have had little or no effect upon building operations in this city, at least so far as may be gained from the figures compiled in the office of Building Inspector C. H. Withnell. These show that 66 permits were taken out for buildings to cost $279,775, which is an increase in value over December, 1906, of $60,100. For the year home building appears to have been the main feature, and as a consequence of building operations there are 933 more homes for the people than was the case at the close of the previous year. Of these houses built during the year 847 were detached dwellings, 31 were double houses, 6 were apartment houses for three families each, 5 were built with accommodations for four families each, 3 for six families and 1 for eight families. There were also five brick apartment houses costing $205,000. Never since 1887 has the building record been so high, while the amount expended for homes breaks all previous records. The total value of the buildings throughout the city, for which the 1500 permits were issued last year, was $4,536,643, while in 1906 the value was $4,273,050. The total amount invested last year in new homes was $2,289,525, which is more than half of the total amount expended for new buildings and alterations during the year.

The Builders and Traders' Exchange held its annual meeting on January 6 for the election of officers and the transaction of other business. The reports presented showed the exchange to be in a flourishing condition and to have a membership of 94. The voting for officers resulted in the following choice:

President, Thomas Herd (re-elected).
Vice-President, A. A. Newman.
Treasurer, J. E. Merriam (re-elected).

After the business meeting had been concluded the members adjourned to Courtney's Café for the annual banquet. George P. Cronk was toastmaster. During the evening selections were rendered by the Builders' Exchange quartette.

Philadelphia, Pa.

During the first 11 months of the past year building operations in this city exceeded the amount for any like period, except 1906, and had it not been for the tremendous falling off during the closing months, due almost entirely to financial disturbances, there is no doubt that new records would again have been established.

The year on the whole has been a remarkable one. Building during the month of April was far ahead of any other month in 1907, operation work being particularly heavy in that month, more especially in dwelling houses. The total cost of new buildings was close to $6,500,000, of which two and three story dwellings contributed over $4,000,000. May was also an exceedingly good month, work aggregating an estimated cost of $5,683,920 being started. March, June, July, August and September were fairly even months, while February was next to the smallest, with new work valued at $987,455.

The falling off during the last quarter of the year is clearly shown in the table which follows:

	Permits.	Operations.	Estimated cost.
January	489	897	$2,488,460
February	352	571	987,455
March	735	1,381	3,535,530
April	1,146	2,688	6,893,500
May	1,015	2,041	5,683,920
June	832	1,405	3,186,410
July	880	1,658	3,784,150
August	822	1,609	3,238,715
September	740	1,384	3,113,810
October	812	1,184	1,763,905
November	553	728	1,159,025
December	352	485	901,045
Totals	8,728	16,021	$36,735,925

This shows the estimated cost of building in the city during the entire year to be $36,735,925, a decline of $3,975,585, when compared with the total for 1906.

Building in the West Philadelphia District, which for the past few years developed very extensively, fell off heavily, and builders turned their attention to the northern and southern sections of the city, where some very large operations were begun. The number of two-story dwellings erected during the year was 7317, at an estimated cost of $13,385,135, which, compared with 1906, shows a decline of $3,632,240. A decline was also shown in the value of three-story dwelling houses erected during 1907, which in round figures amounted to $600,000, as compared to the previous year. About the same proportionate decline has been shown in other classes of building. There were $176,000 spent by the city during the year for municipal buildings, while for schools $881,390 was expended, the latter showing a gain of some $250,000, as compared with 1906. Office buildings swelled the total value of building operations during the past year quite considerably. Work on several large buildings was begun, and the aggregate cost for this class of work reached a total of $2,059,180. Manufactories added $2,843,140 to the year's total, showing a slight increase over that of the previous year. Warehouses also showed fairly well in comparison with the previous year, as did also alterations and additions, on which $6,197,395 was expended, against $6,235,740 for 1906.

What the new year will bring forth, as far as the building trades are concerned, is difficult to say at this time.

While the financial situation now shows a very marked improvement over that of November and December, it is still far from satisfactory, and it will in all probability be difficult to finance many of the propositions which have been temporarily laid aside, until the general situation again approaches the normal.

At a meeting of the Master Builders' Exchange, held recently, the following candidates were named to fill the places of seven retiring members of the Board of Directors, whose terms are about to expire:

James Jackson, H. S. Andrews, P. S. Smith, Joseph E. Brown, John J. Byrne, Francis F. Black, John D. Carlile.

The election will take place at the annual meeting of the exchange, which will be held January 28.

Pittsburgh, Pa.

The notable feature of building operations in the city was the value of the improvements for which permits were issued, as compared with the same month a year ago. The figures compiled in the office of S. A. Dies, superintendent of the Bureau of Building Inspection, show that while 155 permits were issued the estimated cost of the improvements was $1,189,165, as against 174 permits in December, 1906, for building improvements estimated to cost only $449,078.

For the 12 months of the year just closed, however, the showing is less favorable. During this period 3638 permits were issued for new buildings and improvements involving an estimated outlay of $12,826,535, whereas in the 12 months of 1906 there were 3727 permits issued for buildings costing $15,116,252.

It appears to be the consensus of opinion that the high cost of materials and labor has had much to do with the shrinkage in building operations, and to this cause may be added that of financial stress in the later months. With regard to the immediate future it is felt that the present downward tendency in prices of building materials and an improvement in general financial conditions will result in a steadily improving outlook.

San Francisco, Cal.

The building activity in San Francisco shows a considerable change for the better during the last month, says our correspondent under date of January 7. This is particularly true as regards the new work undertaken. The record for December shows permits for new work issued to the amount of $3,910,000, nearly $2,000,000 in excess of the month preceding, and almost equalling the record of $4,140,000 for the month of December, 1906. The unexpectedly good showing was helped out by one or two very large buildings, without which the record would have been comparatively small. Owners of several large buildings have been compelled to go slow owing to the difficulty of getting the needed money for construction work.

During the year ending December 31 the total amount of building undertaken was $52,292,000, as compared with about $39,000,000 for the year preceding. The first half of the year was the more active, April leading all other months by nearly $1,500,000. During the first six months of the year the building permits aggregated $29,630,000, and during the latter six months they aggregated $22,663,000. The total amount spent in the rebuilding of the city since the big fire of April, 1906, is $85,070,000. The most careful estimates obtainable place the number of buildings destroyed in the fire at 28,130. Builders estimate that since the fire more than 6000 buildings have been erected, and that half as many more are now under construction.

Everything in the line of materials is favorable to the erection of buildings during the coming season. Even labor, which was rampant in this city for the first year after the fire, has been more moderate in its attitude since P. H. McCarthy, the president of the Building Trades Council, was defeated for the mayoralty at the November election and the financial panic made money scarce. Lumber shows no signs of advancing in price, and can be had in unlimited quantities on a cargo basis of about $14 per 1000 for fir, and a price somewhat higher in proportion for redwood. Sufficient cars are available for the transportation of lumber in California. Supplies of common brick are large and prices remain very low. Pressed brick are firmer in this market, but prices are not excessive. Portland cement, both foreign and California, can be had in ample quantities at quite low figures, compared with a year ago. Crushed rock and other materials except granite and sandstone are very low. The stone quarries have good orders in view.

Scranton, Pa.

Building operations last year showed a very gratifying increase over the year before, the figures amounting to very nearly $250,000. In December there were 42 permits issued from the office of Superintendent E. L. Walter of the Bureau of Buildings calling for buildings estimated to cost $82,212, as compared with 45 permits in December, 1906, for buildings costing $117,300. For the year, however, there were 934 permits taken out for improvements valued at $2,423,849, while in the 12 months of 1906 there were 1113 permits issued for improvements involving an outlay of $2,075,075.

Springfield, Ohio.

The annual banquet and election of officers of the Builders' Exchange was held on the evening of January 3, with a full representation present. The election was held in the exchange rooms in the Mitchell Building and the contest was spirited. The result showed the following to be the choice of the members for the ensuing year:

President, W. F. Payne.
Vice-President, W. F. Morningstar.
Secretary, R. L. McIntire.
Treasurer, C. E. Ridenour.

The report of Secretary McIntire was read, showing the exchange to have enjoyed a prosperous year, both financially and in a business way. The report of the Membership Committee showed 26 new firms added to the list during the year, and reports were also received from the Finance and Amusement committees.

Following the business meeting a banquet was served, with S. E. Goodall acting as toastmaster. W. F. Payne, the newly elected president, spoke on "Needs of Our Exchange"; C. H. Schuster spoke on "Former Exchanges of the City," J. A. Hinckle made a short address of a rather humorous character, while H. W. Cristman discussed on "Troubles of a Carnival Chairman," and William Poole on "The Advantages of an Exchange to the Members."

St. Louis, Mo.

A review of the figures covering building operations for the year just closed and compiled in the office of Building Commissioner James A. Smith reveals the fact that there has been a decided slump in the value of building improvements, and was especially marked in the last quarter. During the 12 months of 1907 there were 8547 permits issued for buildings estimated to cost $21,884,717, as against 8988 permits issued in 1906 for building improvements costing $29,938,693. The effects of the "money panic," as some are pleased to designate the financial conditions which existed after the middle of October, are shown in the cost of buildings for which permits were issued in October, November and December, the figures being $2,464,599, while for the same months in 1906 the amount spent for new buildings was $7,368,152. It will thus be seen that the last quarter of 1907 accounted for nearly $5,000,000 of the total $8,053,976 decrease for the year. The banner month last year was July, with $3,113,515, and the smallest was December, when the total was only $391,098.

The record showed a decrease in new brick buildings, as compared with the year before of $8,305,237, the figures for 1907 and 1906 being respectively $18,918,497 and $27,223,734. In the way of new frame buildings it is interesting to note that the amount expended last year was $1,038,554, while in 1906 the value of the new frame buildings was $993,332.

In well informed circles the belief prevails that the current year will show an increase in building over the one just closed by reason of the decrease in the prices of building materials during the last few months. It is given as a fair estimate that brick has decreased 25 per cent., steel more than 30 per cent., cement about 50 per cent. and lumber 30 per cent. since the first of last October. When comparing the figures of 1907 with those of the year previous it must be remembered that in 1906 many large mercantile structures were erected, so that taking everything into account the building situation is fairly healthy.

Tacoma, Wash.

The year which has just closed is regarded as the most prosperous in the building trades which the city has ever known. The activity began early in March and continued almost uninterrupted until the last quarter, when there was a slight falling off, but not sufficient to influence the grand total. During 1907 permits were issued for improvements costing $10,350,560, while in 1906 the amount of capital invested in new buildings and improvements was $3,051,505. The latter figures, however, are an increase over 1905, when a little less than $2,000,000 was the value of the improvements for which permits were issued.

Last year the total was swelled by the permit for the 24-story Imperial Building, which is estimated to cost $6,000,000. Even with this deducted from the total the figures for the year are appreciable in excess of those for 1906. A feature of the year's operations has been the number of new dwellings erected or commenced, and not only this, but they are of a considerably better quality than has heretofore been the case. Building Inspector Sherman's figures show that over $1,683,740 was spent in the erection of new homes.

Toledo, Ohio.

The tendency to contract all undertakings in the industrial line, especially during the last 10 weeks of the year just closed, is strikingly manifested in the figures compiled for December by the Department of Building Inspection. In October there were 89 permits issued for buildings estimated to cost $403,307, in November the shrinkage was indicated by 67 permits for buildings costing $105,441, and in December there were 51 permits issued for buildings costing only $85,160. As compared with December of the year before the figures show 60 permits to have been issued for buildings costing $256,912.

Taking the year as a whole the volume of operations in 1907 show a marked contraction, as compared with 1906, this being due in large measure to the high cost of all materials and labor connected with building operations. In 1907, according to W. E. Weber, assistant building inspector, there were 1182 permits issued for building improvements costing $3,400,865, while in the 12 months of the previous year 1307 permits were issued for improvements involving an outlay of $4,696,970.

New Publications.

Structural Drawing.—By C. Franklin Edminster; 148 pages. Size, 9 x 7 in. Illustrated by 74 full page plates. Bound in heavy board covers, with neat side title. Published by David Williams Company, 14-16 Park place, New York City. Price, $2.50, postpaid.

The general scope of this work is indicated by its title, although in preparing it the author, who is an instructor in the Department of Applied and Fine Arts at Pratt Institute, has aimed to present to the mechanic and others interested a systematic course in structural drawing, commencing with the standard forms and gradually leading up to typical columns, girders, trusses and framing details. In view of the extent to which structural iron work is at present employed in connection with buildings of all classes, and especially those designed for business and office purposes, the work under review will be found of special value to the ambitious and progressive student of building construction. A few problems in geometry and projection have been introduced for the benefit of those who have not studied drawing; also a short chapter covering the general notes on drawing materials. In order to accomplish the best results it is suggested that the student commence with the first plate and follow in the order given, mastering each problem in succession. The considerable number of isometric views that are interspersed serve a practical purpose in illustrating various phases of the work in a clear and comprehensive manner, thus materially assisting the student and draftsman.

Field System.—By Frank B. Gilbreth; 200 pages. Bound in flexible leather covers, with gilt edges and rounded corners. Published by the Myron C. Clark Publishing Company. Price, $3, postpaid.

This work is by a well-known building contractor, who has made the "Cost-plus-a-fixed-sum-contract," well known to the building world. In order to handle his extensive contracts the author found it necessary to develop a system whereby his foremen would execute work properly, promptly and economically. The code of rules and instructions to his foremen, as well as the printed forms for their reports, were bound in book form, which the author has called his "Field System." The book is not presented as a literary production, as much of the data has emanated from men in the employ of the author, and the book presents them in terse, concise language, which makes the thought clear to any employee of average intelligence. Each contractor, it is well known, develops his system along lines peculiar to his own ideas and the ideas of those in his employ, but the work under review goes a step further and presents a successful system in its entirety. As such its publication cannot fail in accomplishing the objects sought—to make for a better system and better results in the building industry.

Mechanical Removal of Shavings in Factories.

BY HUGH F. MUNRO.

A shaving and dust collecting system in a wood working establishment is to-day recognized as not only a necessary part of the equipment, but also a money making part. Some of the resultant benefits are: A clean mill or factory; reduction of fire risks; handling the shavings at the smallest cost; utilizing shavings for fuel with the best results; giving better working conditions for the employees, with consequent increase in the quantity of the product; reducing the risk to person and property and liability to damage suits.

Beginning at the shaving or dust making machine, a hood or hopper, preferably of galvanized sheet metal, is closely fitted to the cutters and shaped in such a manner as to utilize the direction given the shavings. This must be easily detached to allow of ready access to the part of the machine it covers. It is advisable to have a gate in close proximity to the hood in order that it can be shut off from the system when not in use.

Sheet metal pipes are laid from the various machines, and these are merged into one main pipe, whose areas must be equal to the sum of the areas of the branches. This main pipe has reducing pieces put into it at suitable intervals, which regulate its area in proportion to the branches it is carrying. This insures an even suction and an uniform speed of the material within the pipes, thereby preventing any choking or unequal pull at varying points of the mill. The main pipe leads directly into the fan which produces the suction pressure.

Requirements of Fan Construction.

The fan used for woodwork is generally made of sheet steel to enable it to withstand the blows given by blocks, &c., passing through it. Within the steel shell a paddle wheel is mounted on a shaft, passing through one side of the shell and carrying a pulley. The shell is open at the opposite side to receive the pipe which is to deliver the mixture of air and material. The paddle wheel, being made to revolve rapidly, exhausts the air within the shell, driving it out through an opening made in line with the direction in which the wheel is traveling. The result is a partial vacuum within the shell which can only be filled by air rushing in at the various inlets of the machines. It is this strong air movement which carries the shavings or dust along with it into the fan. It is evident that the faster the fan revolves the stronger will be the pull at the hoods, but fans consume considerable power, and do so in proportion to the volume of air which they are handling. It is here that the advantage of the blast gates becomes apparent, for, the inlet at any machine being closed while the machine is not in operation, the volume is reduced, and as it often happens that 50 per cent. of the machines may not be in operation, it can readily be seen that a considerable power saving is effected. Fans of this class often handle 5000 cu. ft. of air per minute, and it need not be wondered at that the problem of what to do with this volume and its load of shavings was one that long exercised the minds of those engaged in such work.

Separating Air From Shavings.

Various methods of separating the air from the shavings have been tried. If the dust laden air is blown into a closed receptacle, no openings being left, the back pressure on the fan would prevent it from lifting on the exhausting side. Finally it was discovered that by causing the air to revolve in a cylinder of suitable size the dust would be thrown out of the revolving current because of its greater weight. Centrifugal force acting upon the heavier particles drives them outward toward the inner surface of the shell. Here, in obedience to this force and the impulse of the fan, they begin a spiral movement which ultimately carries them out at the lower end of the collector, completely separated from the air, which in the meantime has escaped through the opening at the top. A certain amount of air can be made to go with the shavings by raising or lowering a disk which is adjustably fixed inside of the collector.

Location of Dust Collector.

The dust collector can be placed at any convenient point for the deposition of the shavings and the discharge from the fan led to it. It is best, however, to locate it over the boiler house, and by means of a furnace feeder the shavings are fed automatically into the boiler. The fuel value of shavings fed in this way is much greater than when fed by hand, the reason being that they are fed in a shower or spray and not in a mass. Nor does the fire suffer the chilling effect caused by frequent opening of the fire doors. The disk inside of the collector can be manipulated to give the proper amount of air necessary to distribute the shavings on the grate bars and to insure perfect combustion, which does away with the large volumes of smoke often seen issuing from a stack where shavings are being burned. It would seem at first sight that a constant and uniform supply of shavings would have to come over from the mill in order that steam would be kept up, and yet none be needlessly burned. This, however, cannot be done in an ordinary mill, nor is it necessary. To effect the desired result a switch damper operated by a cable leads to the furnace and the other to the shaving vault. This damper can be set to divert the whole of the shavings into the vault or the furnace or partially into either. A pipe with a suitable shaped mouth piece is now placed near the vault door and led into the main exhaust pipe near the fan. The switch is set to allow just the exact amount to be fed into the furnace any surplus being deposited in the vault. The accumulated surplus can now be drawn upon when the supply from the mill runs low and by means of the uptake before mentioned is led back into the fan and from thence through the collector and feeder into the furnace. When it is remembered that shavings fed in this manner will go half as far again as those fed with a shovel, it can readily be seen that a complete shortage is not likely to occur. This method has been successfully applied in a factory where only a double surfacer and matcher was in operation.

The Pittsburgh Builders Exchange League.

The annual corporation meeting of the Builders' Exchange League of Pittsburgh, Pa., was held on the evening of Tuesday, January 14, when new officers were elected and new policies agreed upon. It is the intention of the organization to at once begin a campaign of education, conciliation and earnest effort to bring the building trades of the city into a more harmonious relationship than has heretofore existed for some years past. After receiving reports of various officials, the election took place, resulting as follows:

President, Adam Wilson.
First Vice-President, F. C. Jones.
Second Vice-President, W. N. Kratzer.
Secretary, T. W. Jones.
Treasurer, Capt. T. J. Hamilton.

The Board of Directors was very carefully selected and its membership represents the leading building contractors and corporations in the Pittsburgh District, as follows:

Members at Large.—Samuel Francies, E. J. Dietrick, L. E. Aber, Joseph Stockhausen.

Master Builders' Trade.—H. L. Kreusler, T. J. Hamilton, S. P. Trimble, R. K. Cochrane.

Master Stone Contractors' Trade.—Samuel Holmes, Fred Hendler.

Master Brick Contractors' Trade.—Charles H. Austin, B. A. King, M. G. Johnston, John McKay.

Master Electricians.—A. K. Springer, W. I. Bickford, E. C. Carter, H. H. Anderton.

Master Steam and Hot Water Fitters' Trade.—P. F. Maginn, James S. McVey, H. Williams, R. S. Smith.

Cement and Asphalt Paving Contractors' Trade.—D. H. Littell, W. C. Thoma, George L. Peabody, W. C. Williams.

Master Plumbers' Trade.—Joseph A. Weldon, S. S. White, D. G. Deeley, J. H. Folsom.

Master Housesmiths' Trade.—W. N. Kratzer, W. W. Somerville, Richard Martin, A. C. Dean.

Master Slate and Gravel Roofers.—P. Le Goullon, Scott A. White, George P. Helt, William Hahn.

Master Tinners' and Cornice Manufacturers' Trade.—A. Rasner, T. W. Irwin, J. D. Riley, Jacob Graff.

Master Plasterers' Trade.—W. P. Getty, James M. Jones, Joseph Schuchert, W. H. Richey.

Planing Mill and Retail Lumber Dealers' Trade.—Edwin M. Hill, George Glass, representative E. M. Diebold Company; T. W. Jones.

Master Painters' Trade.—Abe Pew, G. G. O'Brien, Frank Brown.

Builders' Supplies Trade.—Otto F. Felix, Pittsburgh Supply Company; Thomas Lane, Thomas Lane Company; James Adams, D. J. Kennedy Company; C. M. Bragdon, Knox, Strouss & Bragdon.

Master Stained Glass Manufacturers.—Frank Rudy.

An amendment to the constitution was adopted limiting the membership to 400. It was pointed out that the change made in the class of membership from corporation to individual during the past year had worked benefits in the association. One of the features of the future programme will be a changing in the policy of reticence to a courting of the fullest publicity. In dealing with the labor organization it is intimated that the various members will stand for the principle of allowing any American boy to learn under them any trade that he may wish. They will discriminate against no organization and so far as it can be done equitably will treat with all classes of labor and seek to gain friendship rather than enmity at all times.

The present condition of the building trade in Pittsburgh is such that the members of the League believe that unless there is an earnest effort on their part and the trades to get together and encourage building enterprises business will be seriously hampered. Many extensive enterprises are under consideration that have been held up because of the uncertainty of the attitude of the building trades, and those who are fostering building prospects must be made to feel that there is no hindrance to operations once they are started before they will make the start.

It is understood that all but a few of the trades have arranged for the year's work, with practically no changes in wage agreements, and the rest can be brought into line by persuasion and fair appeals to them for mutual benefit.

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FREE PUBLIC LIBRARY BUILDING—CARNEGIE DONATION—AT KEARNEY, NEW JERSEY.

HERBERT E. DAVIS }
CALVIN KIESSLING } ASSOCIATED ARCHITECTS

View in Reading Room with Reference Room Beyond

Stack Room and Delivery Desk as Viewed from Main Entrance

FREE PUBLIC LIBRARY BUILDING AT KEARNEY, NEW JERSEY.

HERBERT E. DAVIS } Associated Architects
CALVIN KIESSLING }

Carpentry and Building

NEW YORK, MARCH, 1908.

A Shingled Cottage at Melrose Highlands, Mass.

THOSE of our readers who are interested in home building—and the number is doubtless legion—are likely to find much that is of suggestive value in the design which we illustrate herewith and which constitutes the basis of one of the half-tone plates accompanying this issue of the paper. The pictures show the appearance of the finished structure, and clearly indicate the architectural treatment of the exterior, while the plans afford an excellent idea of the interior arrangement of the cottage. The details presented upon the following pages are suggestive of the construction employed. The building is a single dwelling containing eight rooms, exclusive of a commodious reception hall and a bathroom. An additional room can be finished in the attic if desired, as shown by the dotted lines on the attic plan.

The house stands on a practically level lot of 12,000 sq. ft. area. The foundations and underpinning are of local rubble stone laid in cement mortar, the underpinning being laid in random ashlar. The cellar floor is concreted 2½ in. thick and troweled to a smooth finish. The frame of the building is of spruce. The outside wall studs are 2 x 4 in., placed 16 in. on centers; the collar beams 2 x 4 in.; the sills 6 x 6 in., and the rafters 2 x 5 in., placed 20 in. on centers. The first and second floor joists are 2 x 9 in., placed 16 in. on centers, and the attic joists are 2 x 8 in. placed 20 in. on centers. The veranda joists are 2 x 6 in., and the rafters 2 x 4 in. The sizes of other members are indicated on the framing plan.

The walls, under-floors and roofs are of sound, narrow hemlock boards. The walls are covered with heavy sheathing paper, over which is laid clear cedar shingles. The roofs of the main house and L are covered with extra cedar shingles laid 5 in. to the weather, and thoroughly flashed with 9-oz. zinc and 2½-lb. sheet lead. The roof of the front piazza is covered with 8-oz. duck and treated with four coats of lead and oil paint. The reception room bay has casement sash opening outward, and the finish of the room, including the stairs and seat, is of elm. All other finish is of cypress, whitewood and North Carolina pine, the latter wood being used in the service portion and in the den.

Front Elevation.—Scale, ⅛ In. to the Foot.

A Shingled Cottage at Melrose Highlands, Mass.—Arthur W. Joslin, Architect, Boston, Mass.

The floors of the reception hall, parlor and dining room are of plain oak, while all other floors are of hard pine. All flooring stock is narrow, matched and thoroughly kiln dried.

The plastering is two coat work over 1⅛ in. spruce lath, and all outside walls that are sheathed, as in the kitchen, bathroom, &c., are back plastered.

The plumbing is of the modern type, and all exposed piping is of brass in patent hangers and heavily nickel plated. The bathtub is of iron, enameled, and the kitchen sink and laundry trays are of soapstone. The house is heated by hot water, a Winchester boiler being used.

The fireplace and mantel in the den are made of common water struck brick with pattern in black headers. A 2-in. thick by 7-in. wide North Carolina pine shelf is carried on brick corbeled out from the face of the fireplace breast. The finish of this room is stained "Forest Green," shellaced two coats and rubbed down. All other interior finish is three-coat work, the North Carolina pine,

. . . . Jason of
. . . . Newall of Melrose
. . . . cost of the house includ-
. . . . and electric fixtures,
. . . . included in the above cost
. . . . which amounted to about

The Modern Ice House.

. . . construction is a topic of great interest to a . . . of readers, as evidenced by the questions that are constantly arising as to the methods of preparing buildings either for the storage of ice or for cooling purposes. In many sections of the country it is common to find a small ice house as one of the buildings requisite to complete the farm equipment, and some comments therefore regarding an ice house suitable for the needs of the average farm may not be without integest at this time. It should be remembered, however, that in planning his ice house the farmer should not make the mistake of constructing a building too small, except be live in a section of the country where the winters are long and severe. It

A Shingled Cottage at Melrose Highlands, Mass.—Side (Left) Elevation.—Scale, ⅛ In. to the Foot.

is not so much a question of how much ice he needs for family use as it is of how much he is likely to waste, and whether it will last through the hot season until cold weather again arrives. A large block of ice will last much longer relatively than one somewhat smaller.

A convenient size for an ice house for the farm is about 15 to 20 ft. square in plan. Allowing 1½ ft. for the space between the two walls and the space between the inner wall and the ice, this will give a block of ice 12 to 17 ft. square, and if it is 12 to 15 ft. high it will contain a sufficient number of tons to meet average requirements. The loss of ice from melting is very great in all ordinary ice houses, and especially is this true where it is taken out daily in such small pieces as is usually the case.

The house should be built above ground, and if possible should be placed where it will be more or less protected from the noonday sun. A low cost ice house can be built with ordinary lumber and by any one handy with tools. According to a writer in an exchange, the essentials to be observed are: First, drainage below and ventilation above; second, a perfectly tight foundation, as warm air rises and a current once started through the ice will cause it to melt very rapidly; third, a double wall surrounding the ice on the sides and top.

The foundation should be made of brick, concrete or stone masonry, and in which sills 2 x 8 should be bedded in cement. On this erect 2 x 8 studding, 24 in. apart. On the inside for the inner wall ½-in. sheathing material may be used of almost any kind of lumber. Some durable wood is to be preferred, as these boards are apt to decay quickly. For the outside good novelty siding may be used. It should be free from knotholes and cracks. The rafters should be 2 x 4, with sheathing on the under side. It is important to have air space between shingles and sheathing beneath the rafters, as every one knows how hot it gets under a barn roof in summer. The space between the two walls on the four sides may be left empty if the outer inclosure is very tight, as a dead air space is one of the best nonconductors. But it will not be a dead air space if there are holes or cracks in the siding, but the air will circulate and prove of little value as a nonconductor.

If the ground on which the house is situated is of a gravelly, porous nature, no provision need be made for drainage, as the water will be absorbed as fast as the ice melts. Otherwise the floor should be graded off, so as to slope to one point, where surplus noted may be taken off by means of a trapped outlet pipe to exclude all air while allowing the water to escape.

The door opening of the house should begin about 4 ft. from the ground, and extend upward nearly to the top of the roof. The outer may be made in two or three sections, and the inner inclosure supplied by boards crosswise, put in as the house is filled and taken out as it is emptied. It is a mistake to provide too much ventilation. For an ordinary house 1-ft. square openings at each end under the apex of the roof are sufficient, and it would be of advantage to provide for closing these on worm days.

In filling the house never lay the ice on the ground. The warmth of the earth will melt the ice continuously. The cakes of ice should be laid on old rails or any kind of timber. Straw or cornstalks are not good, as they crush tightly to the earth and get wet, and water is a good conductor of heat.

The ice on the pond should be worked out carefully and the blocks made of uniform dimensions. In laying, the joints should be broken and a space of 8 to 12 inches should be left betwee the ice and the wall. This may be filled with straw, the same material being used to cover over the top of the ice after the house is filled. The house should be painted white.

An ice house 15 ft. square and 12 ft. high will approximately the following amounts . . .

pieces 2 x 8 in. by 12 ft., 8 pieces 2 x 8 in. by 15 ft., 14 pieces 2 x 6 in. by 10 ft., 720 ft. sheathing, 850 ft. siding, 900 ft. shingles. It will cost at the present prices of lumber about $80, independent of the foundations.

Why "Common Sense" Flat Buildings Are Scarce.

Some very interesting comments explaining why "common sense" flat houses are not built in the city by wise investors formed part of the substance of a talk with a man who has grown old and rich in the real estate business, and were published in a recent issue of the *Sun*. The article appeals so strongly to those who have had experience in living in flats that we present it herewith.

This real estate man's dealing is not with the cave dwellers who inhabit holes in the artificial cliffs of 200 or 300 ft. altitude, but with those in other parts of the city who pay rentals of from $35 to $60 a month for flats or apartments.

The difference between a flat and an apartment is, first, in the vestibule down on the street level, and, secondly, in the rental. Almost anything with a rather roomy and showy lower hall is an apartment house and every flat that brings as much rent as $40 a month is an apartment as classified by owners and agents.

This real estate man from acting as agent for other owners exclusively has come to the position of owner and agent, and many of the valuable pieces of property that he manages he also owns.

"Why don't you build?" he was asked, "some common sense flats."

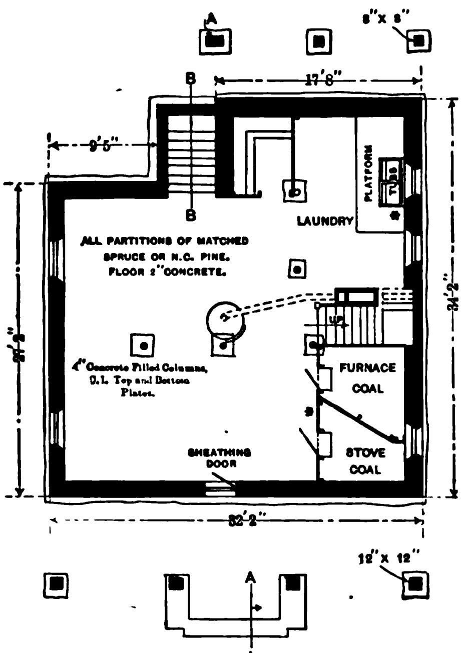
"I will if you will rent them for me," he replied.

"May be you don't know what my notion of a common sense flat is."

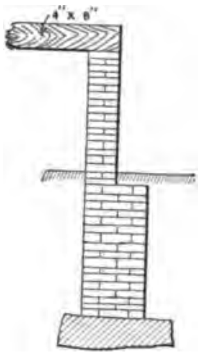
"Possibly I don't, but I know what a common sense flat would be," he said.

Asked to tell what in his opinion such a dwelling place would be, he said:

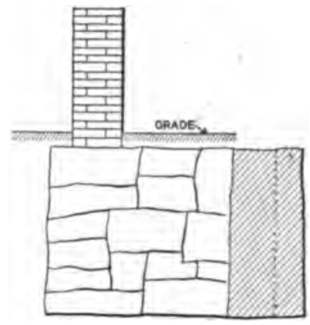
"I take it that you are thinking of such flats as an



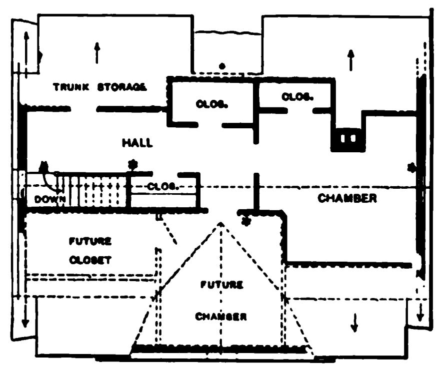
Foundation.



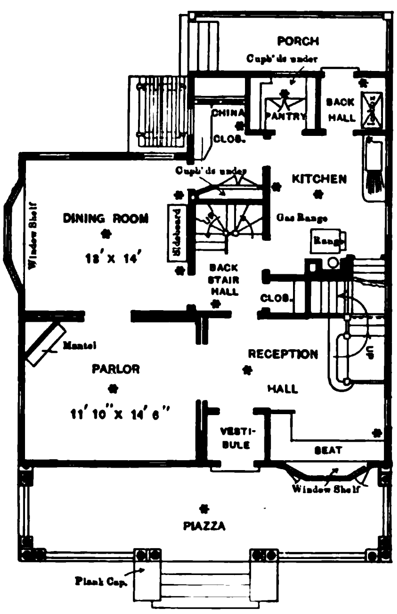
Elevation of Pier A of Foundation.



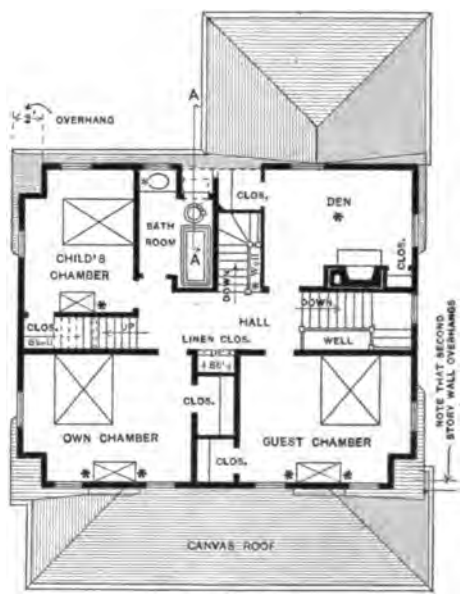
Section Through Porch Foundation on Line A-A of Plan.—Scale, ¼ In. to the Foot.



Attic.



First Floor.



Second Floor.

A Shingled Cottage at Melrose Highlands, Mass.—Floor Plans.—Scale, 1-16 In. to the Foot.

owner could afford to rent for from $30 to $60 a month—if any one would take them. Well, perhaps, the easiest way to indicate what I mean by a common sense flat is to take the average flat that rents for, say, $45 a month, and see what could be done with it.

"Nearly half of its floor space is occupied by parlors. They are the rooms that have daylight in them. A family that can pay $45 a month rent will have these rooms furnished rather nicely. They are then for company and show and not for comfort.

"The space occupied by the private hall, which is also for show, makes the show part of the flat somewhat more than half its dimensions. The dining room must comport with the parlors and the private hall, and is usually furnished in a way that forbids its comfortable use as a sitting room.

"The remnants of the floor space are occupied by two small sleep rooms—I do not say bedrooms, for there is hardly room enough for beds in them, and it would not be fair to speak of them as sleeping rooms, because they are not fit to sleep in—by a bathroom big enough for a three-quarter length tub, by a queer little hole of a kitchen and sometimes a closet that is used as a servant's room.

"Now, there we have some notion of the floor space of the average flat in a fairly good location that rents for about $45 a month. How would you change it to make a common sense flat of it?"

"First, cut out the two parlors and most of the private hall."

"That would also cut out the tenants," said the real estate man. "With most people who dwell in flats it is parlors first, then private hall, then dining room, and afterward some holes in the wall.

"The first thing the average flat hunter does is to look at the parlors. If these do not seem spacious enough for the price they go away, saying that they are much obliged and may perhaps call later. But, just for speculation, let us go on making a common sense flat.

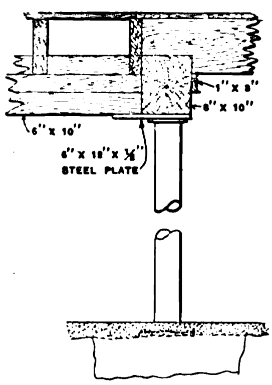
"I think I know somewhere nearly what you mean by such a flat, and will try to tell you what my own idea is, and we will see how we agree.

"You would cut out the two parlors to make space for one good sized living room, with an alcove for a box couch and a bureau such as would be called a chiffonier. This living room you would have furnished for comfort and for use; no parlor furniture, but a big extension table, some comfortable chairs, a couch, a piano, if you have one, and other pieces of furniture fit for a living room. How would that do?

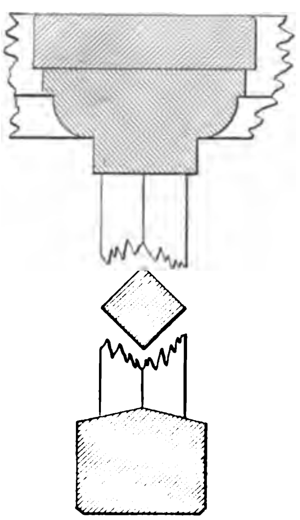
"Well, make a small reception hall out of the end of the private hall you enter from the public hall and of space gained by cutting off the end of the alcove in the living room. This reception hall would be most likely a dark apartment in which there would have to be a light constantly.

"It affords entrance to the living room and extends back as a narrow passage; the narrow part being curtained off by a portiere. Furnish it as nicely as you please.

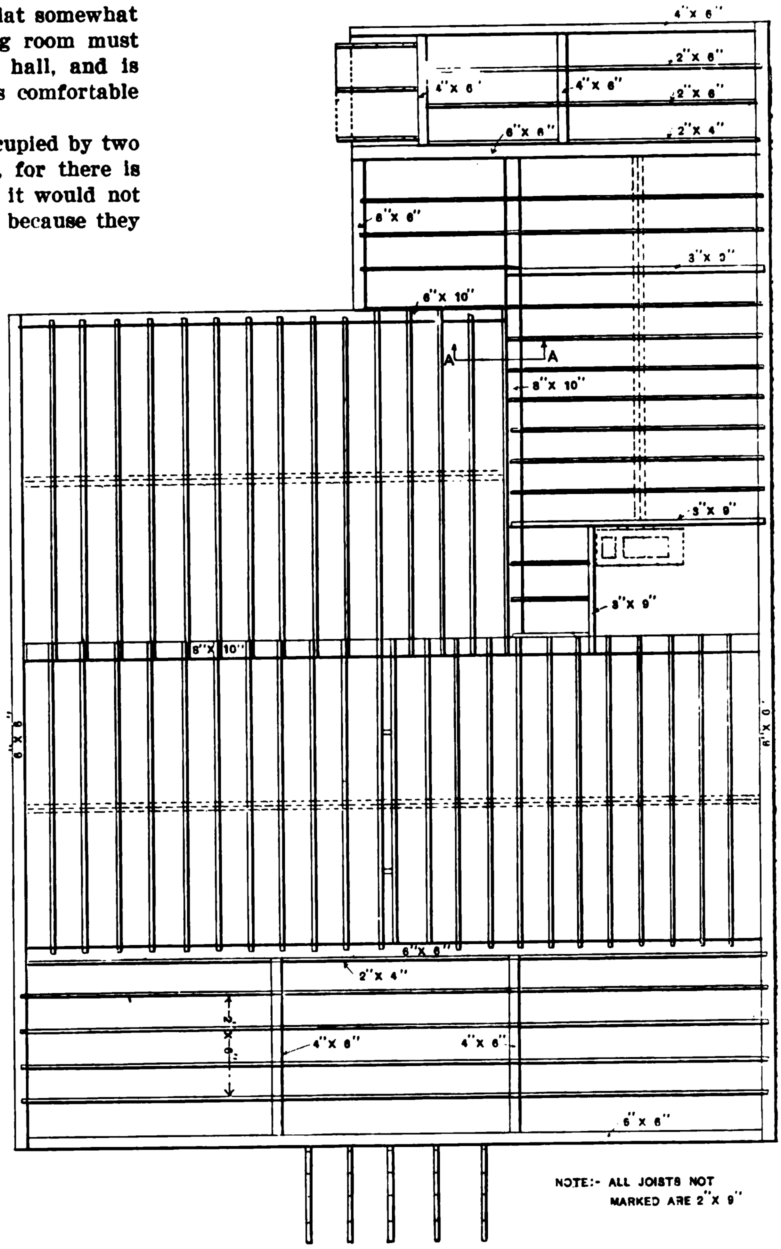
"In the rear of the flat have a small dining room, as well lighted as the construction of the house will permit, and a kitchen at least twice as large as the usual kitchen in a flat of this size. In between these rooms and



Section Through Girder on Line A-A of Framing Plan.—Scale, 3-16 In. to the Foot.

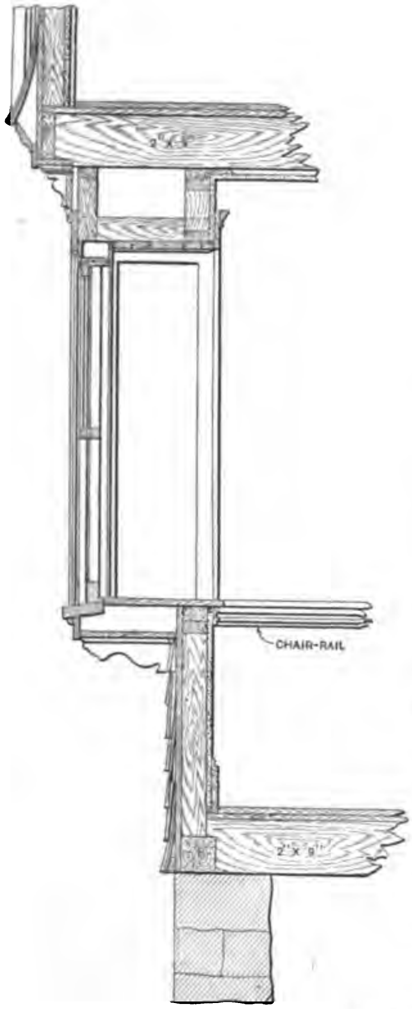


Piazza Balustrade.—Scale, 3 In. to the Foot.

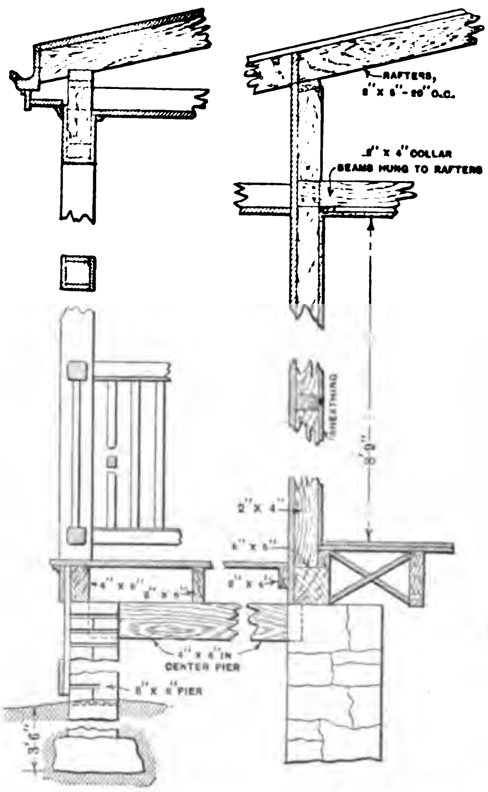


First-Floor Framing Plan.—Scale, ⅛ In. to the Foot.

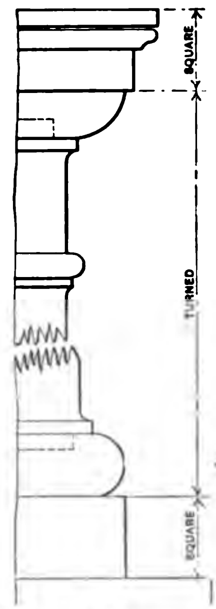
Miscellaneous Constructive Details of a Shingled Cottage at Melrose Highlands, Mass.



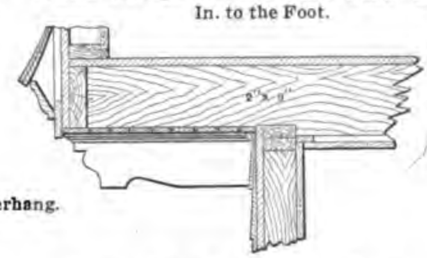
Section Through Dining Room Bay and Overhang. —Scale, ⅜ In. to the Foot.



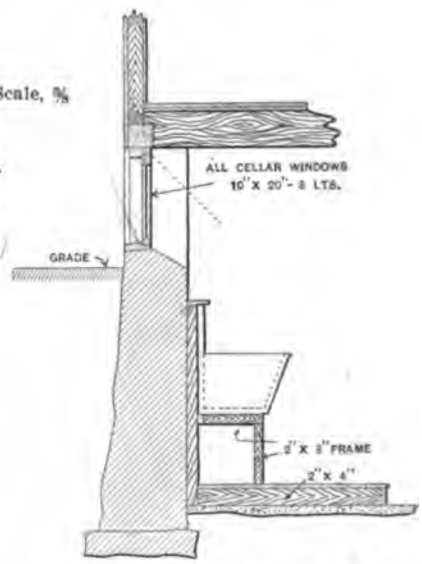
Section Through Rear Porch and Wall.—Scale, ⅜ In. to the Foot.



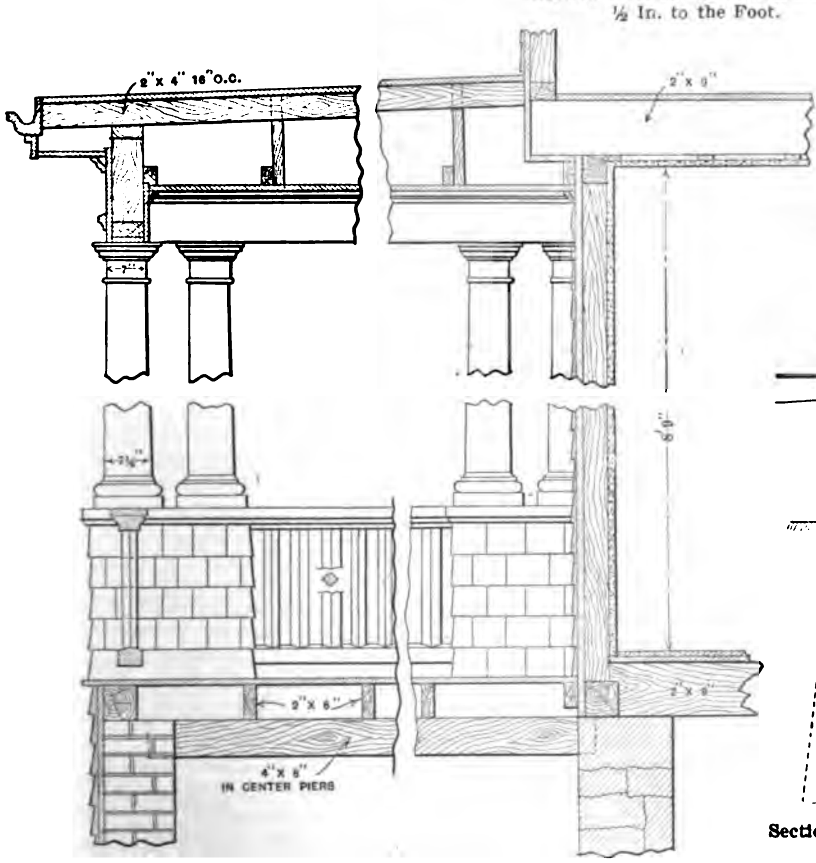
Profile of Piazza Columns.—Scale, 3 In. to the Foot.



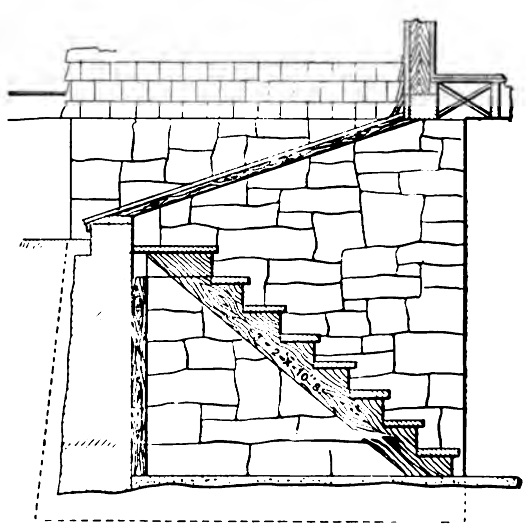
Section Through Overhang.—Scale, ½ In. to the Foot.



Section Through Foundation Wall in Laundry.— Scale, ¼ In. to the Foot.



Sections and Elevations of Front Piazza.—Scale, ⅜ In. to the Foot.



Section Through Bulkhead on Line B-B of Foundation Plan.—Scale, ¼ In. to the Foot.

Miscellaneous Constructive Details of a Shingled Cottage at Melrose Highlands, Mass.

the large front room, and entered from the narrow private hall, two large sleeping rooms with built in closets, and a bathroom and servant's room, all with windows on the air shafts.

"Now, how does this flat differ from the ordinary? It has a large living room, two large bedrooms and a large kitchen. It has a small but pleasant dining room.

"It has no parlors, but has a small reception hall in which callers or guests may be seated until received by the mistress of the home and admitted to the living room or other rooms of the flat.

"That living room, according to my way of thinking, would go far toward making up the difference between the average flat and a comfortable home. It could be furnished in as costly a way as you please, always bearing in mind the fact that the furniture in it is for everyday use, and is not such as is ruined by the sun coming in the windows.

"It could be used as a dining room on extra occasions by extending the large center table. The couch in the alcove permits giving up one of the sleeping rooms to a guest. The dining room, while small, is cheerful; the large kitchen is a blessing.

"But," said the real estate man, "it wouldn't do. None of it for me, as an owner or agent.

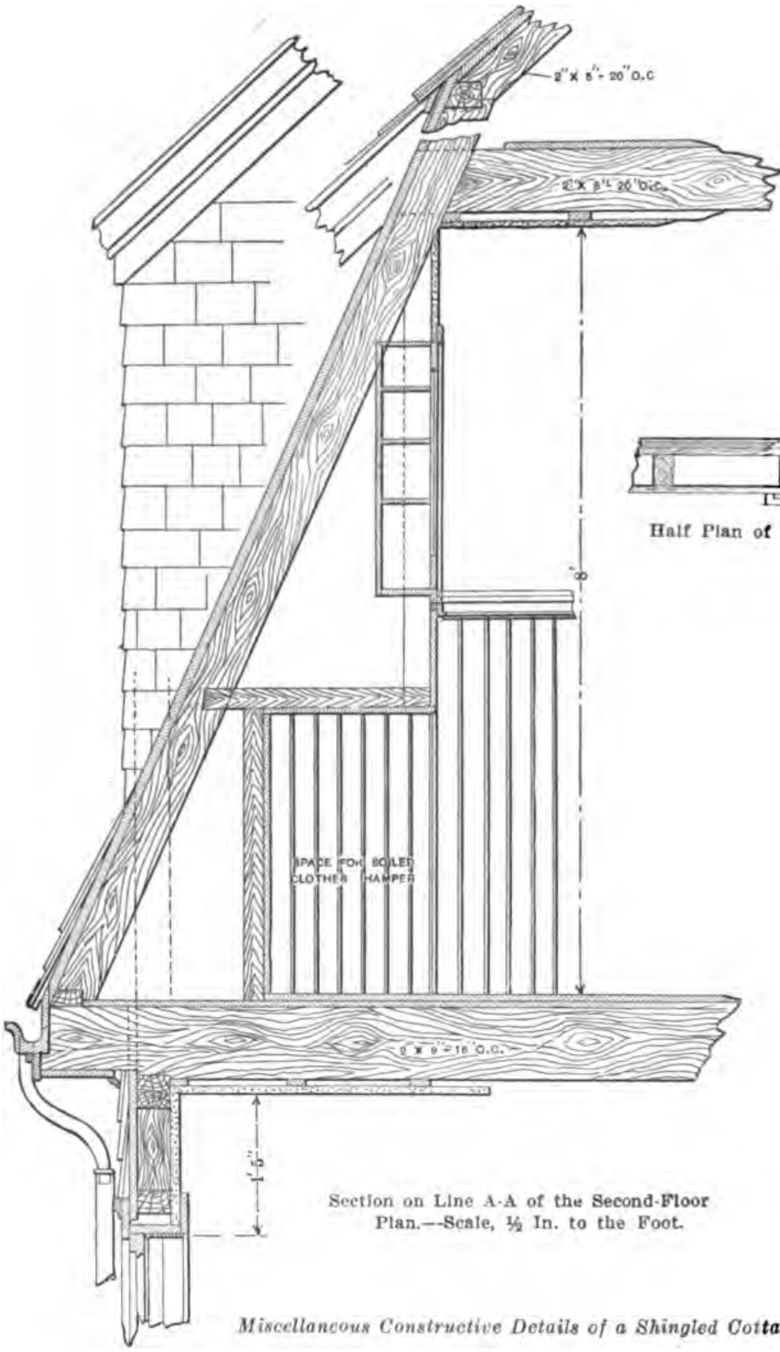
"What most people who dwell in flats want is parlor—all the parlor they can get for the money. Next, they want dining room. And, having these, they are willing to stay in a flat in which there is not a comfortable chair or lounge for everyday use, where the kitchen is smaller than a pantry should be, and where the bedrooms are holes in the wall.

"That's the sort of flat that will rent, and flats are built to be rented."

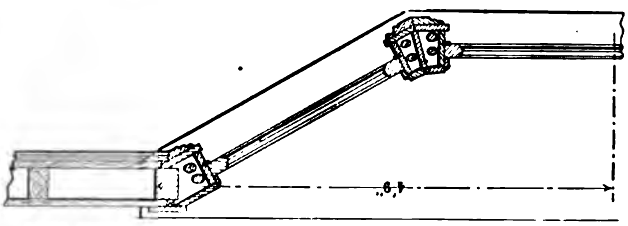
The Lumber Cut in 1907.

More lumber was cut in the United States last year than in any other year in its history. The enormous amount of 37,550,736 board feet was produced, and the mill value of this was $621,151,388. In addition, there were produced 11,858,260,000 shingles, valued at $24,155,555, and 3,812,807,000 lath, valued at $11,490,570. On the whole, it is safe to say that the present annual lumber cut of the United States approximates 40,000,000,000 ft., and that the total mill value of the lumber, lath and shingles each year produced is not less than $700,000,000. These figures give some idea of how vast is the lumber industry and how great is the demand for its products.

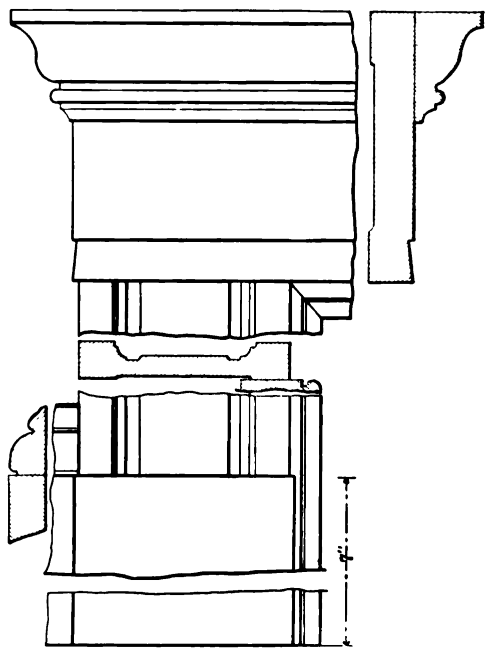
A glance at the kinds of lumber produced shows very clearly the passing of white pine and oak, one the greatest softwood and the other the greatest hardwood which the forest has ever grown. Since 1899 the cut of white pine has fallen off more than 40 per cent., while that of white oak has fallen off more than 36 per cent. To-day yellow pine leads all other woods in amount cut, while Douglas fir—and this will be a surprise to many—comes second. Since 1899 the cut of Douglas fir has increased 186 per cent. Louisiana is the foremost yellow pine State, with Texas, Mississippi and Arkansas following in order.



Section on Line A-A of the Second-Floor Plan.—Scale, ½ In. to the Foot.



Half Plan of Dining Room Bay.—Scale, ½ In to the Foot.



Details of Door Finish and Base in Principal Rooms.—Scale, 3 In. to the Foot.

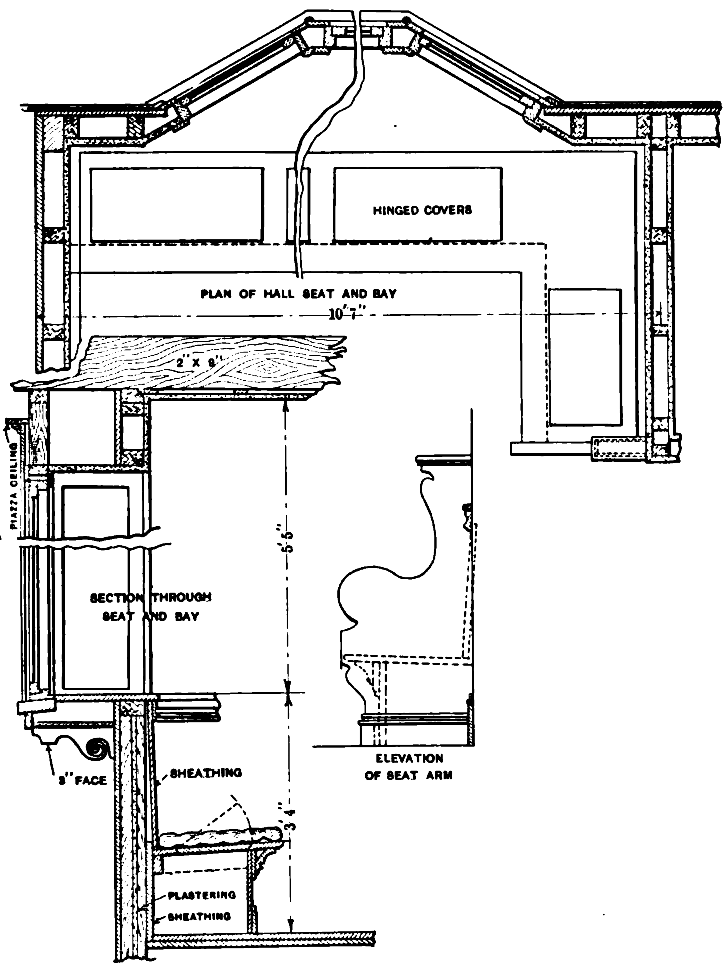
Miscellaneous Constructive Details of a Shingled Cottage at Melrose Highlands, Mass.

Washington produces by far the greatest amount of Douglas fir.

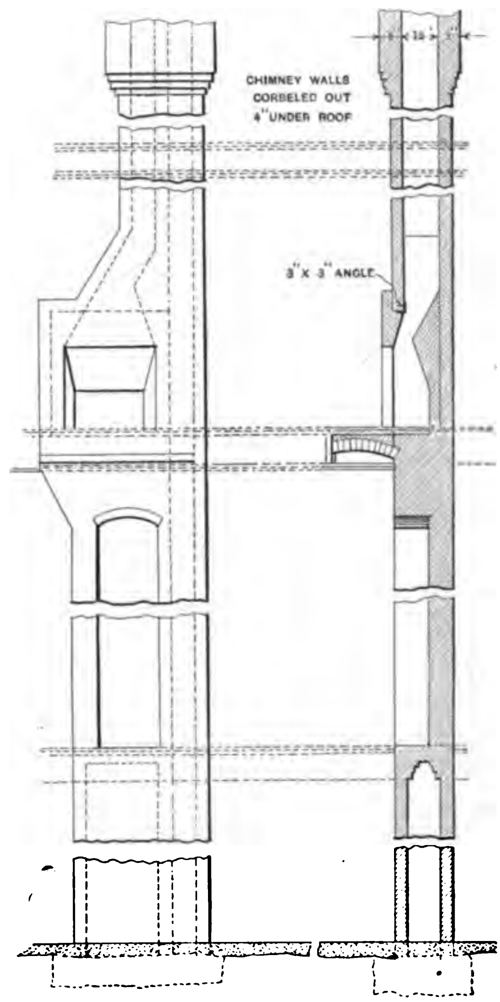
A comparison of the lumber producing States shows that since 1899 there have been many changes in their relative rank. Washington, which in 1899 stood sixth, now leads, while Wisconsin, which eight years ago led all others, is now third. In the same period Oregon, Louisiana, Mississippi, Idaho and California made great strides as lumber producing States, though, on the other hand, the amount produced in Michigan, Wisconsin, Minnesota, Georgia, Kentucky, Tennessee, Missouri, Indiana and Ohio fell off anywhere from 29 to 54 per cent.

The highest priced native woods are walnut, hickory and ash, and the cheapest are larch and white fir. From the fact, however, that since 1899 the average increase in the price of lumber has been 49 per cent., it will not be long before cheap woods are few and far between.

Figures upon the lumber cut of the United States in 1906 are contained in Circular 122 of the Forest Service, which can be had upon application to the Forester, United States Department of Agriculture, Washington, D. C.



Details of Bay Window and Seat.—Scale, ⅝ In. to the Foot.



Details of Fireplace and Chimney Construction.—Scale, 3-16 In. to the Foot.

Miscellaneous Constructive Details of a Shingled Cottage at Melrose Highlands, Mass.

New Uses for Woods.

There is a constant effort to broaden the uses to which various kinds of woods can be placed. Many products of the forest that were regarded as valueless until within the past few years have now become standard commodities. Twenty years ago maple was regarded as either an incumbrance or useful only for firewood. To-day it has become the standard flooring material throughout a very large portion of the United States and abroad, being used in many of the highest class structures, as well as for wagon and agricultural machinery building, &c. Hemlock, a wood despised for years as being practically worthless, is a standard building material to-day. Red gum, but very recently introduced as lumber, was unsalable up to within the last five years. Now the broadened demand is so active that many grades of it show a shortage in the market, says a recent issue of *Hardwood Record*. The despised tupelo gum has recently become a valuable commercial product, with every prospect that within a few years it will be so appreciated as to command as much money as cypress does to-day.

It is the constant study of users of wood to find cheaper substitutes for certain standard commodities, by means of which they can turn out their manufactured product at a diminished cost. Some manufacturers have succeeded in substituting other wood for oak. Chestnut and red gum have been the principal kinds used for this substitution. Yellow pine and poplar have largely taken the place of white pine, and now Pacific Coast woods are substituting the pines and hemlock. Box makers who formerly used soft woods exclusively have recently learned that they can employ gum, cottonwood and a large variety of other hardwoods advantageously. Substitution is going on constantly, and probably will continue to the end of time.

The tamarack of the North has been a despised wood in the past few years in spite of its strength and lasting qualities, and has even been rejected as a building material. It has been but recently discovered that tamarack makes a most excellent material for tanks, and for this purpose it is coming into quite general use at much higher prices than it ever would have brought in the form of joists and scantling.

Experiments are now being made with maple for car decking. It is strange that this trial was never given the wood before, for it certainly will prove an ideal material for this purpose. It will rot no quicker than yellow pine, Norway or fir, and will stand 10 times as much wet and rough usage as any of the woods named. Both northern and Southern hardwood manufacturers are creating a considerable demand of late for the coarse end of their hardwood products for sheathing purposes, and some of the woods are being quite generally used in the form of ship lap and bevel siding with good results.

There is a crying need for a substitute for hickory in the wagon and carriage making trade. It seems scarcely possible that any considerable quantity of undiscovered wood suitable for this purpose will ever be located in the United States, but it is logical to prophesy that a vast quantity of material excellent for this purpose can be secured in Mexico, the West Indies and the northern portion of Southern America. The forests of these countries are all rich in minor hardwoods of very dense character, which are tough and not subject to speedy decay. Undoubtedly the wagon maker who wants to perpetuate a source of supply should cast his eyes in the direction noted.

POPULAR EDUCATION FOR INDUSTRIAL EFFICIENCY.

AT the annual dinner of the Builders' Exchange of St. Paul, Minn., held on January 21, a most important address on the subject of industrial education was delivered by S. L. Heeter, superintendent of the public schools of that city. The speaker went at great length into the matter of popular education for efficiency in the industrial world, pointing out that in the haste of successful industrial development, in the new industrial order which has been evolved, there has been left no place for a broad and adequate training for our industrial workers. He emphasized the fact that the very next step in industrial America must be in the direction of a system of popular education for industrial efficiency. Continuing, he said:

I sincerely believe we are at the beginning of a great development of primary industrial education in America through the channels of popular education. We are just awakening to the imperative need for that sort of thing. It is growing out of the utter inadequacy of our present educational system on the one hand in providing practical education for industrial workers and out of the recognized inability of our industries on the other hand to provide anything more than narrow and highly specialized skill.

We are proud, and justly so, of what we are prone to believe is the finest public school system in the world, a system which has developed marvelously along certain pretty definite academic lines, but they have been *academic* lines looking toward the professions rather than the vocations. There is here one fact which we must recognize. There is too wide a chasm between our educational system and our industrial life. Invention and specialization continue to withdraw the old-time chores, light jobs and occupations from the fireside, farm and workshop, and transplant them behind closed doors. The schools so isolate themselves from the industrial world and receive so little inspiration from the industrial age in which we live, that thousands of boys leave the elementary schools of this country year after year as mere children, helpless in the whirl of our industrial cities, and drift about from one low grade industrial pursuit to another or swell the crowd of improvident juvenile tramps. Make the rounds with me any day with a half-dozen worthy boys looking for a position and I will convince you in a half-hour that our city boys are absolutely put out of business with no free opportunity to learn a trade.

While the school of the future should continue to train the more fortunate few who look forward to a professional life, it should also offer the larger number who go into industrial life an opportunity to at least cultivate industrial intelligence, to grasp the intellectual side of vocations, which is the result of co-ordination of all-round industrial training and all-round mental training. This alone can produce a high type of industrial workers.

Our American laboring classes average less than five years in the public schools; five years in the lower grades of our public schools is the average for the boy who goes to work, while eight years in the elementary school, four years in a classical high school and four years in the professional school is the opportunity provided by the State for the teacher, lawyer and physician. Sixteen years of training for the professional man, and none for the industrial. Sixteen years of *special* training for the 2,000,000 of people engaged in the professions and no educational facilities along lines of special training for the 30,000,000 engaged in productive work in this country. We speak of the dignity of labor and yet say to the working man that there is nothing in industrial processes and materials worthy of being dignified in elementary education.

It ought to be as easy for the majority of our people in their early years to acquire industrial intelligence and the rudiments of craft skill, as it is for the small minority to secure cultural advancement. It ought not to be more difficult to become a carpenter, a machinist or a plumber than it is to become a teacher, a lawyer or a doctor. It is the time for the State to do more than educate leaders. Where there is one who has the natural ability, the aptitude or the time for professional study, there are thousands in the forests, on the farms, in the mines, in all forms of mercantile and commercial life in the city, who, from inclination, necessity or desire, begin their careers with only the rudiments of an education, and with little oportunity in daily life to better their condition.

. . . .

Now, in closing, what are my recommendations? It is easy enough to generalize. But what are the concrete possibilities? First: Reorganization and simplification of the work in our grade schools to such an extent that the elements of general culture as well as the tools of an education as provided in reading, writing, arithmetic, spelling and so on may be acquired in the first six years instead of the first eight. These schools should constitute the "folk schule" of America, the schools for classes and masses alike.

Second: The reorganization of our courses of study and our educational aims in two upper grades of our elementary schools upon the basis of vocation as well as culture. A richer civic content to be given the studies and activities of the grammar schools by the elimination of unimportant topics in arithmetic, by teaching individual handwriting that shall meet the requirements of business, by more regard to business spelling, commercial forms and correspondence, by drawing less artistic and decorative and more mechanical, by more practical language training and less formal grammar, by more attention to the commercial and industrial aspects of geography, to the civic and institutional side of history by more frequent observation and close study of the leading industrial plants of the community.

Third: By a decrease of school hours so far as formal studies in the grammar schools are concerned for certain boys and girls forced by circumstances to go early to work, and by a corresponding increase in time for such pupils to be given to manual training and commercial subjects, to the extent of utilizing a larger variety of suitable materials and processes in the various leading industries of the community, ending possibly in a closely articulated elementary apprenticeship system between the grammar schools and certain industrial enterprises.

Fourth: By the introduction of general manual training and commercial courses in all classical high schools and by the establishment of such a number of high schools in every large city as attendance will warrant, thus making the high school less a school for the privileged classes and more completely a part of our common school system.

Fifth: I cannot make this recommendation without a concrete illustration which I beg you to pardon. A few years ago a little unknown lumber town in Wisconsin was forced to plan for the construction of an ordinary high school building. As the plans were completed one of its wealthy public spirited citizens proposed to build a second building alongside of it at his own expense, connect the two with bridges, the second with an industrial equipment the best that could be bought with money. The schools were built and furnished, the superintendent's salary was doubled by the philanthropist and Wisconsin's first educator, the State Superintendent of Public Instruction was employed. To-day the little town of Menomonie has a world wide reputation, whose industrial schools are visited annually by people from all parts of the world.

Sixth and last: We are not interested in St. Paul alone, but in this entire Northwest. The propositions laid down here to-night should be repeated in every large city of Minnesota, and the time will soon come when both the State and National Government will assist in the establishment of agricultural high schools in the rural districts and technical secondary schools and trade schools for every large city. May that recognition come soon to Minnesota, and then this North Star country will not be outstripped in its race for industrial supremacy.

Convention of New York State Association of Builders.

According to previous announcement the twelfth annual convention of the New York State Association of Builders was held in Rochester on January 29, the meeting being the largest, most enthusiastic and successful gathering the organization has ever held. There were nearly 200 delegates in attendance at the sessions, these coming from 12 cities.

The following is a list of those who officially attended as delegates:

Amsterdam: John J. Turner, K. B. Schotte, C. B. Machold, A. R. Gardner.
Bath: M. E. Shannon.
Buffalo: Fred Allen, R. C. Batt, F. E. V. Bardol, F. W. Carter, A. S. Butler. P. Christman, P. Christman, Jr., W. A. Coles, Fred W. Cox, B. I. Crooker, Thomas Dyer, M. G. Farmer, F. N. Farrar, Christian Flierl, Geo. E. Frank, Jos. J. Feist, P. M. Ginther, A. S. Goltz, Geo. J. Hager, John W. Henrich. Fred Hummell, Jas. P. Hunt, E. D. Hoefler, F .C. Kempf, N. G. Kempf, Geo. W. Maltby, Theo. Metz, G. W. Morris. Frank Petit, R. J. Reidpath, Jas. Rosney, Gus. Schrier, J. L. Seligman, A. H. Stowell.
Corning: M. E. Greggory.
Dansville: Peter le Faforce.
Elmira: C. F. Spaulding, C. A. Pulford.
New York: Isaac A. Hopper, P. J. Brennan, D. W. Mapes, W. G. Jones, Chas. F. Hart, J. Odell Whitenack, Edwin Outwater, Ronald Taylor, Lewis Harding, C. E. Cheney, T. S. Barnes, Ely Greenblautt, A. Von Den Dreisch, Chas. A. Cowen.
Niagara Falls: John Pitman, Chas. Allen, Fred J. Allen, W. W. Snyder, W. H. Gillett, R. W. Pollard, Chas. Braas, W. J. S. Cowdrick, M. T. Ryan, George Halberle.
Olean: R. U Taylor, D. W. Dean, J. W. Shelden, Wm. Gabler.
Syracuse: J. W. Dawson, Richard O'Connor.
Utica: W. F. Weiss, W. B. Williams, F. Bablic, Pierce Jones, Griff Griffiths.

In addition to the above, about 80 delegates from the Rochester Builders' Exchange were in attendance.

The opening session of the convention was called to order at 10 o'clock in the spacious rooms of the City Council, President Fred Gleason being in the chair. The mayor of Rochester, Hon. H. H. Edgerton, he himself being a successful general contractor, welcomed the delegates to the city, the response being made by President Gleason.

President's Address

The regular order of business was then taken up, routine matters being considered, after which President Gleason submitted his annual report, from which the following extracts are presented:

There are some matters that I would like to call to your attention at this time, and if you think proper would be pleased to have some action taken, as I think they are entitled to be termed important.

Liability Insurance.—One of the fixed charges of to-day in the contracting business is liability insurance. Is the policy what it should be? Does it protect all it should?

Does it exempt from its liability to the policy holder most of the things that cause accidents to our employees?

In other words, can and should the form be changed with justice to all concerned?

Is the cost of said insurance fair to all, and the method of determining the amount to be paid the proper one?

National Association.—I have had some correspondence with the secretary of the National Association, and he advances many reasons and the advantages of this association joining with them, and I have promised to call it to your attention, that you might take such action as you thought proper.

As the time has now arrived for my retiring from the office of president I desire to express my sincere thanks to all the members of this association for the great honors they have conferred upon me in selecting me to preside over the destinies of our association for the past two years.

I deeply appreciate their loyal support in everything I have attempted for the advancement and extension of the State Association of Builders, and only regret that I have not been able to accomplish all to which I have aspired.

During my incumbency to the office of president I have endeavored to carry out what I conceived to be the wishes of the association, and if I have failed to meet your expectations I trust you will not ascribe it to lack of interest or effort on my part.

My relations with all of the officers and committees have been pleasant throughout, and I shall ever be grateful for their uniform courtesy and kind words of encouragement.

And now, gentlemen, as we are about to enter the active work of the session of 1908, let me ask you to take up the questions that present themselves for solution, so that the results of your deliberations may result in the greatest amount of good for the State Association of Builders of the State of New York.

Secretary Carter's Report.

The report of Secretary-Treasurer James M. Carter was then presented, showing the association to be in splendid financial condition. During the past year the Mason Builders' Association of Utica has been added to the membership.

At the meeting of the State Association of Builders held in Elmira in January of last year, Isaac A. Hopper of New York City was appointed chairman of a special committee to consider the question of licensing builders. At the present meeting Mr. Hopper submitted an exhaustive report recommending that all builders of cities of the first, second and third classes be licensed, and as a result of his recommendations the question was referred to the Legislative Committee for further consideration.

At the Elmira meeting referred to there was also appointed a committee to consider the apprenticeship question, J. E. Summerhays of Rochester being appointed chairman of this committee. In his report, which was quite exhaustive, he urged upon all contractors the necessity of employing all the apprentices their business will allow, and put upon the employers the responsibility of seeing to it that the boys secured both a thoroughly practical and mechanical training. The committee also submitted a uniform form for indenturing apprentices.

Legislative Work.

The report of Counsel Ernest F. Eidlitz was as usual most interesting, and the following is a summary covering the legislative work for the session of the Legislature of 1907:

The Legislature of 1907 convened on the second day of January, 1907. An adjournment was taken until January 9, for the purpose of the organization of both houses, such as the appointment of the various committees which should consider the different classes of bills introduced. From January 9 the session continued until June 26, being one of the longest sessions of the Legislature in the history of the State.

During the session there were introduced in all, in both houses, 3185 bills. Of this number 1987 were introduced in the Assembly, and 1198 in the Senate, in all 487 bills more than last year. Many of those bills were amended and reprinted after they were introduced, some being amended and reprinted several times, so that there were in all 1980 reprints. All of these bills were examined by counsel as they were introduced or reprinted, and from among that number over sixty were selected as bearing upon the building interests. These were submitted to the Legislative Committee for consideration.

Some of those bills were considered not to materially affect the building interests, and in respect to such bills it was decided that no action be taken. The Legislative Committee, however, decided that 30 of those bills were seriously detrimental to the interests of the building industry and that these should be opposed.

Some of those measures were defeated by written communications from counsel to the chairman and other members of the various committees of the Legislature, to which committees the bills were assigned, but in the majority of those bills it was necessary for counsel to appear before the committee and present arguments, and in many cases submit briefs in opposition.

Election of Officers.

The next order of business was the election of officers. The Nominating Committee, composed of one delegate from each organization represented at the meeting, with M. G. Farmer of Buffalo as chairman, nominated the following officers, who were duly elected to serve the association for the ensuing year:

President, B. I. Crooker, Buffalo.
First Vice-President, C. A. Pulford, Elmira.
Second Vice-President, P. J. Brennan, New York.
Secretary-Treasurer, James M. Carter, Buffalo.
Counsel, Ernest F. Eidlitz, New York.

The following proposed amendment to the lien law was submitted and the same was handed to the Legislative Committee and counsel, with instructions to prepare a bill covering it:

Whereas, The Lien law of this State provides that only an owner may bond a lien; and

Whereas, We believe that a contractor ought to be permitted to bond a lien in the same way as an owner; be it

Resolved, That this association go on record as being in favor of the introduction of a bill in the Legislature providing for such an amendment to the Lien law, and that the Legislative Committee, through counsel, be requested to prepare and have introduced such a bill.

The following resolutions were presented and adopted:

Resolved, That we pledge this association to the full extent of its powers to aid and defend any member of this or any other allied association who, either in his person or business, may be made the victim of the boycott and the malice of any person or organization.

RESOLUTIONS ON DEATH OF RICHARD WICKHAM.

The New York State Association of Builders, in regular session assembled, records upon the records with regret the death of Richard Wickham of Albany.

Mr. Wickham has rightly been called the pioneer builder of the Empire State.

Few men possessed the intimate knowledge of the building lines or the genial kindliness of manner Richard Wickham did; therefore,

Resolved, These resolutions be recorded upon the records of this body, and a copy of same sent to the relatives of our deceased friend.

Social Sessions.

During the noon intermission the builders of Rochester served a delightful luncheon in the rathskeller of the Powers Hotel. At 6 o'clock the delegates were again the guests of the Rochester friends at a most elaborate banquet, served in the banquet room of the hotel. Delegates and friends to the number of 300 partook of the good things generously provided by the Banquet Committee, of which J. L. Steuart of Rochester was chairman and William S. Morse his able assistant.

Richard Williamson, president of the Builders' Exchange of Rochester, presided at the banquet table, and Hon. H. H. Edgerton, mayor of the city, acted as toastmaster. The principal speaker of the evening was Prof. George M. Forbes, who gave a most entertaining talk on technical education. Other speakers were Fred Gleason, retiring president of the State Association; William Butler, associated with Ernest F. Eidlitz in the legislative work; James M. Carter, the genial secertary-treasurer of the association; Hon. J. D. Lynn and Charles A. Cowan, the latter a prominent contractor of New York City.

Proportion of Frame Buildings Erected in 1907.

In a report regarding building operations and the timber supply the Geological Survey says that the increasing price of lumber and a rapidly increasing use of perfected fireproof systems of construction should have much to do in holding down the amount which forests are called upon to yield each year, but that so far these more substantial materials have not decreased the lumber cut of the nation.

Notwithstanding the remarkable increase in the use of cement and other fireproof materials, the last reports of the building operations in 49 of the leading cities of the United States for the year, collected by the Geological Survey, show that 59 per cent. were of wooden construction. This does not include the large quantities of lumber used for the construction of dwellings, stores and other buildings in the thousands of small cities and towns scattered over the country and not included in the 49 cities on which a reckoning was made.

In towns and small cities wood is usually the predominating building material, and it is safe to say that if the statistics had included figures for all places of whatever size the percentage of wooden construction would have been much greater. These figures, as a rule, are only for the corporate limits.

In wooden buildings, New York City is at the bottom of the list, though it leads with $18,075 as the average cost of buildings. Except at San Francisco, where abnormal conditions have prevailed since the fire, Boston shows the greatest increase of any of the cities in the total cost of building operations. The average cost of buildings is constantly increasing, having risen over $300 during the last three years. The average value of a building is given in the report as $2035.

Massachusetts Society of Brick and Stone Masons—Masters and Craftsmen.

About a year ago there was incorporated under the revised laws of the Commonwealth of Massachusetts an association composed of both masters and craftsmen and entitled the Massachusetts Society of Brick and Stone Masons, the special purpose of which was to "regulate and improve conditions between said masters and craftsmen in relation to employment." This is undoubtedly the first organization of its kind in the country, if not in the world, in that it is a union of employers and workmen. Thus far everything has moved along smoothly and orderly, and the meetings which have been held show great harmony, indicating by their orderly conduct the great advaantage of having the employers and workmen together in one body. The disagreeable features so inevitably accompanying the usual trade union meeting have been entirely avoided. Under the provisions of the by-laws the Associate Membership has a distinction from the craftsmen and gives opportunity for that most necessary difference in wages resulting from the variation in scale and ability of workmen, which trade unions have attempted to evade.

At the annual meeting of the society, held in Boston, January 14, the following conditions to govern the employment of bricklayers and stone masons during the year 1908 were established:

Hours.

Regular hours of labor on work within the territory of Greater Boston will be from 8 o'clock in the morning to 5 o'clock in the afternoon, with interval of an hour at noon. During the winter, when darkness prevents working up to 5 o'clock, the noon interval may be shortened, so that full time may be worked. On Saturdays during June, July and August, regular hours will be from 8 o'clock in the morning to 12 o'clock noon.

Work done outside "regular hours" by the same men who are working regular hours on the job will be reckoned as "time and a half," but work done by other men outside "regular hours" will be reckoned as single time only.

Work done on Sundays or legal holidays will be reckoned as "double time."

Wages.

Wages will be as agreed with the individuals employed, and will depend upon skill and efficiency, it being understood that first-class workmen will be entitled to receive 60 cents per hour, and that men admitted as "craftsmen" in this society are considered first-class workmen.

Wages will be paid weekly, and not later than before quitting time on Saturday.

If a workman be discharged he will be entitled to receive his wages in full on the spot, in cash. If this be not done, he will be furnished with an order on the office for the amount due, and will be allowed and paid for sufficient time to enable him to reach the office, in no event less than one hour.

If a workman quits work voluntarily he will not be entitled to receive his wages until regular pay day.

Workmen engaged and reporting for service at appointed time, with proper and sufficient tools, if not set at work will be entitled to one hour's pay, unless the state of the weather or other conditions prevent work being done.

Open Shop.

All work is to be conducted under "open shop" principles.

The Master Builders' Association of Kenosha, Wis., has recently issued a formal notice declaring for the "open shop." The action was taken, it was stated, only after the union men had refused to make any reduction in last year's wage scale.

FRAMING DOMES, PENDENTIVES AND NICHES.—I.

By C. J. McCarthy.

IN the articles on panelling domes and ceilings recently running in the columns of this journal, I endeavored to show the manner of laying out the divisions for the panelling of the different shapes of domes and vaults of double curvature. In the present article and those which will immediately follow it is my purpose to give a few illustrations indicating the manner of framing domes, pendentives and niches of various shapes. Looking at the matter from the viewpoint of the carpenter I will endeavor to show in the clearest manner possible the method of framing, covering and veneering the different constructions under discussion. The construction of the conical roof shown in Figs. 1, 2. 3, 4. 5 and 6 will be evident from a careful examination of the drawings, and a detailed description is not therefore absolutely necessary.

The main principals, it will be seen from an examination of Fig. 3, are united at the top by being inserted in iron sockets cast in one piece, the frame being completed by struts and an iron tie rod. The other four principals are framed like a queen post roof, as shown in Fig. 4. The ties of all the principals are connected by the radiating straps clearly indicated in Fig. 5, through the central circular part of which the tie rod, Fig. 6, passes and is secured by a nut. The same letters refer to similar parts in most of the illustrations with the exception of *a*, which in Figs. 1 and 2 represents the larger circular purlin, but in Fig. 4 is the straining sill between the queen posts.

The construction of a dome roof is shown in Figs. 7, 8 and 9. The curved ribs are supported by struts from the principals, as indicated in Figs. 8 and 9. The plan and elevation show the curved arrises which the sides of the horizontal ribs assume when cut to the curvature of the dome as at *a a* of Fig. 8.

The construction of a dome roof with a circular opening in the center for a skylight is illustrated in Figs. 10, 11, 12 and 13. Two of the main principals C D of Fig. 11 and the corresponding one are framed with a king post *c*, as shown in Fig. 12; the others at right angles to these with queen posts as shown in Fig. 13. The main ribs correspond to the principals and the shorter ribs are framed against curbs between them as at *a a*, Figs. 11 and 12.

The framing of an ogee dome roof on an octagon plan is shown in Figs. 14, 15 and 16 of the drawings. The construction will be readily understood by inspection, and the method of finding the angle ribs shown in Fig. 16 will be understood from what has already been said in a former article on dome ceilings when treating of angle ribs, only in this case the method is reversed, the common rib being taken from the angle rib.

Very often the carpenter finds it a difficult matter to cover or cut material to the proper shape for bending, either vertically or horizontally, around figures such as those under construction. It will therefore be in order to present a few practical hints on the development of these figures. The development of the sphere and other surfaces of double curvature is impossible except on the supposition of their being composed of a great number of small faces, either plain or of small curvature, as the cylinder and the cone. A sphere or spheroid, therefore, may be constructed as a polyhedron, terminated, first, by a great number of faces formed by truncated pyramids, of which the base is a polygon, as in Fig. 17; second, by parts of truncated cones forming zones, as in Fig. 18; third, by parts of cylinders cut in gores forming flat sides which diminish in width as in Fig. 19.

In reducing the sphere or spheroid to a polyhedron with flat sides, two methods may be adopted which differ only in the manner of arranging the developed faces. The most simple method is by parallel circles and others perpendicular to them, which cut them in two opposite points, as in the lines on a terrestial globe. If we suppose that these divisions in place of being circles are polygons of

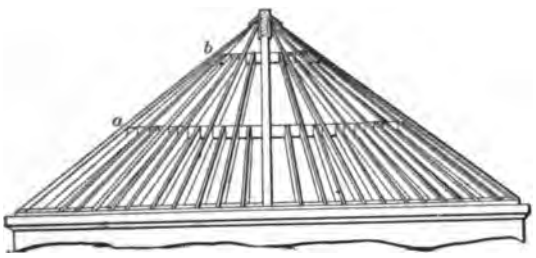


Fig. 2.

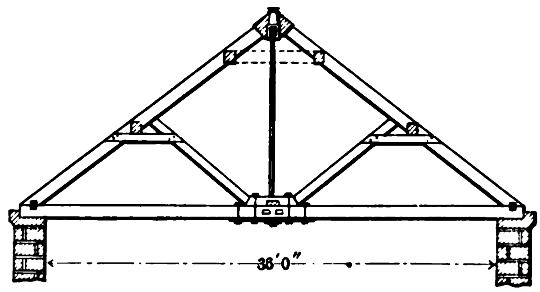
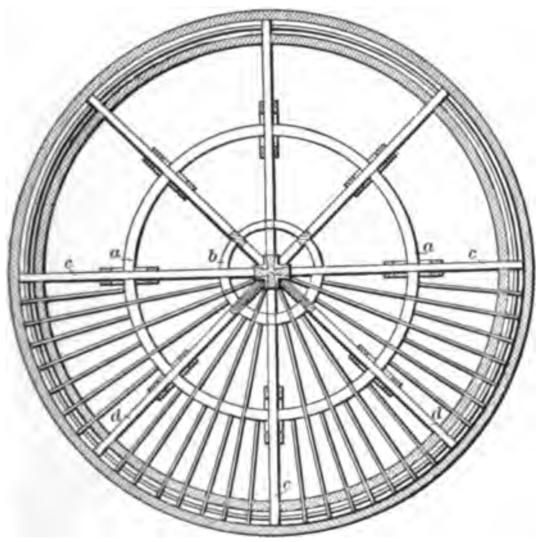


Fig. 3.—Framing of Principal *c*, as Shown in Fig. 1.



Figs. 1 and 2.—Plan and Elevation Showing Framing of a Conical Roof.

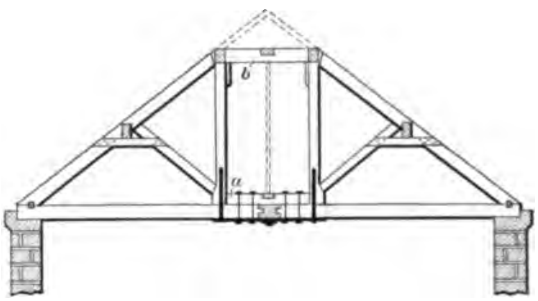


Fig. 4.—Framing of Principal *d*, Shown in Fig.

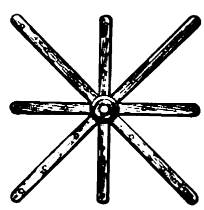


Fig. 5.—Iron Strap.

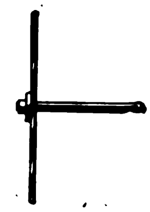


Fig. 6.—King Rod.

Framing Domes, Pendentives and Niches.—I.

the same number of sides, there will result a polyhedron like that represented in Fig. 17, of which the half, A D B, shows the geometrical elevation and the other half, A E B, the plan.

To find the development first obtain the summits, P *q r s* of the truncated pyramids, which form the demi-polyhedrons, A D B, by producing the sides *a* 1, 1 2, 2 3, until they meet the axis E D produced. Then from the points P *q r* and with the radii P A, P 1, *q* 1, *q* 2, *r* 2, *r* 3 and *s* 3, *s* 4 describe indefinitely the arcs A B, 1 *b*,

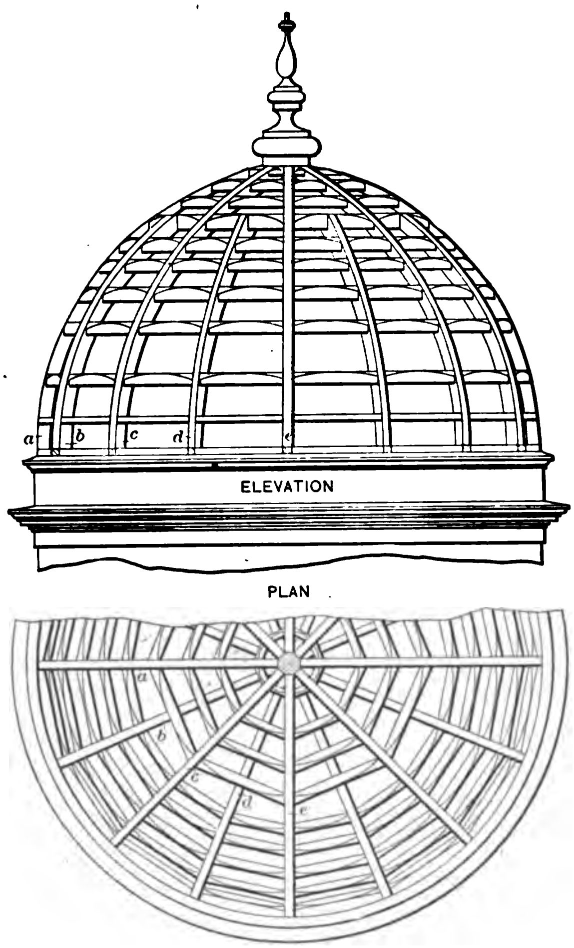


Fig. 7.—Framing Plan and Elevation of Hemispherical Dome.

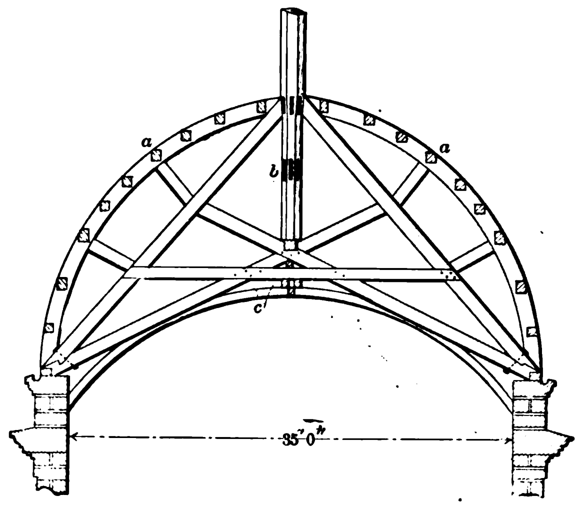


Fig. 8.—Framing of Principals *a*, *c*, *e*, &c., Shown in Fig. 7.

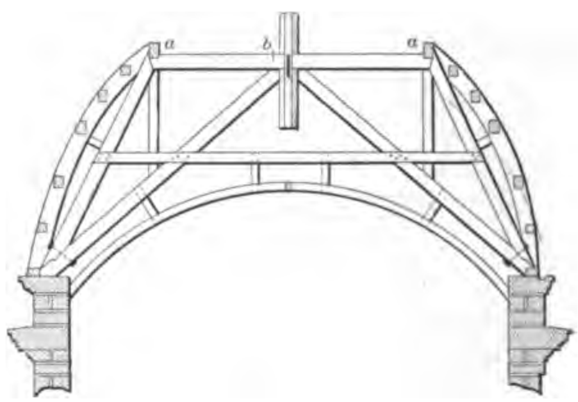


Fig. 9.—Framing of Principals *b*, *d*, &c., Shown in Fig. 7.

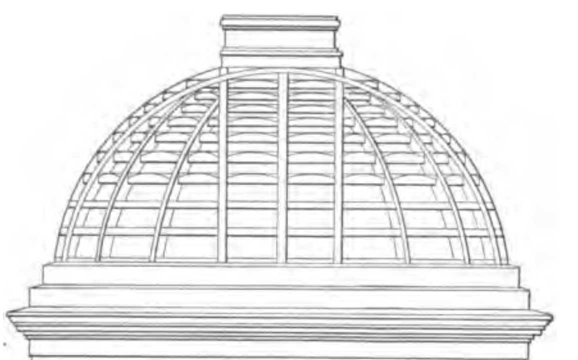


Fig. 10.—Elevation of Spherical Dome with Skylight.

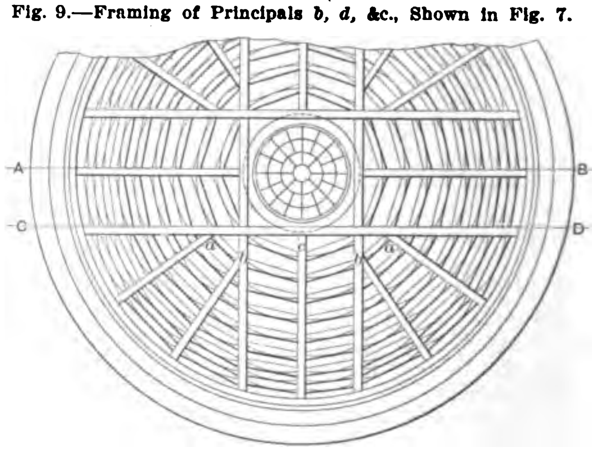


Fig. 11.—Framing Plan of Spherical Dome with Skylight.

Framing Domes, Pendentives and Niches.—I.

1 *b'* 2 *f*, 2 *f'*, 3 *g*, 3 *g'* 4 *h*, and from D describe the arc 4 *h'*. Upon these set off the divisions of the demi-polygon, A E B to the summits P, *q*, *r*, *s* and D, from all points so set out as A, 1, 2, 3, 4, 5, B for each truncated pyramid. These lines will represent for every band or zone the faces of the truncated pyramid, of which they form a part. The next eight figures will be devoted to the application of these principles to the covering of the structures under consideration.

To find the covering of a segmental dome we proceed as follows: Referring to Fig. 20, let No. 1 represent the plan and No. 2 the elevation of a segmental dome. Through the center of the plan E draw the diameter A C, also the diameter B D perpendicular to A C and produce B D to I. Let D E represent the base of a semisection of the dome. Upon D E describe the arc D *k* with the same radius as the arc F G H of the elevation. Divide the arc D *k* into any number of equal parts as 1, 2, 3, &c., and extend the divisions upon the right line D I, making the right line D 1, 2, 3, 4 I equal in length and similar in its divisions to the arc D *k*. From the points of division 1, 2, 3, 4 in the arc D *k* draw lines perpendicular to D E, cutting it in the points *q r s*, &c. Upon the circumference of the plan No. 1 set off the breadth of the gores or boards *l m*, *m n*, *n o*, *o p*, &c., and from the points *l*, *m*, *n*, *o*, *p* draw lines through the center E. From E describe the concentric arcs *q v*, *r u*, *s t*, &c., and from I describe the arcs through the points D, 1, 2, 3 and 4, making *l m* the breadth of the base. Make 1 *w* equal to *q v* and 2 *x* equal to *r u*, also make 3 *y* equal to *s t* and so on. Draw the curved line through the points *l*, *w*, *x*, *y*, *z*, to I, which will give one edge of the gore or board to coincide with the line *l* E. The other edge being similar it will be found by making the distances from the center line D I, respectively, equal. The seat of the gores or boards on the elevation are found by the perpendicular dotted lines *p p*, *o o*, *n n*, *m m*, &c.

In order to find the covering of a semicircular dome we proceed in the following manner: Referring to Fig. 21 a careful inspection of the plan and elevation will show the mode of procedure to be much more simple than in the case of the segmental dome, as the horizontal and vertical sections being alike, the ordinates are obtained at once.

To find the covering of a spheroidal dome the following steps are necessary: Let A B C D of Fig. 22 be the plan and F G H the elevation of the dome. Divide the elliptical quadrant F G of the elevation into any number of equal parts as indicated by 1, 2, 3, &c., and through the points of division draw lines perpendicular to F H, producing them to A C of the plan, meeting this line in the points *i*, *k*, *l*, *m*, *n*. These divisions are transferred by the dotted arcs to the gore *b* E *c*. The remainder of the process is the same as in connection with the last two examples.

In order to find the covering of an ogee dome hexagonal in plan we proceed as follows:

Let A B C D E F of Fig. 23 represent the plan of the dome, and H K L the elevation on the diameter F C. Divide H K into any number of equal parts as 1, 2, 3, 4, &c., and from the points indicated by the figures drop lines perpendicular to H L, producing them to meet the line F C of the plan in the points *l*, *m*, *n*, *o*, *p*, G. Through the points of meeting draw the lines *l d*, *m e*, *n f*, &c., parallel to the side F E of the hexagon. Bisect the side

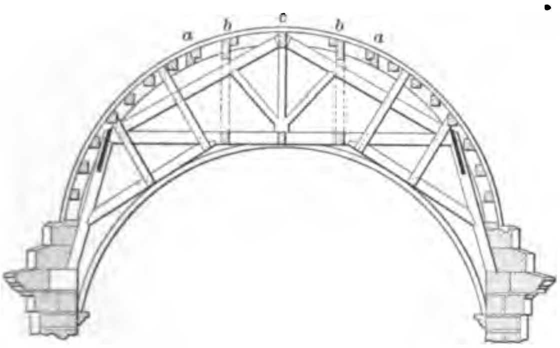


Fig. 12.—Framing of Principal C D, Shown in Fig. 11.

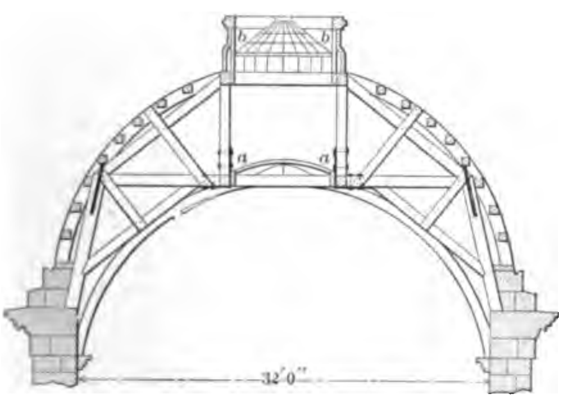


Fig. 13.—Framing of Principal A B, Shown in Fig. 11.

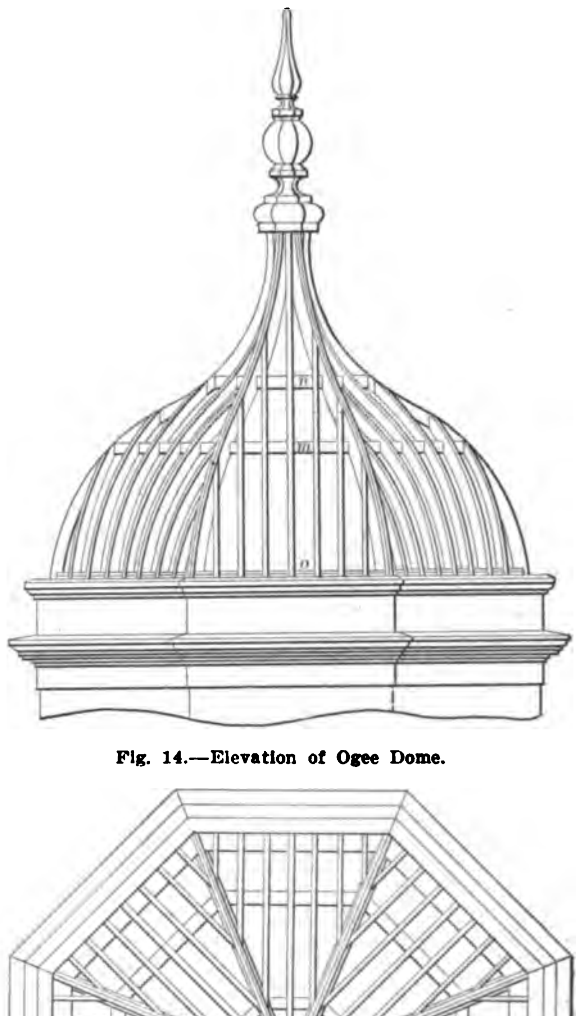


Fig. 14.—Elevation of Ogee Dome.

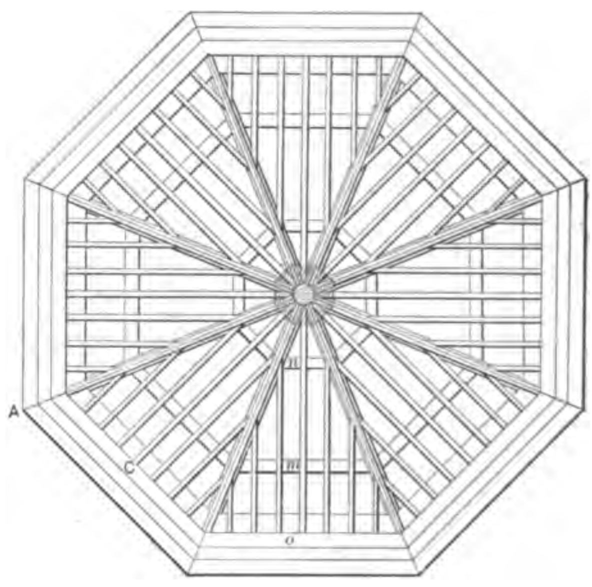


Fig. 15.—Framing Plan of Ogee Dome.

Framing Domes, Pendentives and Niches.—I.

of the hexagon F E in N, and draw G N which will be the seat of a section of the dome at right angles to the side E F. In order to find this section nothing more is required than to set upon N G from the points *t*, *u*, *v*, &c., the hights of the corresponding ordinates of the elevation as represented by *q* 1, *r* 2, *s* 3, &c. Then draw the ogee curve N 1 2 3 4 5 P and use the divisions of this curve to form the gore or covering of one side as E *g h k* M D.

THE January fire loss in the United States and Canada aggregated $29,582,600, this being by far the worst January on record, from a fire loss standard, and compares with $17,723,800 in January, 1906, and $24,064,-900 in January, 1907.

Convention of Society for Industrial Education.

The first annual meeting of the National Society for the Promotion of Industrial Education, held in Chicago January 23-25, was opened by a public dinner given in the banquet hall of the Auditorium Hotel, at which there were present nearly 400 members and guests. The speakers of the evening were Theodore W. Robinson, first vice-president Illinois Steel Company and chairman Illinois State Committee; Dr. Charles W. Eliot, Cambridge, Mass., president Harvard University; James W. Van Cleave, St. Louis, president National Association of Manufacturers, whose addresses were directed to the consideration of "Industrial Education as an Essential Factor in Our National Prosperity," and Dr. Henry S. Pritchett, New York City, president Carnegie Foundation for the Advancement of Teaching, and president of the society, who spoke of "The Aims of the National Society for the Promotion of Industrial Education."

The earnest interest manifested by the participants in this movement augurs well for success in the future development of a system that will prove effective in raising the efficiency and effectiveness of handicraft among industrial workers. Present at this meeting and working shoulder to shoulder with the foremost educators of the country were seen men of foremost prominence in industrial affairs and recognized leaders of organized labor, working to a common end in the cause of industrial education.

After a few fitting words of welcome, Mr. Robinson read a letter from President Roosevelt expressing regret at his inability to be present, in which he said: "My interest in this cause arises not only out of the important results to be achieved by industrial education, both for the wage earner and the manufacturer, but, more than all else, out of the desire to see the American boy have his best opportunity for development. In the interest, therefore, of the American boy, I welcome the efforts of any society like this to focus public attention upon the question and to suggest practical methods for solving it." Continuing, Mr. Robinson spoke in part as follows:

The Society for the Promotion of Industrial Education is the organized recognition of a vital defect in the educational system of this country. The ultimate aim of the society is to promote the prosperity and happiness of our coming generations by increasing their collective efficiency. This country has been sleeping the self-complacent sleep of confidence, born of stupendous resources and wonderful inventive genius, but other nations have possessed themselves of our inventions; and Germany, comparatively poor in nature's heritage, is surpassing us in the markets of the world. The industrial education of Europe is making the Old World new, while apathy and obsolete methods are making our New World old. Our educational development has not kept pace with the marvelous changes that have taken place in the last generation, and it is time that we awake if we are to attain our natural destiny. More than 90 per cent. of the youth of our country progress no further than the grammar school, and of these many are destined to become industrial derelicts merely for want of educational encouragement and opportunity.

Without disparaging any plan of education which seeks its culmination in the university, it is clear that the necessities of this large majority should be better recognized in our primary schools. The census reports of 1905 show 5,470,321 wage earners. If their average daily earning capacity were increased 25 cents it would amount to over $400,000,000 per year to them, to their employers and to the country. These figures are startling, but are indicative of the material reward which might be expected. While there will be honest differences of opinion as to the best means of giving our boys and girls their educational right, mutual confidence and harmony must prevail in our endeavors and in our deliberations. The movement for which our society stands appeals to considerations broader than selfishness or avarice, and will brook no opposition born of mistaken self-interest or desire for restrictive monopoly. We stand for the fundamental principle of just opportunity for all.

President Eliot in his address suggested that with the introduction of trade school training in grammar schools the compulsory age limit should be raised three or four years. "All trade schools," he said, "should embrace some manual training. The old idea that the Yankee can turn his hand to anything is misleading. He can't. Conditions have changed, and a great variety of occupations existent to-day were unknown 100 years ago. Educational training must of necessity conform to present conditions."

Speaking from the viewpoint of the manufacturer, Mr. Van Cleave declared that our efforts in behalf of industrial education have been too miscellaneous, too isolated, too haphazard. He called attention to the fact that the little kingdom of Bavaria, with a population not much greater than that of New York City, has now 290 trade schools, giving instruction night and day in 28 trades and crafts, to pupils from the first to the fifth grades, and stated that in this whole country of 85,000,000 people there are fewer trade schools than in that little German kingdom. He also suggested that there should be a com-

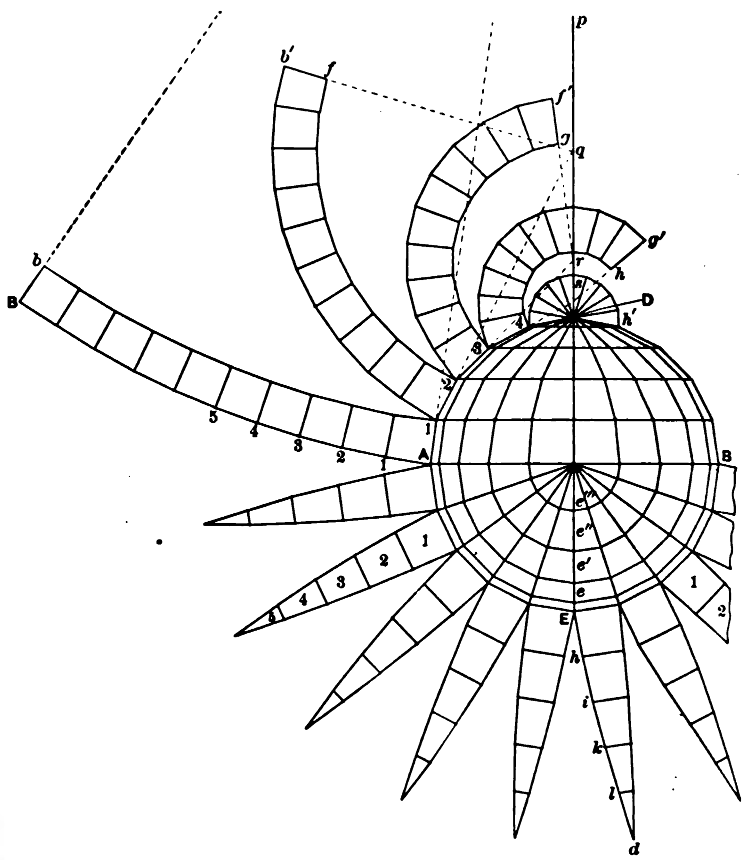


Fig. 17.—Covering of a Sphere.

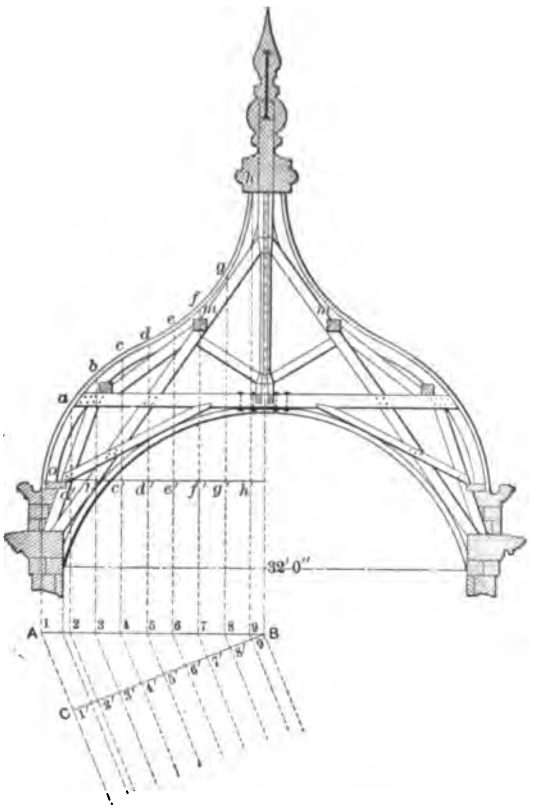
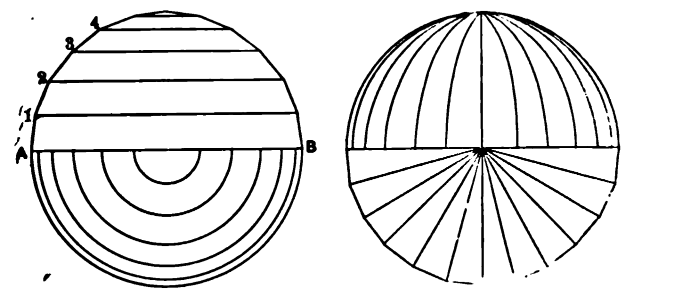


Fig. 16.—Framing of Angle Ribs in Ogee Dome.



Figs. 18 and 19.—Methods of Constructing a Sphere.

Framing Domes, Pendentives and Niches.—I.

missioner of industrial education as the head of a bureau of one of the administrative departments.

The final address of the evening, delivered by Henry S. Pritchett, was confined principally to a statement of the aims and purposes of the society, in which he emphasized the fact that the problem involved is one to be dealt with in the spirit of industrial peace—not a spirit of industrial war. Referring to the development and progress of industrial training in Germany and elsewhere, he suggested that some of the methods there employed might be profitably borrowed. "If you can't produce a good thing yourself," he asserted, "the next best thing is to know how to borrow it."

Morning, afternoon and evening sessions were held on Friday, the first of which was presided over by Carroll D. Wright, president of Clark College. Different phases of "The Apprenticeship System as a Means of Promoting Industrial Efficiency" were discussed, and valuable suggestions offered by men close in touch with industrial requirements in skilled labor. In the afternoon and evening sessions a number of thoughtful and interesting papers were read upon pertinent topics, which developed spirited discussion. The morning session on Saturday was devoted to the consideration of "The True Ideal of a Public School System That Aims to Benefit All."

At a business meeting held during the closing session the following officers were elected to serve for the ensuing year: Carroll D. Wright, president; Magnus W. Alexander, vice-president; Frederick O. Pratt, treasurer. Managers for three years: Henry S. Pritchett, Everett V. Macy, Frederick P. Fish, Samuel B. Donnelly, Mr. Halsey, Mrs. B. B. Mumford, J. Gunby Jordan and Horace E. Deemer.

A Model Barn Door.

Having seen the need of a good substantial barn door, that could be closed in such a way as to prevent animals from passing in or out of the building, and at the same time admit light and fresh air, a writer in an exchange claims to have devised one that will meet the requirements. The idea is to make a strong frame, say, for a door 6 x 8 ft., of 2 x 6 in. pine, mortised together and braced in the lower portion with common 2 x 4. The lower part is then completely boarded up, the upper ends being beveled and coming to within about 2 in. of the top of the center of the cross piece. The boards are cut and fitted in the shape of a door for the upper part. Two 1 x 5 in. boards will serve for cleats. The corners are then cut so that they will not interfere with the hanger.

The door is then placed and hung with two flat hinges, the upper side is fitted with a spiring catch having a small chain attached to unfasten with. It can be readily seen that this door can be "opened down" while the main part is closed, preventing any live stock from passing in or out.

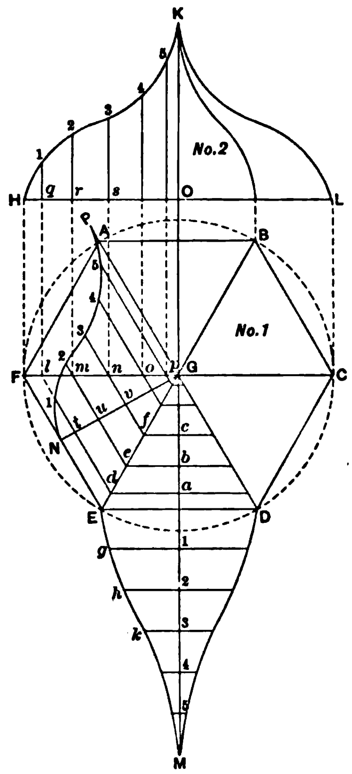


Fig. 23.—Covering of a Polygonal Ogee Dome with Vertical Gores.

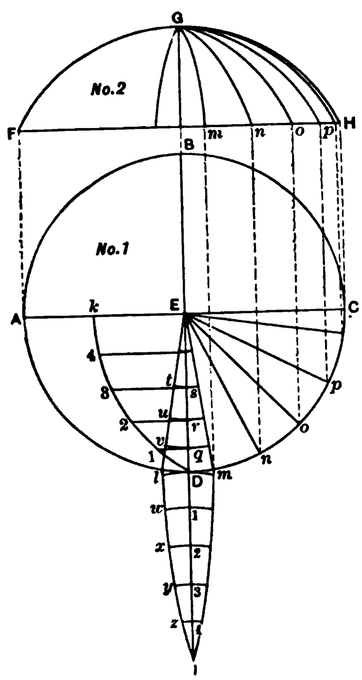


Fig. 20.—Covering of a Segmental Dome with Vertical Gores.

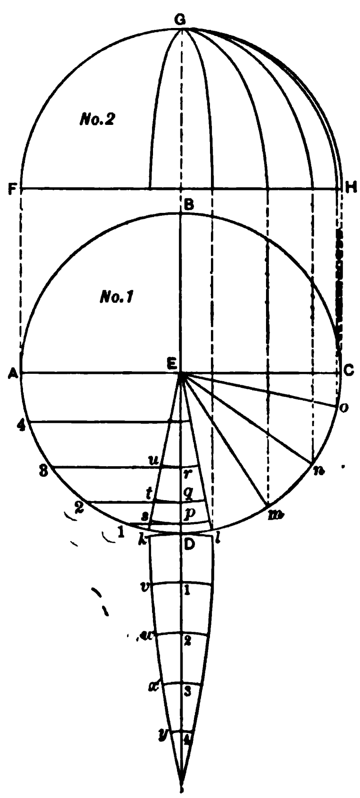


Fig. 21.—Covering of a Hemispherical Dome with Vertical Gores.

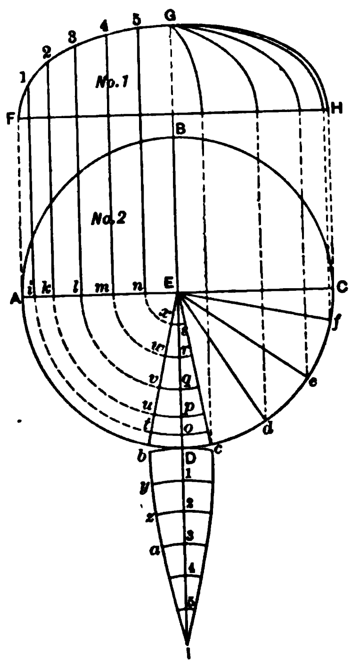


Fig. 22.—Covering of a Spheroidal Dome with Vertical Gores.

Framing Domes, Pendentives and Niches.—I.

Carpentry and Building

WITH WHICH IS INCORPORATED
THE BUILDERS' EXCHANGE.

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(Entered at the New York Post-Office as Second-Class Mail Matter.)

MARCH, 1908.

Impure Air in Dwelling Houses.

The fact that when a house is to all intents and purposes closed up and the interior temperature is the same as that outside the building, an interchange of air can take place between different compartments of the house, renders it incumbent upon the architect and builder to give special attention to the cellar and foundation construction. Analyses of air in a house under the conditions named have shown that the air of the first story is 7 to 8 per cent. cellar air, and that the air of the second story is 3 to 4 per cent. cellar air. When contamination to this extent can take place without accelerating conditions it is reasonable to suppose that with the chimney-like action possessed by the warm interior in winter a greater amount of the cellar atmosphere can be expected in the floors above. Figures recently published affirm this assupmtion, the first floor in the heated house showing 40 per cent. cellar air and the second floor 25 to 30 per cent. Granting the tendency that must exist in the average house the question is, Does the cellar contaminate? If it has been built with impervious walls and bottom it cannot be a serious menace through transmission from the surrounding earth, but from the condition in which it is kept. Similarly, if the cellar is in direct communication with the outer air, it is not likely to be regarded as unwholesome, for the free admission of the atmospheric pressure serves to destroy the suction or chimney action of the house on the cellar, subjecting the walls and the earth to the same pressure as that out of doors. The chance of the emission from the walls into the cellar of gases or organic matter is then minimized, but the importance of having well built walls and bottom, particularly if located in made ground, is obvious. Besides the hydrostatic pressure to which the cellar walls and bottom may be subject, due to the higher earth surrounding, which would be a fertile source of contamination with the presence of much dampness, there is also the tendency for gases to be forced in by the atmospheric pressure transmitted to a greater extent than generally realized, through the earth and through the cellar walls into the cellar; this is so, provided the cellar atmosphere is at slightly less pressure than the atmosphere, which would be the case in a reasonably tight house in the heating season. Depending on the character of the soil earth has been found to take up different amounts of air, according as the atmospheric pressure, recorded by the barometer, is greater or less. The earth is the seat of bacterial changes on a large scale, and the possibilities of the exudation through cellar walls of gases and organic matter, leading to such diseases as malaria, should not be ridiculed. The tendency of the times in building lines is close attention to the soil of the site and the proper preparation of the foundation walls.

Another "Flatiron" Office Building.

A most interesting example of what may be termed the "flatiron" type of office building is found in the new 21-story structure now rapidly being completed in the center of the insurance district of the Borough of Manhattan, occupying as it does the triangular site at the intersection of Maiden lane and Liberty street. The building strikingly illustrates the successful surmounting of difficult and peculiar conditions which confronted the architects and contractors. The unusual outline of the building site, the excessive traffic in this locality combined with the narrowness of the streets, were factors which forced the builders into many novel expedients. By reason of the location of the building it was necessary to carry the foundations 25 ft. below tide level in order to reach hard pan, or about 50 ft. below the level of the street. This was accomplished by caissons, under air pressure, which were afterward keyed together in such a way as to constitute a complete cofferdam around the site. The building, which at the point of the triangle is 20 ft. wide, has the unusual advantages of full frontages on three streets, giving exceptional opportunities for light and air in every office. The façades of the first three stories are of granite in bold and monumental design. Continued pilasters of dull glazed white porcelain brick form the fronts from the fourth to the seventeenth story, broken at the fifteenth floor by a granite balcony. The panels below the windows at the different floors are of special glazed brick. Above the seventeenth story the entire front is of terra cotta glazed in colors, including the overhanging cornice and its groining. There will be an entrance on Maiden lane, in which there is a frontage of 138 ft., and one on Liberty street, in which the building has a frontage of 28½ ft., the elevator concourse connecting them serving also as a vestibule to the general offices of the German-American Insurance Company, the owners of the building, and who will occupy the first, third, fourth and fifth floors. The wall facings are of Sienna marble laid out on Gothic lines, while the ceiling is lofty and vaulted. The remainder of the building will be devoted to office purposes. The mechanical equipment will be most complete, and has been the subject of much study on the part of Hill & Stout, the architects. There will be five hydraulic elevators for passenger service, and an extensive system of mechanical ventilation, pneumatic tube service, vacuum cleaners, telegraph and telephone conduits, &c. Just how the structure appeared in course of erection is shown by means of the halftone engraving forming the basis of one of our supplemental plates accompanying this issue of the paper.

The Supreme Court on Boycotts.

The various decisions which were cited in the recent decision by the United States Supreme Court against boycotts enforced by labor organizations, are suggestive that whenever the consideration of the court is sought in fields where practices similar to those adjudicated are resorted to the same discomfiture might result which has followed the labor organization. Organization in an association has too often led to the abuse of the power thus created. The temptation is great when the power exists and can be used in place of persuasion and patience, especially where hesitation on the part of some interferes with the advancement of the purpose which to others seems commendable and worthy of unanimous support. It is possible that many, gratified by the decision mentioned, who are employing labor, might well investigate carefully all of the things they subscribe to through their membership in associations which endeavor to accomplish their purpose by means of informing other members from whom to purchase their manufactured supplies. The feeling is often expressed by tradesmen of the old school that some of the things they are requested to do in the interest of some of their customers shows a simple lack of fairness, while other manufacturers or tradesmen freely grant the requests made without question, and still others who fail to comply pay the penalty in their inability to do business with some who are urgent in making these requests. This method of applying a boycott is frequently regarded less creditable than the outspoken method which has been condemned by the highest court in our land.

Report on the Parker Building Fire.

A vast amount of discussion has ensued relative to fireproof construction, growing out of the recent destruction of the Parker Building at Fourth avenue and Nineteenth street, Borough of Manhattan, N. Y., the point being made that for a fireproof structure it resisted but poorly the ravages of the flames. Inspections have been made of the ruins by underwriters and city officials and their reports are of a most interesting nature. The tenor of their comments is that the structure was not "fireproof" in the sense in which the term is now used, it having been erected under an old building law, and therefore not in accordance with the provisions of the present code. Engineer P. H. Bevier visited the building after the fire and made the following report, which cannot fail to set at rest some of the criticisms which have freely circulated touching the danger to the city from fire in towering steel skeleton frame buildings of thoroughly up to date and modern construction:

The building was constructed in 1899, under the old building law, and not in accordance with the provisions of the present building code. It is of skeleton construction, with brick and terra cotta curtain walls: Columns, cast iron; girders, single I-beams, 60 lb., 15 ft. long. Beams, 12 in., 40 lb., 20 ft. long. Each bay is divided in three panels, two of 4 ft. 6 in. spans and the center one of 6-ft. span. Beams are framed into the girders, center of beam being on center of the girder, which leaves the bottom flange of the beam 1½ in. above the bottom flange of the girders.

The floor arches throughout are 8-in. semiporous, side construcion, hollow tile arches, with lip skewbacks projecting 1½ in. below the lower flanges of beams. There was no girder covering used. The soffit of the arches being 1½ in. below the flanges of the beams, the under side of arches were flush with the bottom flange of the girder, so the plastering was carried level across the flanges of the girders without metal lath to hold plastering in place.

All fireproof partitions were of 3-in. hollow tile blocks. The circular cast iron columns were encased in 2-in. porous terra cotta column covering. On top of the floor arches there was a very lean cinder concrete fill.

Present Condition.

The brick wall and terra cotta on the Fourth avenue side seem practically uninjured. There is some damage to terra cotta lintels on the Nineteenth street side. The floor arches where standing are apparently in good condition, with probably 5 per cent. of the blocks damaged by fire and water. A number of arches have collapsed near the top of the building. In most cases the collapses were caused by heavy safes falling through the wood flooring as it burned away, upon the arch beneath, letting the safes fall through, with the blocks, to the floor below. In most every instance collapsed arches were in the 6-ft. span. I believe in no case were there any 4 ft. 6 in. spans collapsed, except where falling safes or printing presses caused damage. The cast iron columns were still standing and appeared in perfect condition. The column covering is intact, except where injured by falling material. Two sections of the building have collapsed. One from roof to the cellar and one from the seventh to the eleventh floor. One of these collapses was caused by failure of a column, carrying with it the surrounding bay. The cause of the failure of this column is not known. The other failure was apparently caused by the falling in of the pent house on the roof, which was supported on unprotected columns, and when it fell carried several floors below. The openings caused by these failures provided a flue for the flames and created intense heat on the surrounding arches. The girders being unprotected were exposed to the direct heat and in many cases deflected, causing failure of arches and failing of partitions which rested upon them

Summary.

The building was in no sense a type of modern first-class fireproof construction. The hollow tile arches were of good material, but 8-in. arches should not have been used in 6-ft. and 7-ft. spans. The present building code requires 12 in. Girders should have been protected by at least 2 in. of fireproof material. Partitions in the high stories should have been at least 4 in. thick, and should have had steel bucks instead of wood around the elevator and stairway. Many of the subdividing partitions were of wooden boards, others of wooden studs and metal lath and some of plaster blocks, which are all down. Cinder concrete should have been of better quality. More attention should have been paid to the fireproofing of steel members carrying the roof construction.

It is entirely possible to so increase structural steel members of a building that they will not be affected by heat, but the fact that this work is slighted in certain instances does not prove that skyscrapers are dangerous, or that proper fireproofing fails to do its work when fire comes.

This building with all its faults is an example of the value of fireproof construction. Had it been built in any other way the floors and walls would have collapsed and spread the fire to the surrounding buildings and perhaps caused a disastrous conflagration.

As it is, however, in spite of lack of water, the fire did not spread beyond the building in which it originated, and the building itself is not so damaged but that it can be readily repaired and put in proper condition.

Meeting of Buffalo Builders' Exchange.

The annual meeting of the Builders' Association Exchange of Buffalo, N. Y., was held on Wednesday, January 15, the polls being open from 11 a.m. until 2 p.m. There was only one nominee for the office of president, that being M. G. Farmer, who is the general manager of the Buffalo Expanded Metal Company.

There was a keen good natured contest between Henry Schaefer and Alfred A. Berrick for the office of vice-president. Both contestants are large general contractors. Mr. Schaefer was elected by a narrow margin.

Frank C. Kempf was elected treasurer and P. M. Ginther and B. I. Crooker were elected trustees to serve for three years. During the election the usual standing lunch was served to about 300 builders and friends.

The annual meeting of the Builders' Exchange was held January 27, when reports from retiring officers were rendered showing a splendid numerical gain the past year and a financial condition far superior to any previous time in the history of the organization. After some routine business the officers elected at the annual meeting were installed. The retiring president, Peter M. Ginther, was presented with a beautiful set of dinner knives and forks, the gift coming from the members of the exchange.

After the business session an informal banquet was served in the exchange room. Frank N. Farrar presided as toastmaster on this occasion and many of the members responded with a few informal remarks.

National Association of Building Material Dealers.

At the ninth annual convention of the National Association of Building Material Dealers, held in Chicago, February 5, and at which more than 350 delegates were present from 24 States, the following officers were elected:

President, Gordon Willis, St. Louis.

Treasurer, Henry W. Classen, Baltimore.

The new members of the Executive Committee elected were John A. Kling, Cleveland, and Charles Warner, Wilmington, Del.

THE ninth annual dinner of the Mechanics' and Traders' Exchange of Brooklyn, N. Y., was held at the Imperial on the evening of February 5, there being present a large representation of members and invited guests. Numerous addresses were made, and among the topics discussed were banks and banking, water supply system, &c.

THE ART OF WOOD PATTERN MAKING.—III.

By L. H. Hand.

THE ancient and honorable craft of wood pattern making is not a trade; that is, in the sense that the barber, the cigarmaker, the baker, the butcher, &c., are tradesmen. It is one of the fine arts, as a glance into the pattern room of any of our great machine shops, stove foundries, &c., will readily demonstrate. It embodies the combined trades of the woodworkers' craft with the inventive genius of the architect and the hand and brain of the artist. The first written record of wood pattern making so far as the writer is aware, is the account given by the man who was assisting on the woodwork for the molten image which aroused the ire of Isaiah, and his tools and manner of working seemed to be nearer in line with modern pattern shop practice than could reasonably have been expected. With his equipment he appears to naturally seem that so simple a shape would not admit of many ways of making the pattern—at least not many correct ways—and yet there are numerous ways to arrive at the same result.

Shrinkage is figured at 1-10 of an inch to the foot, which is approximately correct. Heavy castings shrink more than light ones, and cylinders and kindred shapes cast on end, if very long, shrink more at the bottom, where the metal is dense, than at the top. First we will make a square block 2 x 3 x 5 in., allowing for shrinkage and bore a 1-in. hole through it. We will take this block to the sander, Fig. 26, and put a very little draft in it all around; that is, we will smooth it up so a try square, when applied to the edge and ends of the block, shows a peep of daylight at one side. Then we slip the hole

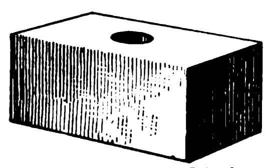


Fig. 27.—Iron Key Block.

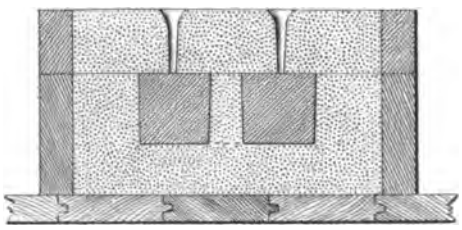


Fig. 28.—Key Block in the Sand—First Method.

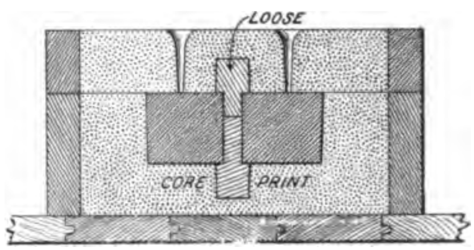


Fig. 29.—Second Method.

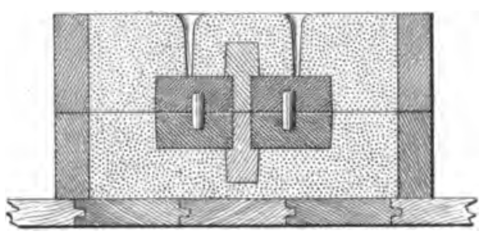


Fig. 30.—Third Method.

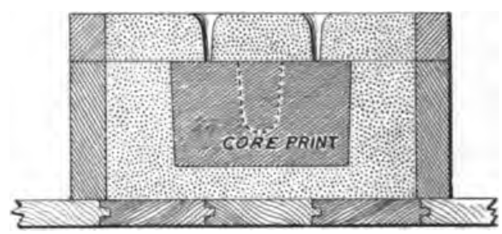


Fig. 32.—The Fifth Method.

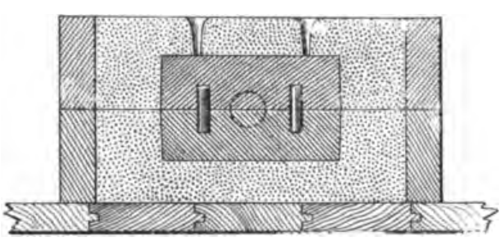


Fig. 31.—Fourth Method.

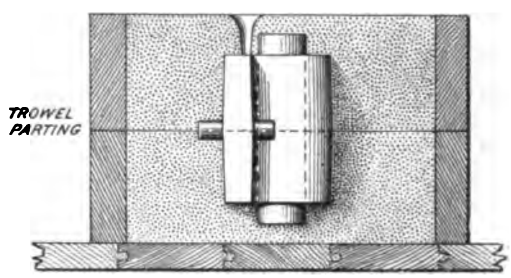


Fig. 34.—Molding from an Old Casting—First Method.

The Art of Wood Pattern Making.—III.

have put up a pretty fair pattern, though no mention is made of a shellac finish to make it "draw" readily.

In considering the making of any pattern the first requisite is draft; that is, the pattern must not be made square, although it may look so. It may be approximately square, but there must be enough bevel—that is draft—so it will loosen as it is raised out of the sand. When necessary it may be almost square, but when it does not effect the usefulness of the casting, give it as much draft as possible, so it may be lifted quickly and without the extreme care required when the minimum draft is allowed. Any one can tell you the correct way to make a pattern from the fact that scarcely a casting or the drawing of a casting comes to the bench that does not admit of numerous ways of making the pattern, and all of which will produce exactly or approximately the same piece of metal. One can only tell how *he* made a certain pattern and the resulting metal casting.

To illustrate the idea I am endeavoring to make plain, I shall select about the simplest shape I have been called upon to make; namely, a key block for freight car draft timbers—simply an iron block 2 x 3 x 5 in., with a 1-in. hole in the center as shown in Fig. 27. Now it would over the end of the tapered spindle and put a nice draft in it. Give it plenty so it will lift easily; finish with two or three coats of black shellac, sandpapering between coats, and rub down with a woolen cloth and a drop or two of linseed oil. This pattern will go into the sand as shown in Fig. 28. There might be a reason why we would be required to make a straight instead of a tapered hole, in which case instead of a 1-in. hole, we would probably bore a ½-in. hole. Into this, on the draft side, we would glue a 1-in. core print, and on the face or follow board side we would place a loose 1-in. core print and make a half core box 1 in. by about 4 in. long. This pattern would appear in the sand as shown in Fig. 29. The portion of the wood pattern representing iron would be finished in black shellac, and the portion representing a core be finished in light shellac.

In every case, regardless of what the metal may be, the cores are finished in exactly the opposite color to that of the metal, thus, if the pattern is to be brass, it will be finished light and the cores dark, and if iron the pattern must be black and the cores light.

Another and fully as correct a method of making this pattern would be to take two 1-in. pieces and dowel them together. Cut the block so formed to 3 x 5 x 2 in.; put a little draft in each of the holes, the sides and the ends, so that the parting may be in the middle of the pattern. Still another way is to put core prints into each of these blocks. Either way the pattern would go into the sand as shown in Fig. 30.

Supposing, however, that a perfectly square edge on the block is required, or for any reason it were better to cast it the other way in the sand, the pattern could be divided through the core prints and cast as shown in Fig. 31.

Still further to illustrate the matter, although it

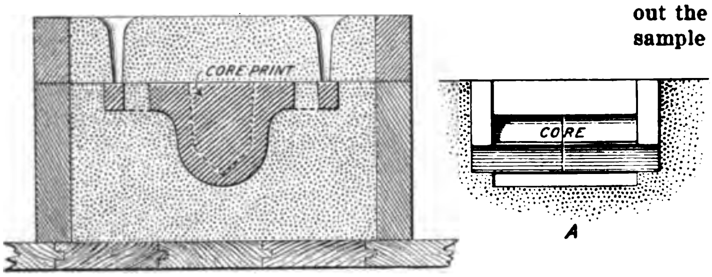


Fig. 35.—Molding from an Old Casting—Second Method.

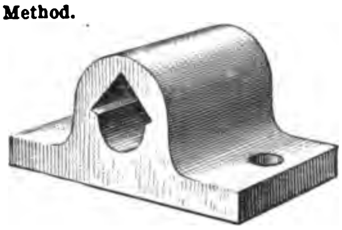


Fig. 33.—Swing Log Hanger Bearing.

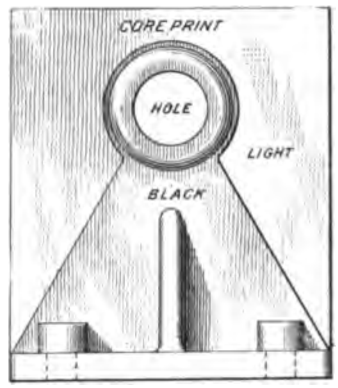


Fig. 40.—Face View.

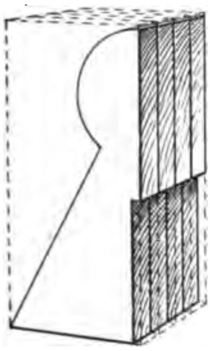


Fig. 36.—Method of Cutting Out the Jaws.

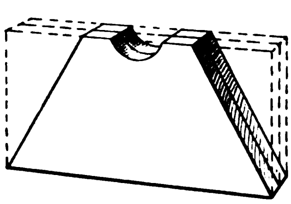


Fig. 37.—Cutting Out the Web.

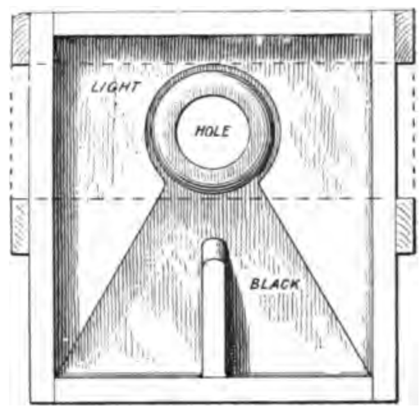


Fig. 41 - Face View.

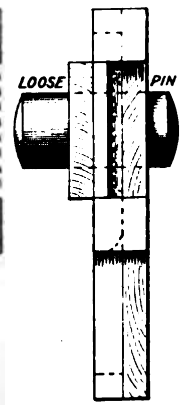


Fig. 42.-Side View.

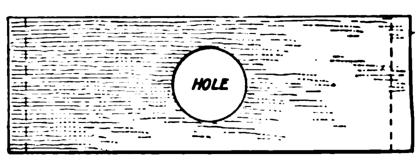


Fig. 43.-Pin Guide.

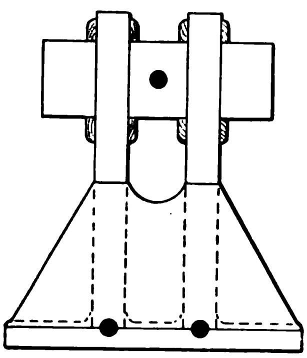


Fig. 38.—View of One-half of Pattern for Equalizer bearing, Facing the Parting.

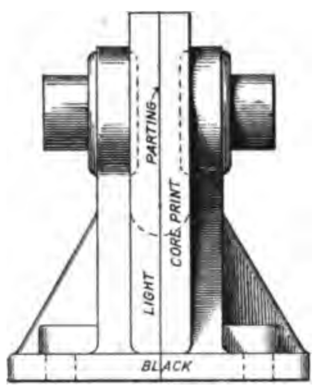


Fig. 39.—Side View of Pattern for Equalizer Bearing.

Figs. 41, 42 and 43.—Details of Core Box for Equalizer Bearing Pattern.

The Art of Wood Pattern Making.—III.

would be a rather unusual way of doing it, the desired block of metal could be procured by placing a stop core print on the side of the pattern and mold it all in the drag and on edge, as shown in Fig. 32.

A first-class patternmaker must be a fairly good mechanical draftsman. Most patternmakers work to full size drawings made with an ordinary steel square on a smooth pine board, which is redressed when the drawing has served its purpose. Mechanical drawing is so generally taught now in schools and colleges that it is hardly worth while mentioning other methods of acquiring it. It is, however, also taught in the school of experience by those willing to pay the price of tuition. A very careful study of the pages of *Carpentry and Building* since its first number was issued might be of benefit. It is all the schooling in that line the writer ever had, and he has managed to worry along and hold down some pretty fair jobs. Even now, when past my days of usefulness and nearly ready to be chloroformed according to Dr. Osler, I can always find three or four jobs to do for every one for which I can find the time.

We will next take up a little more difficult piece of work, so we may pass along by easy stages from one phase to another. We will select a swing-log-hanger-bearing for a freight car, as shown in Fig. 33. Now with simple forms like this in a repair shop where only two or three pieces are required the first thought of the pattern maker is how to procure them with the least trouble to himself and expense to his employer. In this case the casting can be procured in three different ways without the necessity of making a pattern at all, provided the sample furnished is a perfect casting.

First, if the original pattern had been parted in the center at right angles to the large hole and it was found that this hole had sufficient draft, it would only be necessary to plug the bolt holes, rub up the casting to remove the rust and any rough projections that might be on it, and give it two or three coats of black shellac. In such a case the bolt holes would, of course, have to be drilled afterwards, or it is possible to put core prints in the bolt holes and provide suitable core boxes. In either case the molder must make a parting with the trowel. Should it be found that the large hole had no draft, then a core print must be put in and a core box made. It would then be molded in the sand, as shown in Fig. 34.

Now for the sake of argument we will suppose it necessary to core the large hole. This will require two core boxes if we get the bolt holes, but we can avoid this by putting stop core prints on each side of the casting and making a single stop core box, making the stop cores of proper length, so they will just meet in the center of the mold. The parting of this would be along the base of the casting, as in Fig. 35. The bolt holes would make their own cores. After the pattern was drawn out of the sand the two stop cores for the large hole would be inserted and the cope replaced, all as indicated at "A," in Fig. 35. Always make this kind of a core heavier in the sand than in the mold, so it will not tip down. In the instance mentioned a pattern had to be made, and this is how it was done.

The extreme measurements of the casting were 6½ x 4¼ x 3 in. From a 1½-in. plank cut a piece of stuff 4½ x 14 in. This being dressed out of wind, cut it in two pieces and dowel them together. I then dressed one edge of the block so formed, true and square. Taking this edge as the base line, I laid out the pattern on one side exactly the size and shape required at the parting. This was then cut out on a fine band saw and the large hole cut and mortised squarely through. It then remained to go carefully over the entire piece with sharp formers and give the required amount of draft, round up the corners and put in core prints for the bolt holes—half in each part of the pattern—and finish with black shellac, leaving the core prints light. This pattern molds half in the cope and half in the drag.

We will now go back and take up the actual work in halves and lay out with a lead pencil the gains for the jaws square across the pieces. With a sharp instrument for a marker set the base of the jaw between the pencil marks, allowing an equal amount of draft on each side, and scribe the gains. Next with a thumb gauge lay off the required depth of the gains and cut them out. Rabbet the thick edge of the stuff to receive the web and dress off the gained side for draft. The next operation is to apply good hot glue to the joints and fasten the work with suitable brads. I say *hot glue* if in a warm room, but if in a cold, drafty shop use some liquid glue.

Next turn out four disks with either round, coved or ogee edges, or even a neat bevel, ⅜ in. thick and 5¼ in. in diameter, with a 3¼-in. hole in the center. Dowel two pieces of stuff 3⅜ x 1 11-16 together, of sufficient length for the core, allowing about 1½ in. on each end outside of the disks for core prints. Turn this up to 3¼ in. in diameter. Now with the dividers take the exact width between jaws and mark the length wanted by holding the dividers to the work while the lathe is in motion. With the parting tool cut the piece nearly off, working the tool to the scribes outside. Lay off the outside core prints 1⅞ in. long, cutting the ends slightly convex with the three-quarter paring chisel, but not entirely off. Sandpaper with lathe in motion and apply a coat of white shellac. When dry sandpaper lightly and apply a second

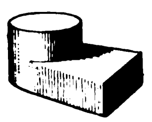


Fig. 44.—A Stop Core.

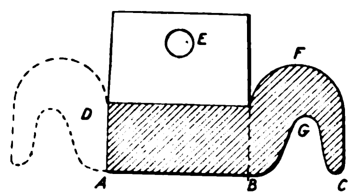


Fig. 46.—Working Drawing Cross-Section on *x-y* of Fig. 47.

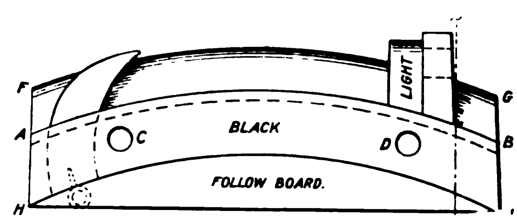


Fig. 47.—Side Elevation, Showing Movable Hook.

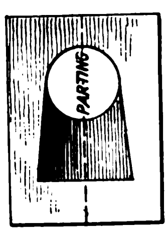


Fig. 45.—Stop Core Box.

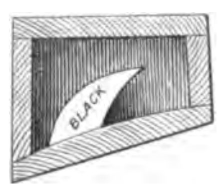


Fig. 49.—Core Box for Hook Shown in Fig. 48.

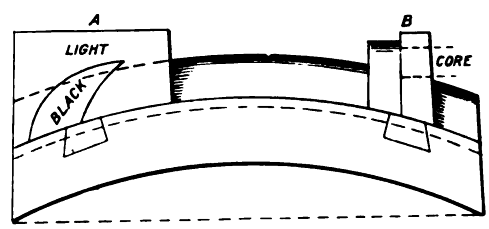


Fig. 48.—Second Method of Reversing the Pattern.

The Art of Wood Pattern Making.—III.

of constructing the wood pattern for a locomotive equalizer bearing, which was shown in Figs. 5 and 6. It will be noted that this pattern will part equally well either with or at right angles to the pin hole. In this particular case the base was 1⅛ in. thick, the jaws 1⅜ in. thick and the pin hole 3¼ in. in diameter. It was 11½ in. from the base of the pattern to the center of the pin hole. The web, which runs parallel to the pin and supports the jaws, was 1 in. thick, approximate measurements from which the draft must be deducted. We begin operations by taking a piece of 1⅛-in. stuff double the length and half the width of the base; a piece of 1⅜-in. stuff four times the length and half the width of the jaws, and a piece of ½-in. stuff double the length and the full width of the web at the highest part. We next cut the 1⅜-in. plank into four pieces and build them into one block, securing the parts in position with small finish nails placed so they will not interfere with the band saw. The edge of the block so formed is then dressed perfectly square and the drawing of one-half of the jaw laid out on one side of the block.

We next cut the ½-in. plank into two pieces and proceed in like manner, laying out the form of the web on the side of it. Next, with a fine sharp band saw we cut away the surplus wood, as indicated by the dotted lines in Figs. 36 and 37. The block of jaws is then taken apart and each piece dressed just enough to give it the draft toward the outer edge. Next cut the part for the base coat. When this begins to get a little hard take a woolen cloth and a few drops of linseed oil and polish in the lathe. Now with a very fine back saw cut all the disks in halves and glue in place. These should be finished in the lathe with black shellac. The disks will have a kind of pocket, which will help hold and brace the core prints, which can now be cut off and glued into place. Looking at one-half of the pattern at the parting, it will now appear as in Fig. 38.

The pattern is now ready to be smoothed up and finished. The base will have to be looked after in order to make sure that it has draft on the bottom side. Place a small fillet in all sharp inside angles. This can be of wood, although leather is better, the leather fillets being readily purchased through the trade. Fillets for small work are also put in of wax, hard drying coach painters' putty, &c.

Now if it is desired to core out the bolt holes make stop core prints and finish them in white shellac. Finish the pattern with black shellac, leaving the place bare where stop cores set, and when done glue on the finished stop cores. The core boxes for this purpose consist of a simple stop core and a half round common core box, 3¼ in. in diameter. A stop core is any core where the print is extended in such a manner as to make the pattern so it will draw out of the sand.

The foregoing is an exact description of the way the pattern was made. Now let us suppose that for any reason we desire to part this pattern at a right angle to the pin hole. We first get out two pieces of stuff half the thickness of the space between jaws and the width of the base, and, say, 1 in. longer than the jaws. This we dowel together for a core print and dress them with a little draft from the center outward on sides and top and a very little the other way on the bottom. Next lay out the jaw full size on a 1⅝-in. blank. Fasten this to another piece of the same thickness and cut out the jaws. While yet together smooth up, giving the edges a little draft from the joint out and reversing the draft at the bottom, making it exactly like that of the main core print. Now with brads and glue fasten the jaws to the core prints with the bottoms even. Procure two pieces of 1½-in. stuff, half as wide as the base is long and of a length equal to the width of the base. Fasten these to the jaws and core, making the joint even with that in the core print. Cut out a little triangular base of 1-in. stuff and dress it with plenty of draft; then secure it in the center of the jaw and base. Turn up two disks as described in connection with Fig. 38, without center hole. Turn up two core prints, ¾ x 1½ in. long; fasten the disks to the outside of the jaws and the core prints in the center of the disks, or turn up the mold and core print in one piece if it is convenient so to do. This gives the pattern shown in Figs. 39 and 40. When completed dress off the bottom for draft. These drawings also show us exactly how to build our large core box.

By again referring to Figs. 30 and 40 we note the fact that the core box is reversible, hence only requires one-half of the core to be molded.

We next build a box like that shown in Fig. 41, half the depth that the core is thick and exactly the size indicated by the core print in Fig. 40. In the bottom of this box lay out the form of the casting and finish it in black, putting in a partition, as shown, to make a cavity in the core for the web. Next turn out the disk for the mold, as described in the first method, and fasten it in place. Cut the hole through the bottom of the box so a 3¼-in. pin will just slip into it and turn easily. Another way would be to put a core print on the disk, but it would be necessary to give this draft while the pin can be turned as it is drawn, leaving a straight hole in the core. Place a fillet along the base side of the box.

Next make the pin guide, Fig. 43, and fasten it across the top of the box in any manner so it may easily be lifted off, and with the pin hole square above the hole in the core box. Next make a 3¼-in. pin. A side view of the box with the parts assembled is shown in Fig. 42.

As we are obliged to use stop cores in this pattern, we will now take up this phase of the subject. Stop cores are used where a hole is parallel to the parting, such a core being shown in Fig. 44. The core box I have usually made of two pieces of stuff of a thickness equal to the length of the hole. This insures the print being heavier than the core and setting firmly in the sand. Lay off the desired shape of the hole on both pieces and cut it out. If round, put the pieces together in the vise and bore clear through. Smooth up the part that molds the core for the hole, giving sufficient draft. Then with the pattern for the core print, which may be cardboard, thin veneer or other suitable material, lay off the other piece and cut it out, allowing for draft. Fasten the two pieces together with long brads and glue. Smooth up perfectly and finish with shellac rubbed to a polish. Stop core boxes are also made to part in the center of the core, as indicated in Fig. 45.

We will now take up the brake shoe illustrated in Fig. 10. From this pattern it was necessary to mold a full set of shoes for an engine, hence the same pattern had to serve for right and left shoe. It may be stated that the first thing to do in making this or nearly any other pattern is to lay out a full sized drawing of the work showing all the bolt holes, cores and core prints. This laying on the trestles handy to the bench saves many details and much vexation and well repays the trouble. The best way to make this pattern will first be described, and then followed by the way the writer made it. Referring to the cross sectional drawings, Fig. 46, we prepare a block of suitable size and of the proper thickness from A to B; then another of the thickness indicated from B to C. On the first mentioned piece lay off the arc A B shown in Fig. 47, and on the second one the arc F G on Fig. 47. Next on both sides of the first block lay off the dowel pin holes C D and bore clear through, boring from each side half way, and on into the second block. Drive the dowels well glued into the second block, and then sand paper down until the first block will slide on and off easily but not loosely. Put the blocks together and cut the arcs F G and H J. In cutting H J the surplus wood can be saved, and witn very little work will make a follow board which will naturally assist the molder. Take the blocks apart and cut the arc A B through the prepared block; lay off and mortise for the retaining hook, making the mortise just a little larger at the bottom than at the top, so that the hook will bind snugly in place, but loosen up as soon as it begins to draw out. Be sure the curve in the mortise is just right so the hook will not pull the sand out with it when being drawn from the mold. Fit the hook in place. A little beeswax melted in linseed oil is a fine thing to use in work of this kind, as it obviates the tendency of the parts to stick together. Prepare the block E in Fig. 46 with suitable stop core print as indicated in Fig. 47. Carefully round up the outer edge of the second block as at F in Fig. 46, using a pattern cut out of thin veneer to gauge the work. Then cut the groove G of Fig. 46 in like manner.

Make all smooth and be sure of draft at F H and G J of Fig. 47. Make a stop core box for the bolt hole E in Fig. 46. An awl hole should be made in the base of the hook and a large screw eye sent along for removing the hook from the sand.

To reverse the pattern simply take it apart and put it together the other way. Finish with shellac as previously described.

Another method and the way the pattern was actually made, is illustrated in Fig. 48. The block forming the mold for the brake shoe was made in one piece, and the retaining hook was cast up in a core, as shown in Fig. 48. In order to reverse this pattern the core print A and the hook B were made to interchange on dovetail slides as shown. These slides should have a dressing of beeswax and oil to make them work smoothly. A core print having metal extending into it should have the metal represented upon it with black for the benefit of the molder. The core box is further explained by Fig. 49.

This pattern will be easier for the molder if a follow board accompanies it. This can be made of the surplus wood from cutting the arc H J of Fig. 47 by gluing the pieces together and putting a beveled extension on each side of the piece so formed.

Irish Round Towers.

It is a mistake to suppose that all the Irish round towers are of very early date, says an English writer. Many of them are contemporary with our Norman buildings. One at least was built as late as the thirteenth century. But this in no way affects the antiquity of the type. Though some of the existing towers are as late as the days of Giraldus, yet the famous passage of Giraldus about the towers would alone prove that the custom of building such towers was already ancient in his time. This argument would be equally sound, even though it could be shown that every existing example was certainly of the twelfth century or later. All that would be proved would be that the existing towers had replaced earlier ones of essentially the same type. So with the ancient churches and groups of churches there is no need to prove that many of them were built after, some long after, the invasion, Norman or English, or whatever we are to call it. But the type is none the less ancient and national. It is shown to be so all the more by the fact of its being retained in native foundations alongside of the new type introduced by the invaders. In fact, some of the arguments often employed about Irish buildings are simply another form of the old heresy about the year 1066. Discussions of Irish as well as English antiquities are often unconsciously affected by a lurking belief that after all nothing could have been done anywhere before the time of William the Conqueror.

CORRESPONDENCE.

Finding Side Cut of Valley Rafter in Roof of Unequal Pitch.

From J. M., Hartford, Conn.—In looking over some of the back numbers of the paper my attention was drawn to the inquiry of "C. W. H.," East Haven, Conn., regarding "a method of finding the bevel cut of an irregular valley rafter; that is, where there are two different pitches," and it has occurred to me to offer a few comments which, taken in connection with what has already appeared on the subject, may be of interest to the correspondent in question. While many replies have been forthcoming, there is one method which no one seems to have mentioned, neither have I seen it described in any work on carpentry. The method occurred to me several years ago and I thought at the time that it was well known, but this appears not to be the case. The method is very simple and requires no construction of diagram, all that the carpenter needs being his roof plan, bevel and rule. Of course he will also have his steel square handy and the stick that he is going to lay out.

The method works equally well on hips, valleys or jack rafters on any kind of a roof, whether irregular or polygonal with any number of sides.

Referring to the sketches, we have in Fig. 1 a roof plan of rather abnormal proportions and indicated in outline by A B C D E F G H. The rise of the main roof is 2 ft. to the foot, while the rise of the gable G F is 6 in. to the foot. I have taken such a plan for it makes a very good demonstration. All the different side cuts of the valley or jacks can be laid out in the same manner and it is therefore unnecessary to consider more than one of them.

To develop the side cut as required where the valley E K laps on the main ridge at K proceed as follows:

First mark the plumb cut on the valley timber as E K of Fig. 2, this cut being 16.491, or practically 16½ on the blade and 8 on the tongue of the steel square; the tongue gives the cut. Next set a bevel to the angle which the valley E K makes with the ridge L J on the roof plan, Fig. 1, and mark this bevel across the top or back of the valley timber as shown at M N in Fig. 2. Square across from N to O. Next draw a line square with the plumb cut as P R. Take the distance from M to O and measure back from the plumb cut on the line P R the same distance, locating R. Through R draw Q U parallel with E K. Square across from Q to T and draw a line from K to T, which gives the side bevel. In case the timber is previously backed then the bevel can be laid out on the under side just as well.

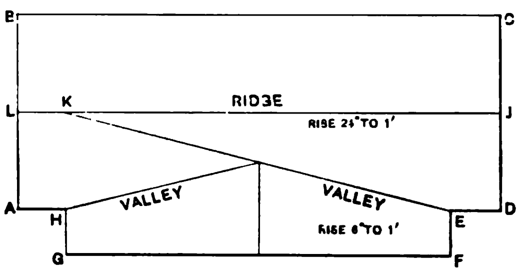


Fig. 1.—Roof Plan.

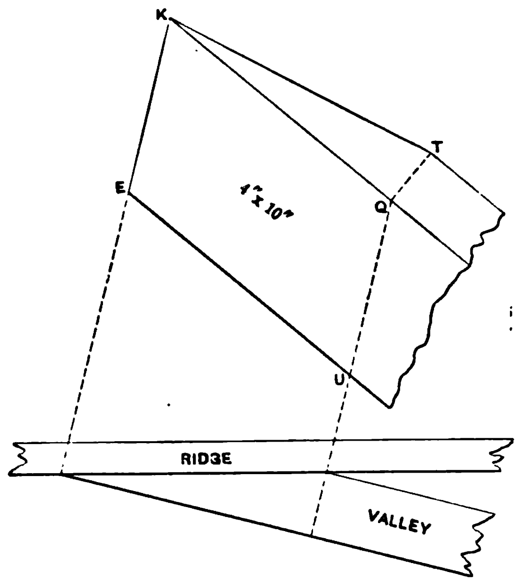


Fig. 3.—Enlarged Sketch of the Joint, Showing How the Side Bevels May Be Obtained.

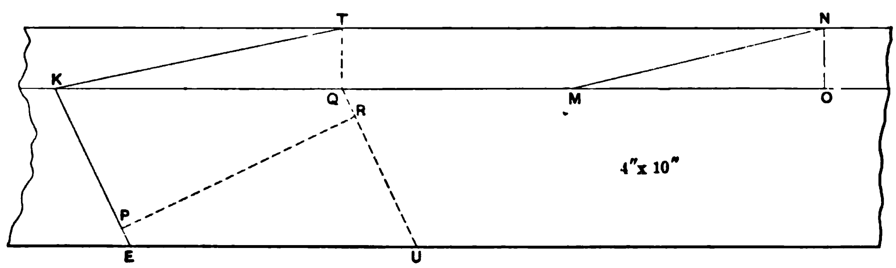


Fig. 2.—The Valley Rafter.

Finding Side Cut of Valley Rafter in Roof of Unequal Pitch.

In Fig. 3 of the diagrams I show an enlarged plan of the joint with an indication of the manner in which the side bevels may be obtained. It would seem that no explanation of this diagram was necessary, and I will therefore only call attention to the fact that the dotted lines, which are extended from the intersecting points of the valley and ridge, are drawn at right angles to the valley.

In his very interesting serial articles entitled "Construction of Centers and Sashes for Arches of Double Curvature," Charles H. Fox employs this very same method "to find the true section as given at the oblique plane which forms the top of the plank and determines the true angle of the bevels as are required in order to give the proper direction for making the side cuts." (See *Carpentry and Building* for April, 1906, article 3, by Charles H. Fox.)

Now in roof framing the conditions are similar and the same geometrical principles will govern our work. They will have to be applied in some manner, and I believe that in a majority of cases the method first suggested will be found the quickest, most convenient and easiest to remember.

At this time I wish to express my appreciation of *Carpentry and Building*, which I estimate very highly for its many instructive articles on the problems of our craft, which to the ambitious student are of great educational value, while the Department of Correspondence gives him an opportunity to gain valuable information from the more experienced readers.

Construction of Veneered Doors.

From F. T., Sidell, Ill.—I would say in reply to "W. F. S.," Hermitage, Tenn., that I have had some experience with veneered doors. I once put up a pair of them in a dwelling at Pensacola, Fla., and the veneering began to let loose in a few days, notwithstanding there was a porch to protect them. In my estimation any door for outside exposure ought to be mortised through and wedged. These pinned and glued doors do not stand well outside.

I have taken *Carpentry and Building* for some years and have obtained valuable information from its columns.

Estimating Cost of Buildings.

From R. G. D., Worcester, Mass.—I am planning to erect a small wooden one-story building, and before consulting an architect I desire to obtain a general estimate of its probable cost. Will some one give me the desired information or tell me the best method of securing it. I would state, by way of description, that the building is to be 70 ft. in length, 40 ft. in width and 20 ft. in hight. It is to have a flat roof but no shingling. The structure is to be of cheap, light building materials, such as are generally used in connection with summer dance halls, &c. It will have plain finish throughout, and the floor will be graded 1 ft. in 70. The inside will be plain, and there will be probably six windows and three doors. Could I do this for $500 or less?

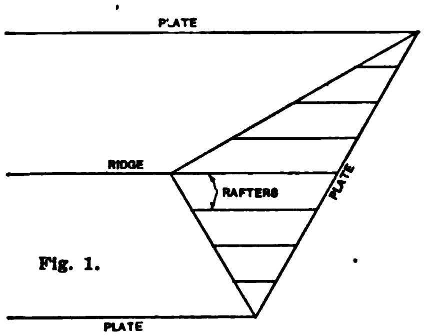


Fig. 1.

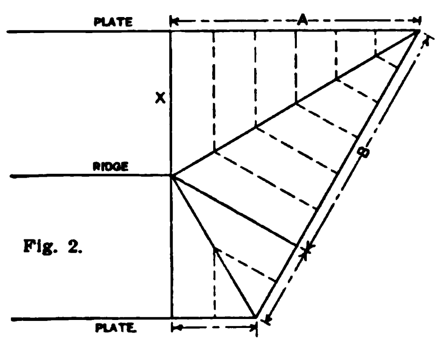


Fig. 2.

A Steel Square Problem.

A Steel Square Problem.

From English, London.—So much has been said about the steel square and its multifarious uses, especially in connection with framing work, that I am constrained to describe a little problem that developed one evening when I was experimenting somewhat with this well-known adjunct of the carpenter's "kit." I had before me a statement from a local building paper to the effect that "in roofing out of square the heel of the blade is put on the ridge line, with the blade and tongue touching the outer angles of the roof."

The general way I believe of getting the rafters on the skew end is to run them straight to the plate, as indicated in Fig. 1 of the diagrams. It occurred to me that by throwing the rafters of the skew end the same as those between the last full length or common rafter and the point of the hip on the straight sides I would get two pieces of the same lengths and bevels, only of course opposite bands.

Thinking the matter might be of possible interest to your readers I will describe my method of solving the problem, simply requesting that practical carpenters criticise the solution, to the end that all phases may be discussed.

Take the distance from the last common rafter, as indicated by X in Fig. 2, to the point of the hip on the straight side, as A, and measure an equal distance along the skew side, as B, which gives the point of the longest rafter on the skew side. The actual rafter is the same length as those on either side of roof. The dotted lines show the jacks filled in.

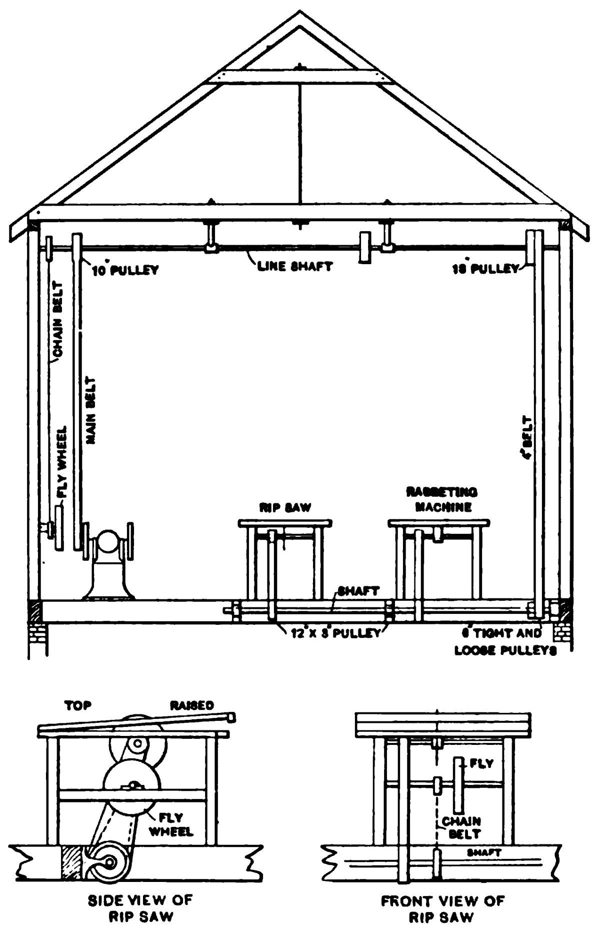
The bevel for jacks is as obtained in the following manner:

Add the distance from the common rafter to the point of the hip to the gain of a common rafter running that distance. Take the same on the blade and the run of the common rafter on the tongue and the blade gives the bevel. Note that the bird's mouth of all rafters on the skew side by this method is square.

More Power for a Carpenter's Shop.

From J. E. D., Milton, Iowa.—I have a small carpenter's shop 20 x 40 ft. in area and 8 ft. high equipped with a 2-hp. gasoline engine and with power machines, most of which are my own make. These consist of a rip saw and a rabbeting machine, with the main line shaft overhead and belted to the shaft under the floor with tight and loose pulleys. The machines are belted to the shaft under the floor. On the left side there is a flywheel belted to the main shaft with a chain belt. What I want to know is where to put this flywheel in order to make it easier on the engine.

I will explain: When I am running all of my machines at the same time and doing ripping and rabbeting it takes about all the power the engine can produce without the flywheel. Where I now have the flywheel belted to the main shaft it does not seem to do much good, and I would like to have some of the practical readers tell me where to put it so as to give more power. Will it give more power to attach the flywheel to the frame of the rip saw and belt it to the shaft under the floor with a chain belt, as I think a chain belt would pull more than a leather belt. At present I have trouble making the 4-in. belt running from the main shaft to the shaft under the floor operate my machines, as the belt slips quite often



More Power for Carpenter's Shop.—Sketches Accompanying Letter of J. E. D.

when I am doing ripping and rabbeting. The belt from the engine to the main shaft also slips quite a little.

The sketches which I send will, I think, readily explain the position of the machines and the location of the engine, shafting, belts, &c. It will be noted in the small sketch, showing the side view of my rip saw, that the machine is belted to the lower shaft. I also send a sketch showing the flywheel attached to the frame of the rip saw and belted to the lower shaft. I would also ask whether or not this is a good place to put it. If some reader of the paper has a shop of this size in a small town I would like to know his experience, success or failure in operating his machines. Possibly he will tell me to use different sizes of pulleys, and leave off the wheel. If so what size balance wheel should I use and where should I place it. Briefly, I want more power with the same engine if I can get it and without running the engine to its full capacity.

The Value of "Carpentry and Building."

From J. D. M., Benton Harbor, Mich.—I wish to thank the editor for the great help his valuable paper is to me each month. I have seen and read a number of different periodicals devoted to the building interests, but I do not find any which equals *Carpentry and Building* for practical information. It is also a great help to my patrons in selecting house designs for execution, as the pictures show both exterior and interior views. All trade topics are so ably and simply treated that I consider it a journal which no one using carpenters' tools can well do without.

From F. K., Chambersburg, Pa.—In renewing my subscription to your valuable journal I desire to say that I have taken it ever since it was first issued, and regard it as the best and cheapest publication of its kind. I am 71 years of age, but enjoy reading its pages as well as I did many years ago, for I find many valuable suggestions to both old and young mechanics. It has my best wishes for a prosperous future.

Builders' Cost Sheet for Reinforced Concrete Work.

From G. C., Malden, Mass.—Thinking the readers of *Carpentry and Building* may be interested in a form of cost sheet for use in connection with reinforced concrete building operations, I am sending herewith a blank form, which is employed by a concern doing business in the Northwest, but which is applicable, of course, to any section of the country. I shall be glad to have the readers comment upon this cost sheet and to express their views in the light of the experience, which they may have had in connection with work of the character indicated.

COST SHEET No.

AT JOB No. ____ 190__

No. CORRECT TIMEKEEPER.

	DAY	FORMS						CONCRETE					STEEL								HOISTING		PLANT					
								MIXING					BARS OF EXPANDED METAL															
		Wall	Columns	Beams	Flooring	Shoring	Removing and Piling	Machine	Hand	Wheeling	Placing and Tamping	Finishing or Plastering	Handling & Storing	Cutting	Bending	Placing	Hooping	Handling Material	Removing Debris	Extras	Engine or Horse	Engineer or Laborer	Erection Repairing Dismantling	Branch Expense	Total Hours	Rate	Amount Earned	Amount Advanced
Chief Engineer																												
Superintendent																												
Carpenter																												
Foreman																												
Carp. Helper																												
Laborers																												
Foreman Laborer																												
Hoisting Eng.																												
Firemen																												
Blacksmith																												
Totals																												
Due																												

Class of Work

Remarks

Building on the Percentage Basis.

From C. E. Woodnutt, Williamsport, Pa.—In regard to executing building contracts on the percentage basis, some reference to which subject has appeared in *Carpentry and Building*, permit me to say that during the past eight years we have executed many thousand dollars' worth of work on a percentage agreement, in several instances doing a second and even a third operation for the same owner.

With one exception, which I will name later, I feel it is one of the fairest ways to have work done. By it the owner secures all of his labor and material at *net cost* to the builder, who is able in most instances to purchase it at a much lower cost than the individual owner. In several instances known to the writer this saving has amounted to more than the commission paid to the builder for his services.

By this method the owner secures his building at actual cost, plus a legitimate profit to the builder, and the builder is assured of a reasonable profit—which all agree he is entitled to on his work.

The exception noted above to doing work under such an arrangement is that it lays the contractor open to a charge of having made the work cost more than it should for the purpose of swelling his commission.

This is largely brought about by the fact that very few owners are able to fully complete a building operation without departing from their plans and specifications. Very rarely does an owner realize that he has made changes of sufficient moment to affect the cost of his building; then when the work is completed and he finds the building has cost more than he contemplated, he feels that his builder has not taken the proper care of his work.

In looking over our records we find a number of instances where we have bid on work in the open market and have afterward been awarded the work on a percentage basis, and upon completion have shown the owner a net saving of from 3 to 8 per cent. on his lowest bid to do the work by contract.

There is another plan of executing building contracts that I favor very strongly, known as the "Cost plus a fixed sum contract." This has all of the good features of the percentage method and eliminates the disagreeable one mentioned above. Under an arrangement of this kind the owner is assured of getting his building at cost, as by the percentage method, and in addition knows exactly what he is to pay his builder for services rendered.

Of the two methods the latter appears to be the most satisfactory wherever tried, as it is absolutely fair to both parties interested.

Trouble with Refrigerator "Sweating."

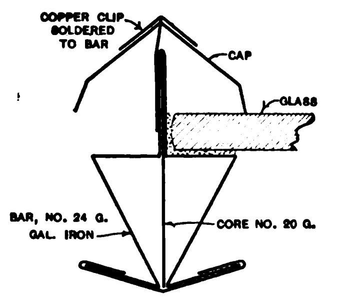
From E. A. W., Concord, N. H.—I find *Carpentry and Building* a very interesting and helpful magazine, especially the Correspondence Department, and as I have a little problem which I would like to submit to the craft I come to it for assistance. It is becoming the custom in this vicinity to build stationary refrigerators into the better class of houses. These are usually constructed in a rather hit-or-miss sort of fashion, with little regard to scientific principles of refrigeration. Consequently some give satisfaction and some do not. Several years ago I built a refrigerator in my own home. It is economical of ice consumption, and the food keeps well, but the ice box "sweats," so that nothing in an open dish can be set under, while the resulting drip is a nuisance generally. The refrigerator is 3 ft. 4 in. by 1 ft. 6 in. and is 3 ft. 7 in. high. The ice box is 1 ft. 4½ in. by 1 ft. 6 in. by 12 in., and is in the center of the refrigerator, occupying the entire width. The box is of galvanized iron and rests on a wooden shelf with a space of 8 in. between the top of the sides and the ceiling of the refrigerator. Perhaps the condensation on the ice box is caused by the sides of the box being the same hight, so that there is not a good air circulation. Would raising one side of the box and cutting down the other as low as possible remedy such a defect?

I shall be very glad of any hints on the part of the practical readers as to the proportion of ice box to size of refrigerator, circulation of air, insulation, &c.

Construction of a Large Skylight.

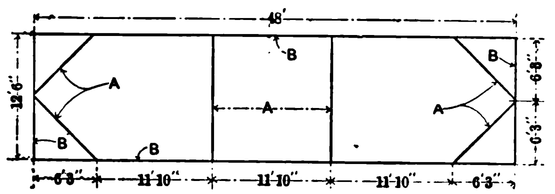
From Skylight, Brooklyn.—In the Correspondence columns of the December issue of the paper "S T. S.," Burlington, N. C., asked for information regarding the size of skylight bars to support glass in sheets 48 x 84 in. in size.

In reply I would suggest that "S. T. S." split his glass into 24-in. widths, as it is rather risky to use 48-in. as a span of the glass work. It is advisable never to use 24-in., and 18-in. is the favorite length in this city. A light of glass ⅜ x 24 x 48 in. weighs 70 lb., and this weight is not concentrated at one point, but evenly distributed over the length of the bar. A bar made according to Fig. 1 of the accompanying sketches is capable of sustaining this weight without perceptible deflection. The skylight curb is subjected not only to the weight of the glass, but also to the thrust from the glass and the bars. This stress must be taken care of, otherwise the skylight will collapse. Another of the sketches, Fig. 2, shows a skylight curb of sufficient strength to resist the stress, which force is transmitted to the roof curb, so that it is necessary to make the roof curb capable also of withstanding the thrust. I presume the roof is framed in wood, in which case a good way is to tie the roof curb with rods, as shown in Fig. 3 of the sketches.



RIDGE & HIP SIMILAR, BUT TO REQUIRED PROFILE

Fig. 1.—Type of Skylight Bar.



A RODS; B ROOF CURBS.

Fig. 3.—Diagram of Roof Framing.

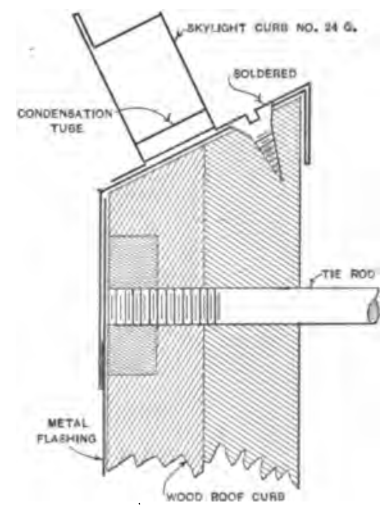


Fig. 2.—Construction of Skylight Curb.

Construction of a Large Skylight.

Rapid Construction of a 12-Story Building.

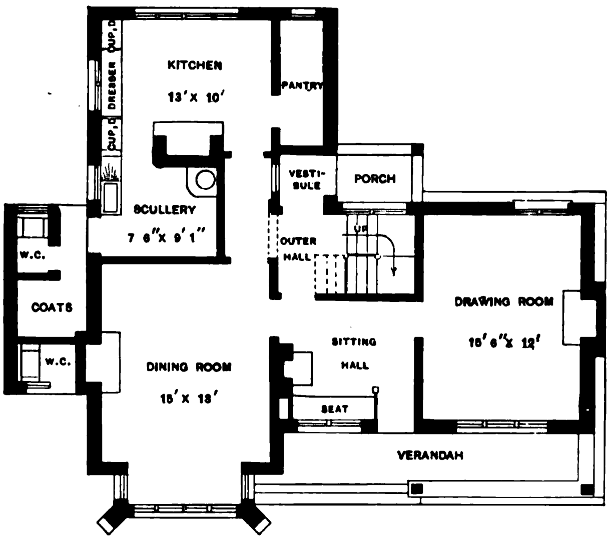
From A. M. M., Tacoma, Wash.—In the February number of *Carpentry and Building*, of which I have been a reader for many years, I find an item relating to the rapid construction of a 12-story building at Pacific avenue and Fifteenth street, Seattle. I would state, by way of correction, that the location of the building is not in Seattle at all, but in the city of Tacoma. There is no Pacific avenue in Seattle. There is also to be erected in this city a 24-story building known as the Imperial. If you will kindly publish this correction in your next issue you will oblige me, as well as many other of your subscribers who have the interests of Tacoma at heart.

A TYPICAL ENGLISH COTTAGE.

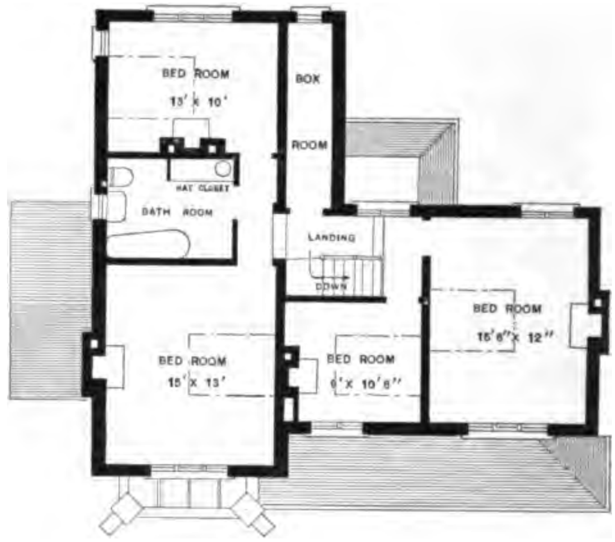
GREAT interest attaches to designs of low and moderate cost houses in whatever part of the world they may be erected, as a careful study of the various schemes of arrangement suggest points that may be utilized in connection with other work. With a view to affording our readers an idea, therefore, of the arrangement of what may be designated as a typical English cottage, costing in the British Isles between $2500 and $3000, we reproduce herewith floor plans and two elevations of such a structure. the drawings of which were furnished one of our London contemporaries by F. A. Jackson, an architect who has done considerable work at Southend-on-Sea.

Front Elevation.

View Looking Toward Rear Porch.



First Floor.



Second Floor.

A Typical English Cottage.

The problem was to so arrange the interior space that the living rooms should be on the south side of the house, in order to get the benefit of the sun, the building occupying a site 50 ft. in width, facing the north. Between the kitchen side of the house and the main road is sufficient space for a garden, this being bordered on the road side by an attractive hedge. A gate in the center of the hedge opens to a walk leading past the drawing room to the veranda. The living rooms look out upon a well kept lawn which embraces the remaining portion of the lot.

According to the architect, the "shell" of the house is of stock brick, above which the external walls are cement, rough cast, with roofs of red tiles. An examination of the plans shows a somewhat peculiar stair arrangement, and there are other features which will doubtless attract the attention of American readers as being somewhat at variance with common practice in this country.

A SHORT TIME since we referred to the probability of an office building occupying the site of the old-fashioned four-story Parsons residence, at 505 Fifth avenue, Borough of Manhattan, New York, and recently plans were filed for the new structure. It will be an 18-story office building, having a frontage of 37 ft. and a depth of 108 ft. The façade will be of brick, with trimmings of limestone and terra cotta, and adorned with Corinthian pilasters at the sixteenth story, supporting an ornamental cornice.

Modern Fireproof Bank Building.

The eight-story Bank of Italy Building, which has been completed on the southeast corner of Montgomery and Clay streets, San Francisco, is eight stories in hight, and while it covers a ground site of only 50 x 60 ft., it is one of the handsomest structures of the new San Francisco. The plans, by Architects Shea & Lofquist, called for a perfect type of Italian Renaissance, and the work has been well executed in stone and brick. It is a class A building, with a monolithic concrete grill and cantilever foundation starting 35 ft. below the curb line. The total weight of the steel frame is 350 tons. The exterior facing of the first three stories is of white granite from the McGilvray quarry at Raymond, Cal. The upper façades of the building are faced with limestone from New Bedford, Ind. The floors are of reinforced concrete, and reinforced concrete fireproofing is the rule throughout the structure. All partitions are of metal and hard wall plaster. Copper doors and trim are used throughout. The window frames are of metal, and wire glass is used. The banking room occupies the entire first floor. Walls, desks, railings, partitions, counters and vault fronts are all of Paonazzo marble. The flooring is also of Italian marble. Bronze doors and window frames, candelabra and counter screens are features of this room. The entrance hall leading to the elevators communicating with the offices on the upper floors is finished entirely in Italian marble, with a marble floor. The doors and staircases are of bronze. All of the halls have marble floors, and the marble wainscoting is about 7 ft. high.

CABINET WORK FOR THE CARPENTER.

CLOTHES CHESTS AND WARDROBE.

By Paul D. Otter.

THE disposition and care of wearing apparel is an important one, despite the fact that very frequently little attention is given to the subject by those having to do with the planning of homes. Men do not take this into serious account, and too often a house is turned over to the wife as a monumental gift of the husband's thrift and affection—a house of rooms, with the usual meager closet allowance—in many instances a room or two without a closet, or one the depth of which is controlled by the size of a chimney stack, which must be there, and were it not there possibly the closet of one room and that of the adjoining room would be minus also. This is a niggardly idea, cheating the occupant of that room ever after, and calling for some form of portable wardrobe, chest or chiffonier. This subject therefore is dedicated to the closetless many, the sufferings of whom only the housewife it seems will ever intelligently know about.

Assuming a chimney jamb closet has a depth only sufficient to hang up garments of daily wear, time soon develops the necessity of a place for extra garments, suits or dresses; the situation is relieved by making a clothes chest. Should the room be of ample size such a chest may be after the old-fashioned proportions; in other words, about the size and pattern of your grandfather's tool chest or the chest of some seafaring grandsire. These chests are coming into vogue, not only as the chest for the bride's trousseau, but they have a satisfying amplitude which no chiffonier ever possessed. The drawing, Fig. 1, illustrates the construction. Three or four easy fitting tills, Fig. 2, give ready access to the contents and relieve the pressure from such dresses and clothing that may have been put away ironed or pressed.

The "unit system" so much in use in modern office fixtures is being applied to the development of present day wardrobe furniture, the predominate idea being that the outer casing or protection is necessary, but the immediate accessibility of all parts within is of greater necessity. The objects sought are accomplished by dividing the interior space with light removable tills or partitions, permitting garments of a certain kind or weight to occupy a certain till. There is no proof obtainable that red cedar repels moths or insects, but from its beauty and light weight it is to be recommended, as the same size of chest of oak or other hardwood becomes an unwieldly article to move about or transport from one place to another.

The idea indicated in Fig. 2 suggests an easily removable till, the corners of which it would be well to dovetail, although glued up in box like manner with neatly fitted triangular corner pieces would make a firm joint. The material for such a tray should be soft wood not over ½ in. in thickness, and the trays set one upon another.

Restricted floor space in some bedrooms apparently prevents having a clothes chest, yet a very ample chest may be constructed after the manner indicated in Fig. 3. The hight from the floor is shown, or rather it should be determined by the space from the bottom of the side bed rail to the floor; 4 or 5 in. wheels sawed or turned from 1-in. stock are hung on projected axle stumps turned nicely to fit with a square left or inner end which is tightly mortised to the sides of the chest as shown. The chest then becomes a wheeled affair, permitting of its being easily run under the bed out of the way and as easily drawn out for use. Two tills similar to that shown in Fig. 2 should be provided and made of a size to fit easily. The width and length for this form of chest may be greater if desired than that shown, thus permitting of the placing away of pressed trousers to the full length, also coat and vest laid out, few creases being required.

Now the modern wardrobe is suggested. This should appeal particularly to the masculine mind, for it proves to be a mute valet looking after the master's clothes with unconscious care, for in its appointments it provides for and gives quick access to everything a man wears in the nature of outer garments, with tills for

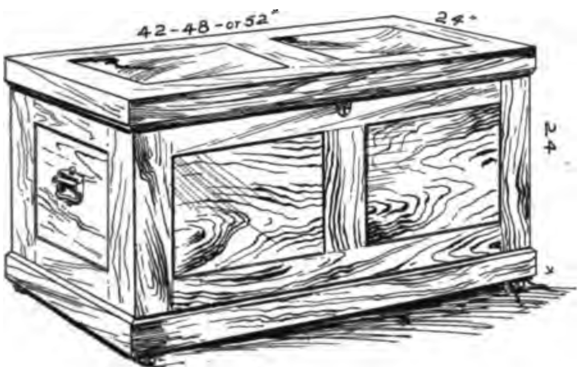


Fig. 1.—General View of Clothes Chest.

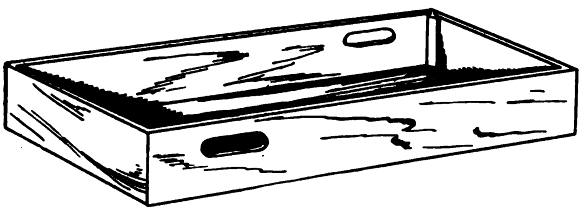


Fig. 2.—Tray for Clothes Chest.

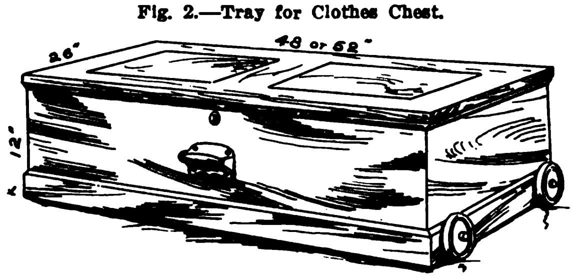


Fig. 3.—Another Style of Clothes Chest.

Fig. 4.—Open View of Wardrobe.

Cabinet Work for the Carpenter.—Clothes Chests and Wardrobe.

washable apparel. To make this case complete and convenient a generous supply of coat and trouser hangers should be purchased, otherwise the idea is somewhat defeated. A few single hangers for odd garments and two or three sets of the combined coat and trouser hangers permit of an entire suit to be hung and withdrawn very readily, while occupying a minimum of space. As these articles are and have been written for the progressive carpenter it is useless to go over the standard form of case construction considered in former articles, and in dealing with the construction of the wardrobe we may be permitted to state that the carcase is built after the manner of all bookcases, wardrobes, &c.—that is, a frame and panel construction, back and sides, with solid top and bottom, doors being framed in the usual manner.

It is quite necessary to draw up a one-half working detail, and from measurements given or setting down such measured changes as individual requirements suggest. The object aimed at when departing from given measurements is to reduce or enlarge proportionately. The dimensions given are ample for the hanging of coats, vests and trousers or skirts at their full length in the division marked 1, while 2 represents light removable tills or drawers for underclothes, shirts and laundered goods. These tills slide on thin parting cleats. The part marked 3 provides two drawers for cuffs, collars and small dressing materials, while 4 will hold two or three hats. Immediately above 4 is a 1-in. space, which allows for a light mirror, 5, to be drawn out and turned up into the position shown for shaving or dressing purposes. A loose pin joint will readily suggest itself for withdrawing to a definite stop.

In Fig. 6 is shown two turn balls and wooden or metal rod, which is secured to the door stiles of an opposite door not shown in the illustration. On the bottom door rail No. 7 is fastened. These two parts provide for an umbrella rack, which closes in with the door of the clothes closet. A similar rod, like No. 6, may be secured on the upper portion of a door for a rail upon which to hang ties.

After staining and filling, the usual three shellac and three varnish coat finish is most desirable. The interior is usually oiled natural color, with three coats orange shellac and an after oil rub.

Specifications for Setting Tile.

The extent to which tile is employed at the present day in connection with the finish of buildings of all kinds renders interesting the following brief specifications for laying tile and ceramic mosaic, issued by the Mosaic Tile Company of New York City. In regard to floors, the statement is made that the base or subfloor for the concrete must not be less than 3 in. below the finished floor. Where it is of wood the boards are to be spaced to allow for swelling. Dampen the base when it is brick, terra cotta or earth, to prevent its robbing the concrete of water.

The concrete is to be mixed dry of 1 part Portland cement, with respectively: 2 parts sharp sand, 5 parts clean gravel, or 1 part sand, 6 parts coal cinders, or 2 parts sand, 3 parts broken stone, moistened not to exceed the dampness of molding sand, spread in even layers, which are rammed to utmost compactness, until it is raised to within 1¼ in. of the finished floor line. The concrete must be left perfectly level, protected from grease and building débris, particularly lime and plaster.

Setting of the tile should be begun within a day after the concrete is laid, or if this be impossible the concrete must be thoroughly saturated with water to prevent its drying the cement mortar. Mix dry 2 parts Portland cement with 3 parts clean sharp sand, and add no more water than needed to make a very stiff mortar, which must be used fresh, and thrown away if it has an initial set before using. In no case mix lime with the mortar, except in setting tile to perpendicular walls, and then not to exceed 10 per cent.

Spread the mortar evenly, with great care, to establish the level of the floor for the tile, without excessive pounding.

Set the tile with ample joints of at least 1-16 in., and fill or grout these from the surface with clear Portland cement mixed with water to the consistence of cream. Wash off all cement from the surface of the tile before it sets, and clean the floors by mechanical means. If acid must be used for the removal of cement stains, dilute and apply it with a sponge to a small space at a time only, and wipe up immediately with clear water to keep from cutting out the joints. Protect the floor from use for five days.

Preservation of Piling Against Marine Borers.

The length of service of piles in wharfs and other marine structures is greatly shortened by the attack of marine borers or shipworms. A method of protection, both efficient and cheap, is much needed, the more so because the timbers best suited for piling are becoming very scarce and are increasing rapidly in price.

Marine borers are found as far north as Maine and Alaska, though they are more numerous and destructive in warmer waters farther South. Since they require only a small exposed surface in order to gain entrance and completely destroy a pile, any effective means of preservation must protect the wood from high water mark to a point in the mud below which the borers do not go.

A number of excellent methods have been devised for protecting piling by external coatings or sheathings, any of which, properly applied, will increase the life of the pile. Three factors which decrease their efficiency are the corroding action of salt water, the wash of the waves which injures and often breaks the casing, and the dangers from floating timbers and débris. Thick iron cases resist damage from these sources for a long period, but they are very expensive.

The injection of preservatives through holes bored in the top of the pile, or near the mud line, has failed to secure a distribution sufficient to adequately protect the outer layers of wood. All soluble salts have also shown a tendency to leach out when exposed to salt water. Impregnation with creosote, a coal tar product, has usually proved highly efficient with suitable kinds of timber properly prepared, when a sufficient quantity of good creosote is used.

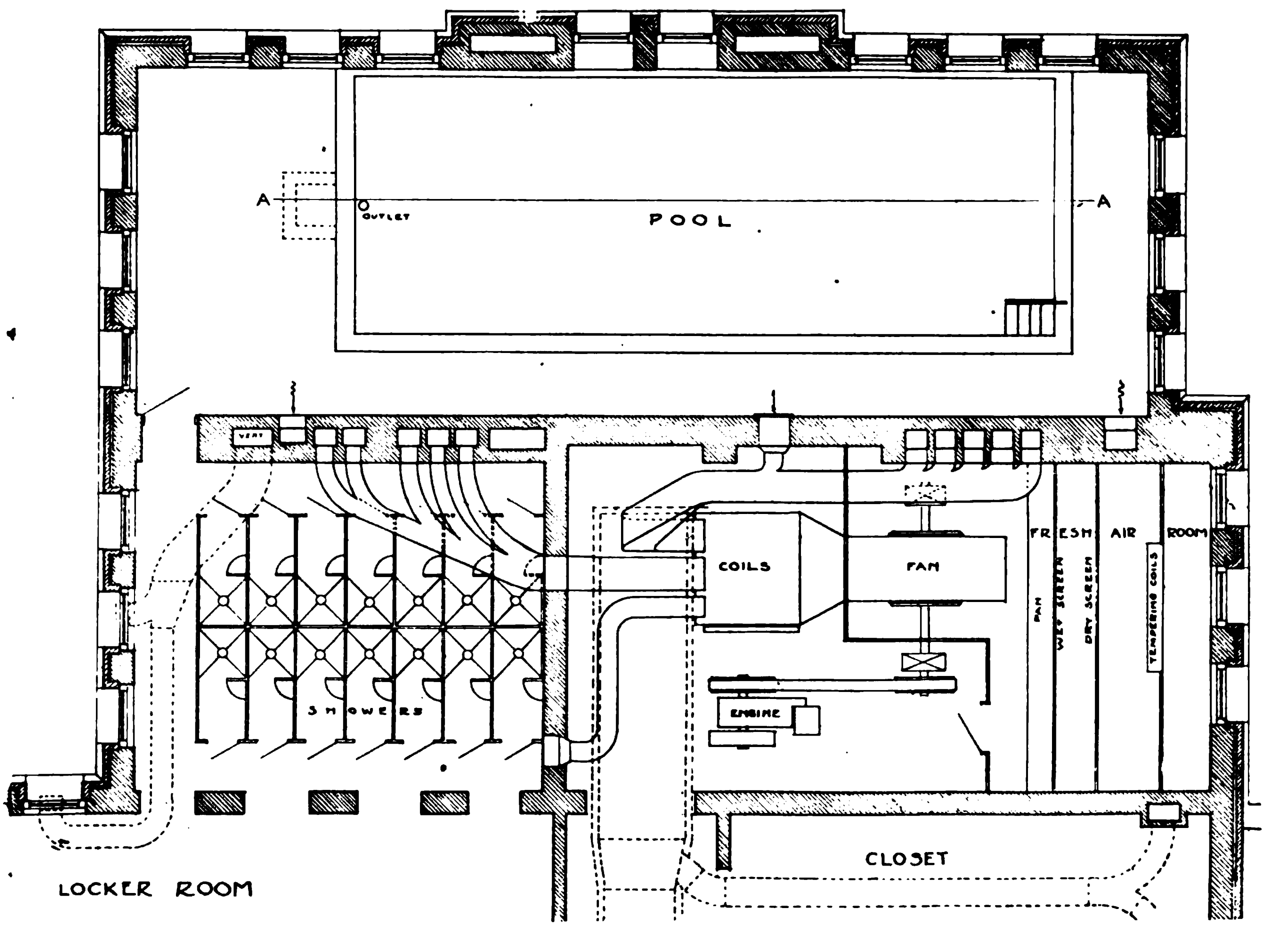
The principal timbers used for piling are long leaf, short leaf and loblolly pine, and white and red oak on the Atlantic coast and Gulf of Mexico, and Douglas fir on the Pacific coast. Spruce, redwood, cedar, cypress, eucalyptus and palmetto are used locally. All of these woods with the exception of palmetto are subject to damage by borers. Hardness is not a complete barrier to their attack, although boring is probably slow in dense woods. Southern pine and oak can be impregnated with creosote, and this promises to be one of the most efficient means of resisting the borers. It is probable that some of these timbers can be successfully treated by the open tank process. However, if a very heavy absorption is desired, a treatment under pressure may be the more efficient.

Circular 128, just issued by the Forest Service, gives a detailed description of the most important marine borers and their habits, together with a discussion of the different forms of mechanical devices in use for the protection of piling and of protection by chemical preservatives. This publication will be sent free upon application to the Forester, Department of Agriculture, Washington, D. C.

A commercial building which will be 16 stories in hight is about being erected at the corner of Broadway and Fourth street, Borough of Manhattan, New York, at a cost approximating $1,000,000. It will have a frontage of 80½ ft. on Broadway and 110 ft. on Fourth street; will be of fireproof construction, with façades of brick trimmed with limestone and terra cotta, decorated with large carved owls at the fourth story and pilasters at the topmost stories, supporting a roof cornice decorated with a row of flambeaus. The drawings were prepared by Architect William C. Frohme.

HEATING A SWIMMING POOL.

IN connection with institutions of a varied nature it is quite common at the present time to include a swimming pool in the conveniences afforded, this being the case especially with clubhouses, schools, colleges and other places where athletics are enjoyed to a greater or lesser degree. In the arrangement of the pool and the methods of heating it in cold weather many interesting problems are frequently involved. An example of this character is found in the swimming plunge bath in the school building of the Ohio Institution for the Education of the Deaf and Dumb, at Columbus, Ohio. The plan view, which we present herewith, represents a portion of the basement of the school building, showing the location of a swimming plunge bath, as well as a portion of the heating apparatus. It may be stated in passing that there are two such plunges, one for boys and the other for girls, the two departments occupying symmetrical positions on opposite sides of the center line of the building. There is also a duplicate installation of fan and heating coils for the heating and ventilation of the building as a whole.



Plan Showing One of the Swimming Pools and One of the Fan Heater Units.

Heating a Swimming Pool.

The walls of the swimming pools are of brick, plastered on the inside with a 1-in. coating of Portland cement and sand, and the bottom is concrete 6 in. thick, with a finished surface on top. A wall at the end of the pool contains the valves controlling the outlet and the hot and cold water supply. There is no provision for heating the water after it enters the pool. The water is admitted to the pool at the proper temperature, and, if necessary, a small amount is let out and then additional hot water supplied if the water gets too cold. This water is heated in the power house for the institution, 300 or 400 ft. away.

One of the old tubular boilers was remodeled to make a hot water boiler, this boiler being 48 in. in diameter and 16 ft. long. There are two brass coils in the boiler, supplied with low pressure steam from the heating lines of high pressure direct from the boiler, as may be desired. This was laid out with a return circulating pipe, with a pump attached to circulate the hot water, but the pump has never been used, as it was not found necessary. The boiler has a 3-in. cold water supply and a 3-in. hot water pipe that supplies all the hot water for the institution, which, with the pupils and attendants, numbers something over 600 persons. A 2-in. line is carried through the tunnel for the steam lines to the school building to supply the showers and pool.

A 7-in. low pressure steam main is carried from the power house in the tunnel to this building, with a 5-in. connection to each group of coils, and a 2½-in. high pressure line is run to supply the engines, with a 2-in. line to each engine, which operates the fan. The low pressure steam is the exhaust from the engines operating the generators, and is supplemented by live steam when necessary. In each end of the building is located a three-quarter housing steel plate fan, with blast wheel 99 in. in diameter and 42 in. wide at the periphery, and 53 in. wide at the center, with outlet 56 in. square. The engines are each 8 x 12 in. center crank Buffalo Forge, class B. The heater coil for each fan contains 5800 lineal feet of 1-in. pipe, and each tempering coil contains 1500 ft. of 1-in. pipe.

The flues near the fan, as indicated, are connected with the ducts by galvanized iron pipes on the ceiling. All other fresh air ducts are under the floor and connected with the flues below the floor. Each flue is supplied with hot and cold air, and has a hand mixing damper operated from the room which the flue supplies. The wet screen in the fresh air room is arranged with a spray to cover the screen with water. These screens have never been used, as the authorities did not care to furnish the water for them. For the showers, douches are used, controlled by Universal mixing valves. The partitions are of Tennessee marble and the floor is cement.

WHAT BUILDERS ARE DOING.

REPORTS from the leading cities of the country for January emphasize the contraction which is taking place in building operations in all sections. This perhaps is not altogether surprising when it is remembered that the building industry is generally regarded as the first to feel the effects of a slowing down in business and the last to recover from it. In considering, however, the shrinkage in building in January it must be borne in mind that a year ago activity was at a high tension, so that the present showing is not as discouraging as a first glance at the figures might suggest. According to the available data the falling off in the volume of the building improvements for which permits were issued in 47 cities of the country in the month just closed was considerably over 40 per cent., as compared with January, 1907. The figures show a decrease of over 50 per cent. in Greater New York, the Borough of Brooklyn falling off 74 per cent. and Manhattan 42 per cent. Other important decreases are, Philadelphia, 61 per cent.; Chicago, 21 per cent.; Buffalo, 41 per cent.; Louisville, 59 per cent.; Pittsburgh, 21 per cent.; Salt Lake City, 54 per cent.; Rochester, 25 per cent., and Syracuse, 72 per cent. It is, however, gratifying, to note a more hopeful feeling in the trade as regards the future, with indications of a larger volume of building as the season advances, subject, of course, to such restrictions as are usually presented each Presidential year.

Bradford, Pa.

The members of the Bradford Builders' Exchange held their annual meeting on the evening of January 21, following an enjoyable banquet at the St. James' Hotel. Officers for the ensuing year were elected as follows:

President, W. H. Dennis.
Vice-President, C. M. Luttrell.
Secretary, C. C. Stratton.
Treasurer, H. H. Osgood.

The delegates who attended the convention of the Pennsylvania State Association of Builders' Exchanges recently held at Wilkes-Barre, Pa., gave reports of the proceedings there.

Cleveland, Ohio.

It is too early to give a valuable forecast of the extent of building operations in this city during the coming season, but builders are hopeful that a fair amount of construction work will develop when spring opens. During January 308 permits were issued by the Cleveland building inspector, amounting to a total of $291,771. During the same month a year ago the permits aggregated $1,700,000, and during January, 1906, they amounted to $266,805. Of the permits issued during January 109 were for frame buildings, to cost $175,495; 16 were for brick buildings, to cost $71,790, and 183 were for additions, their estimated cost being $44,486.

Columbus, Ohio.

At a meeting of the newly elected directors of the Builders' and Traders' Exchange held on the afternoon of Thursday, January 16, Charles R. Wilson was elected secretary to succeed John R. Beynon. Mr. Wilson is a representative of the Logan Clay Product Company. The standing committees of the exchange for the year are as follows:

Rooms.—David W. Roberts, A. A. McGrew and Thomas T. Swearingen.

Membership.—George E. Snyder, William E. Knox, C. W. Tompkinson, John D. Evans and Herbert R. Kuhn.

Legislation.—Frank H. Howe, W. H. Conklin and Darius Tallmadge.

Arbitration.—P. B. Gould, A. J. Thompson, John M. Rittel, A. Mulby and E. J. McNamara.

Entertainment.—Irving M. Jones, C. E. Saffell, J. C. McMaster, David Lehman and F. H. Nichol.

It is expected that with a number of young and broad minded men on the Board of Directors unusual efforts will be made to increase the membership of the exchange and to extend the work of the organization. It is understood that it will be the object of the directors and the new secretary to make the Builders' Exchange as perfect and powerful a working body as that of the exchange at Cleveland.

Jacksonville, Fla.

The annual meeting of the Jacksonville Builders' Exchange was held on Monday evening, January 13, in their rooms at 111 East Bay street. The reports of the officers showed the exchange to be in a flourishing condition and that the members had enjoyed a good year in the building line during 1907. It is generally expected that this year will be a most successful one.

The election of officers for the ensuing year was the next order of business and resulted as follows:

President, J. H. Boden.
First Vice-President, S. Silsbe, Jr.
Second Vice-President, G. P. Hall.
Secretary, E. J. Gartley.
Treasurer, J. W. Ingram.

The Board of Directors elected consisted of H. H. Richardson, George R. Foster, Jr., H. H. Kooker, D. Warrington and J. C. Halsema.

After the business meeting a collation was served in an adjoining room, at which time several interesting addresses were given and the occasion was greatly enjoyed by those present.

Milwaukee, Wis.

At the annual meeting of the Builders' and Traders' Exchange, held on Tuesday evening, January 14, officers and directors were elected as follows:

President, Frank Luenzmann.
First Vice-President, William Rediske.
Second Vice-President, Edward Whitnall.
Secretary, George Meredith.
Treasurer, Anton Hennecke.

The directors elected for three years were J. J. Quinn, Peter Paulus, A. P. Michie and George F. M. Whitty.

The Builders' Club held its annual meeting at the same time and elected the following officers:

President, Nic Ehr.
First Vice-President, W. H. Gregory.
Second Vice-President, John Greenslade.
Secretary, S. J. Brown.
Treasurer, Henry Weden.

Directors for three years are James A. Meyers and A. J. Maag.

After the business of the meeting had been concluded the members present enjoyed a smoker.

Minneapolis, Minn.

The Builders' and Traders' Exchange has recently issued its official directory, which cannot fail to prove of interest to a large class of contracting builders, not only in the Northwest but throughout the country at large. Within its flexible covers are 144 pages of letter press containing the business classification of the members of the exchange, as well as the names of Minneapolis and St. Paul architects, together with those of architects who have expressed a desire to have their names published in Minnesota, North Dakota, South Dakota and parts of Iowa and Wisconsin. In addition there are lien laws of the several States, together with advertisements of members of the exchange, indicating the lines of business in which they are engaged. The matter is arranged with great care and reflects great credit upon Secretary Eugene Young of the exchange.

Montreal, Que.

Building operations were conducted in the city upon a somewhat liberal scale, and the aggregate cost of the improvements was only a little less than in 1906. The figures of Building Inspector Chausse show that last year the money expended on buildings amounted to $8,403,129, while in the year before the total was $8,639,388. The months of April and May were the most active, as previous to that time contractors were busy in preparing for the work in contemplation, and again, it is at this time that winter is breaking up and building is started with a rush. Permits were issued in April for improvements costing $1,030,866, and in May $1,870,465. The month showing the next highest total was October, with $998,159, although June and July were close behind.

The tenth annual banquet of the Builders' Exchange of the city of Montreal was held at the Place Viger Hotel, on the evening of December 12. The dining room was well filled by the members and their invited guests, and while the many good things provided were being duly considered there were songs and humorous recitations in the way of entertainment.

James Simpson, first past president, was in the chair and on his right were Hon. R. Dandurand, speaker of the Senate; L. A. Rivet, M.P., Alderman De Serres, acting mayor; C. H. Catelli, president of the Chamber of Commerce, and A. O. Brossard, provincial architect, while on his left were Hon. W. A. Weir; Hon. J. D. Rolland, president of the Canadian Manufacturers' Association; Messrs. A. Chausse, Jos. Thibeault, and J. H. Lauer, secretary of the Builders' Exchange.

A number of most interesting addresses in response to toasts were made by members and guests, that of the Hon. W. A. Weir, Provincial Minister of Public Works and Labor, being especially entertaining, dealing as it did with phases of industrial questions which are commanding much attention at the present day. Reform in trade unionism was one of the things advocated by the speaker. The feature of unionism to which he objected was the policy by which a similar wage is demanded from each employee irrespective of ability, which in the opinion of the Minister is a fatal defect, telling against the workman himself.

The toast, "Our City and Technical Schools," was responded to by Ald. De Serres, acting Mayor, and president of the Montreal Technical Schools, also by Hon. J. D. Rolland, president of the Canadian Manufacturers' Association, and by C. H. Catelli, president of the Chamber of Commerce. The toast, "Our Architects, Dominion and Provincial," was responded to by George A. Ross, of the Canadian Institute of Architects; by Acide Chausse, secretary, and by R. P. Lemay, president of the Province of Quebec Association of Architects.

Philadelphia, Pa.

The estimated cost of building work for which permits were issued by the Bureau of Building Inspection during the month of January, amounted to $954,510, the smallest total for any January since 1904, and not much over one-third of the total for the same month last year. Permits numbered but 399, covering 578 operations, of which by far the greater proportion were for alterations and work of a miscellaneous character. Two-story dwelling operations fell off very extensively during the month. Operations started numbered 142, at an estimated cost of $287,000, while the cost of three-story dwellings were at a total cost of but $169,500. Tenement houses show some gain, however, and permits were issued for two operations, to cost $41,000.

The Board of Directors of the Master Builders' Exchange of this city met on January 30 and elected officers for the ensuing year as follows: President, Cyrus Borgner; first vice-president, F. M. Harris, Jr.; second vice-president, Frank H. Reeves; third vice-president, James Johnston; treasurer, Henry Reeves; secretary, William Harkness, and John S. Stevens, trustee.

Portland, Me.

The members of the Builders' Exchange held their annual meeting at Riverton Casino on the afternoon and evening of January 29, at which the following officers were elected for the ensuing year:

President, Vance L. Porter.
Vice-President, J. Emery Harmon.
Secretary, William M. Howatt.
Treasurer, Sylvanus Bourne.
Directors: N. E. Redlon, Sylvanus Bourne and F. E. Wheeler.

After the regular meeting had been completed those in attendance, with invited guests, enjoyed a banquet, which the Committee of Arrangements had provided.

Scranton, Pa.

The annual banquet of the Builders' Exchange was held on the evening of January 21, and was a most enjoyable affair, members of the exchange and their friends to the number of about 100 being present. President E. S. Williams acted as toastmaster, and among the speakers were Judge A. A. Vosburg the Rev. Dr. I. J. Lansing, George S. Boyle of the Wilkes-Barre Builders' Exchange, and B. Griffin, secretary of the Pittston Builders' Exchange. Music was furnished during the evening by Bauer's Orchestra, and the Exchange Quartette rendered selections.

In his introductory speech Toastmaster Williams gave expression to many of his personal views on the labor question. The first speaker was Judge Vosburg, who discussed at some length "The Uses and Abuses of the Injunction." He was followed by Dr. Lansing, who spoke on the "Master Builder."

St. Paul, Minn.

The sixth annual dinner of the Builders' Exchange, which was held at the Ryan, on January 21, was largely attended and was a most enjoyable affair. Although essentially intended as a social gathering of builders there was much that was of a serious, practical nature, an unusually entertaining feature being a paper by S. L. Heeter, Superintendent of Public Schools, appealing for a practical education which will equip the rising generation to adequately meet the world's present demands. He pointed out the practical need for general manual training and commercial courses in all classical high schools, making them less institutions for the privileged classes.

Other speakers were President William Rhodes of the local Builders' Exchange; John A. Seeger, Louis Betz and E. F. Kelly; W. A. Elliott, president of the Builders' Exchange at Minneapolis; H. A. Hall, president of the Builders' Exchange of Duluth, and O. H. Olson, president of the Builders' Exchange at Stillwater.

There was an interesting programme of entertainment, including songs, monologue sketches, orchestra numbers, &c. Throughout the entire programme, however, the shop talk of the contractor and the characteristics of the building business predominated.

The Committee of Arrangements consisted of E. W. Finck, F. H. Romer, J. D. Roberts, C. E. Villaume and T. C. Vanden Aker.

Youngstown, Ohio.

At a meeting of the Builders' Exchange of this city, held on the evening of January 14, for such business as might properly come before it, a resolution was passed inviting all outside bidders on the new court house to use the rooms of the exchange as their headquarters while in the city. Incidental to the meeting the new Board of Directors was organized with the following officers:

President, Henry Niedermeier.
Vice-President, J. L. Dalzell.
Secretary, W. H. Black.
Acting Secretary, G. H. Coller.

New Publications.

Modern Carpentry and Building. By W. A. Sylvester. 276 pages; size 5½ x 8 in. Profusely illustrated. Bound in board covers. Published by David Williams Company, 14 and 16 Park place, New York City. Price, $1.50, postpaid.

This is the second edition of a well-known work on carpentry, and has been greatly enlarged and improved. The major portion of the book is devoted to methods of obtaining the various cuts in carpentry, and also rules for stair builders, notes on builders' estimates, the uses of the slide rule and the steel square, data relating to the strength of materials, mathematic rules, &c. The latter portion of the work is given up to a series of modern residences, some of which are shown by means of half-tone reproductions from photographs. Accompanying the views of the houses are floor plans, together with framing plans showing approved methods of construction. Many of the more modern buildings shown with plans are taken from recent issues of *Carpentry and Building*. Among these may be mentioned a cement residence with hollow block foundations, a bungalow of attractive exterior, a Colonial residence, a hollow cement-concrete block recidence, a brick veneered frame residence, and a carriage house and stable. Finally there is a glossary of terms used in architecture and carpentry, which will be found of interest and value in this connection.

How to Read Plans. By Charles G. Peker. 46 pages; size 5 x 7½ in. Numerous illustrations. Bound in board covers, with attractive side title. Issued by the Industrial Publication Company. Price, 50 cents, postpaid.

One of the requisites of success on the part of the ambitious building mechanic who desires to make rapid progress in his chosen calling is the ability to readily read and work from architects' drawings and interpret all that is shown thereon. The mechanic who cannot read plans is more or less handicapped, and therefore not likely to make as rapid progress as one who can intelligently follow a working drawing. The little book under review is intended to assist those who wish to acquire a knowledge along these lines, consisting as it does of a simple explanation of the meaning of the various lines, marks, symbols and devices used by architects on working drawings, so that they can be correctly followed by the workman.

While the descriptive text is profusely illustrated, there is at the end of the book a complete set of architects' drawings for a seven-room frame cottage, which the mechanic will find of great interest and value in connection with the descriptive matter.

Steel Construction. By F. A. Tucker. 300 pages; size 7 x 9¾ in.; 275 illustrations. Bound in board covers. Published by the American School of Correspondence. Price, $1.50, postpaid.

The rapid progress which has been made in recent years in the use of iron and steel in the construction of buildings of all kinds renders especially acceptable a work treating on the subject of steel construction. Such a work appeals strongly to architects, contractors and engineers, as it presents in condensed form a vast fund of valuable information relating to the particular kind of construction indicated by the title.

The volume under review is embraced in five chapters, the first of which deals with the structural elements of a building. Here are considered the foundations, the inclosing walls, the columns and bearing partitions, the floors and the roof. The next chapter treats of the steel shapes used and the methods of rendering buildings fireproof. There are presented the building laws of different cities, some comments upon wind pressure, which is an

NEW BUILDING FOR THE GERMAN-AMERICAN INSURANCE COMPANY

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Supplement Carpentry and Building, March, 1906

Carpentry and Building

NEW YORK, APRIL, 1908.

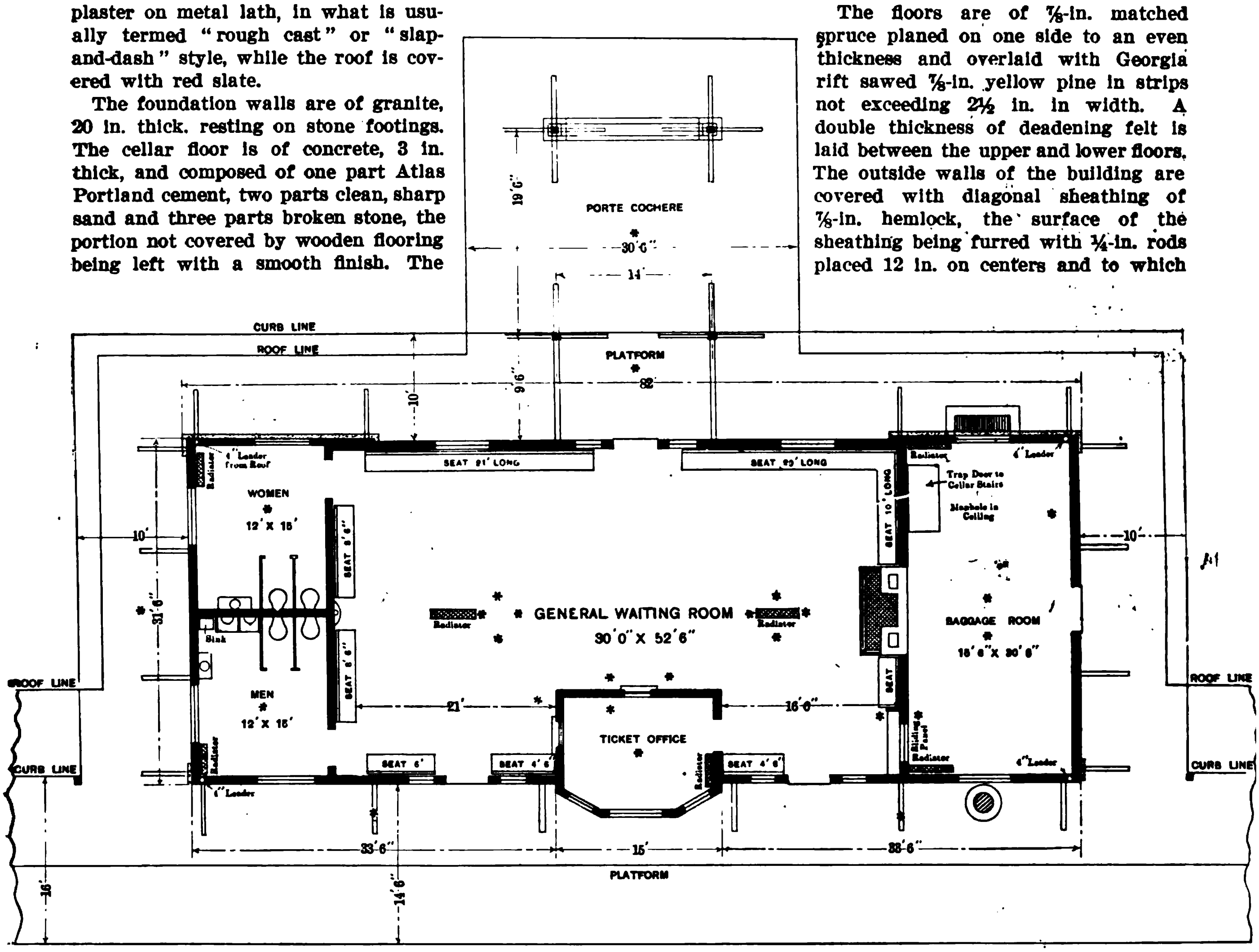
Frame and Cement Plastered Railway Station at Lenox, Mass.

PICTURESQUELY situated among the far famed Berkshire Hills is the railway passenger station which we have taken as the basis of our half-tone supplemental plates this month, and the construction and arrangement of which are clearly indicated by the illustrations presented upon this and the pages which follow. The building is of frame, covered externally with cement plaster on metal lath, in what is usually termed "rough cast" or "slap-and-dash" style, while the roof is covered with red slate.

The foundation walls are of granite, 20 in. thick. resting on stone footings. The cellar floor is of concrete, 3 in. thick, and composed of one part Atlas Portland cement, two parts clean, sharp sand and three parts broken stone, the portion not covered by wooden flooring being left with a smooth finish. The frame, with the exception of the 8 x 10 hard pine girders, is of spruce. The posts at angles and opposite partitions are 6 x 8 in.; the braces and studding for outside wall 2 x 6 in.; the studding for inside partitions 2 x 4 in.; the floor joists 2 x 12 in., placed 16 in. on centers; common rafters 2 x 8 in., placed 20 in. on centers; the hip and valley rafters 3 x 10 in., and the ceiling joists 2 x 8 in., also placed 20 in. on centers. The sills, which are bedded in cement mortar, are 6 x 6 in., halved and pinned at the angles, while the plates are 4 x 6 in., also halved, pinned and made continuous. The underside of the sills and the ends of the girders are painted two coats of oil paint before being set in place. The floors are bridged every 5 ft. with a straight, continuous row of double herring bone crossbridging of 1 x 4 in. spruce. The ceiling joists extend clear across from rafter to rafter, to which and the plate they are securely spiked. The roof is framed as shown on the cross section, the overhanging roof being formed with 2 x 6 in. cypress joists. All studding is bridged with horizontal bridging, and the studding of the outside walls, 2 x 6 in., are mortised into the sill. The studs at all openings are 1 in. thicker. The soles of the partitions over the girders rest directly on the girder and all others on the under flooring.

The floors are of ⅞-in. matched spruce planed on one side to an even thickness and overlaid with Georgia rift sawed ⅞-in. yellow pine in strips not exceeding 2½ in. in width. A double thickness of deadening felt is laid between the upper and lower floors. The outside walls of the building are covered with diagonal sheathing of ⅞-in. hemlock, the surface of the sheathing being furred with ¼-in. rods placed 12 in. on centers and to which securely stapled is expanded lath covered with cement. The first coat of mortar is ½ in. thick and the outer ½ in. of cement mortar is finished with a rough surface except the water table, which is smoothed 1 in. thicker and extends 4 in. below the bottom of the sill on the foundation. All exterior vertical corners, including the arches on the façade, are rounded off. The coping of the porch façade is of wood covered with tin and a narrow molding of cement run in as shown on the detailed drawing.

The inside walls of the rooms are plastered above the wainscoting in the general waiting room, a molded cove finishing at the ceiling, while all other rooms have square corners. The wooden partitions, except outside of the ticket office, are plastered. The moldings, baseboards, sheathing, interior door and window casing corner blocks, &c., are of yellow pine. A 3-in. molding is used for the chair rail in ticket office and baggage room. In the wait-



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

Frame and Cement Plastered Railway Station at Lenox, Mass.—William S. Babcock, Architect, New York City.

ing room is a capacious fireplace of yellow brick with tile hearth, the fireplace being lined with firebrick. The ceilings of the sheds, porch and eaves of the main roof are dressed, the exposed part being of white pine.

All windows and frames are of white pine except the pulley stiles and parting beads, which are of yellow pine. All exterior windows above the cellar have 2-in. sash and are double hung with wire cords. The window in the ticket office is hung with weights to slide up into the partition. The outside doors are 2½ in. thick and the inside doors 1¾ in. All doors and frames are of cypress, with hard pine thresholds.

The *porte cocherc* is built as indicated on the drawings. The outside wall and post supports at the end are of field stones in their natural state, having a granite coping on top. The posts supporting the sheds, as they are termed, extending to the right and left of the main building, are of hard pine, 8 x 8 in., in cross section, and are placed 20 in. on centers, except in front of the station. The braces are 4 x 12 in., and the plates or stringers 6 x 8 in., all of hard pine, with chamfered edges and dressed. The rafters are 2 x 6 in., placed 20 in. on centers and notched, spiked and tied with 2 x 6 in. ceiling joists to carry the roof. The stringers supporting the over-hang roof are supported by brackets and braces projecting from and securely fastened to the main wall.

The plumbing fixtures include Neptune water closets, placed as shown on the plans, and operated by automatic seat attachment.

The urinals are of large size, Dalton & Ingersoll make, fitted with ¾-in. supply and 1½-in. waste pipes. The sides, backs and floor and partitions for the urinals are of slate. The partitions are 5 ft, high and 1 in. thick, with nickel plated screws, plated pulls and pipes where exposed. The floor is 2 in. thick. In the men's toilet room is a cast iron sink, 12 in. wide, 24 in. long and 8 in. deep, with 1½-in. supply and 3-in. drain. Wash bowls are placed where shown, having countersunk marble tops, 22 x 33 in. in area, with 12-in. backs and molded edges, the bowls being of porcelain, 15 x 19 in. in size, and fitted with nickel plated cocks, chains, plugs, &c. The water supply tank placed in the attic over the toilet room is 3 ft. wide, 4 ft. long and 3 ft. 6 in. deep.

The station is lighted by electricity and heated by steam. The latter is furnished by a No. 404 Gurney hot water heater.

All exterior woodwork, with the exception of the window frames and sashes and the moldings on the porch, are finished in two heavy coats of spar oil rubbed to a finish. All interior woodwork exposed to view is finished with one coat of wood filler and two heavy coats of hard oil finish, well rubbed down. All floors have two good coats of oil, while the metal work is treated with two good coats of metallic paint. The lower sash in the toilet rooms is glazed with ground glass, while all other glazing is double thick American glass.

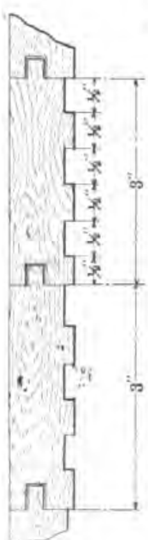
The platforms are of granolithic, laid on a cinder foundation extending to a depth of 5 in. below the finished grade. On this is placed 4 in. of concrete, composed of 1 part Portland cement, 3 parts sharp sand and 5 parts of 1½-in. broken stone. On this before it was set was laid the wearing surface 1 in. thick, composed of 1 part Portland cement, ½ part clean, sharp sand and 1 part of crushed trap rock ¼ in. in size. This was thoroughly mixed dry, and only enough water added to bring it to a stiff mortar, when it was spread in place, straight edged and troweled. The surface was colored to imitate North River flagging and rolled with indentation dot roller. The work was laid in blocks of designated size and the joints cut plumb through from top of finished surface, the work being guaranteed for a period of five years.

The frame and cement plastered passenger station here shown is located at Lenox, Mass., on the Berkshire Division of the New York, New Haven & Hartford Railroad, and was erected in accordance with drawings prepared by Architect William S. Babcock, 17 Battery place, New York City.

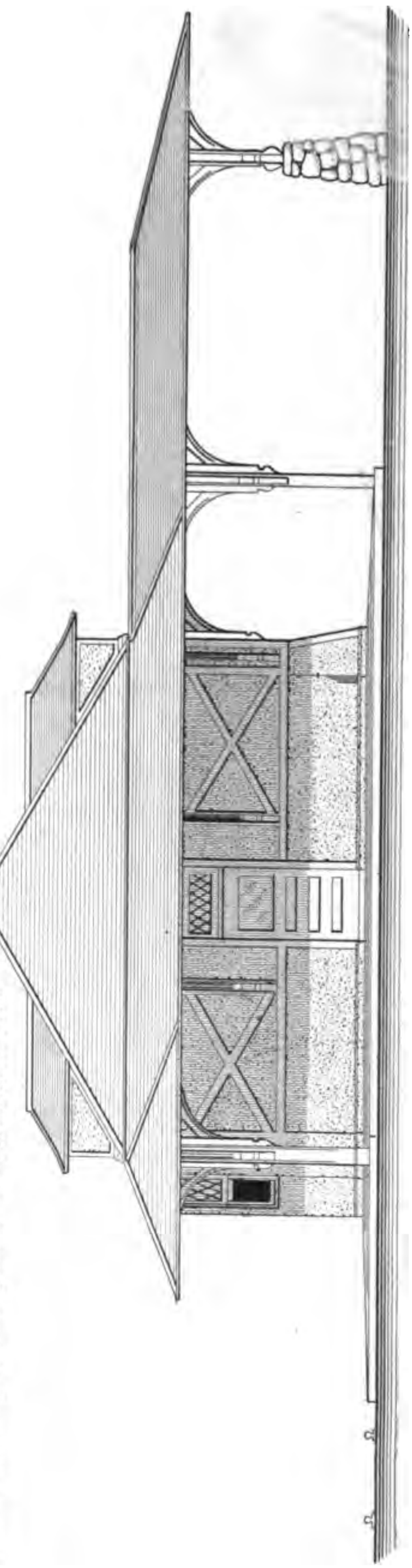
Plumbing of Public Schools.

Among the interesting papers presented at the Chicago meeting of the American Society of Inspectors of Plumbing and Sanitary Engineers was one on the above subject by C. M. McHugh of Cedar Rapids, which we print herewith.

In the year 1902 a plumbing ordinance was passed and

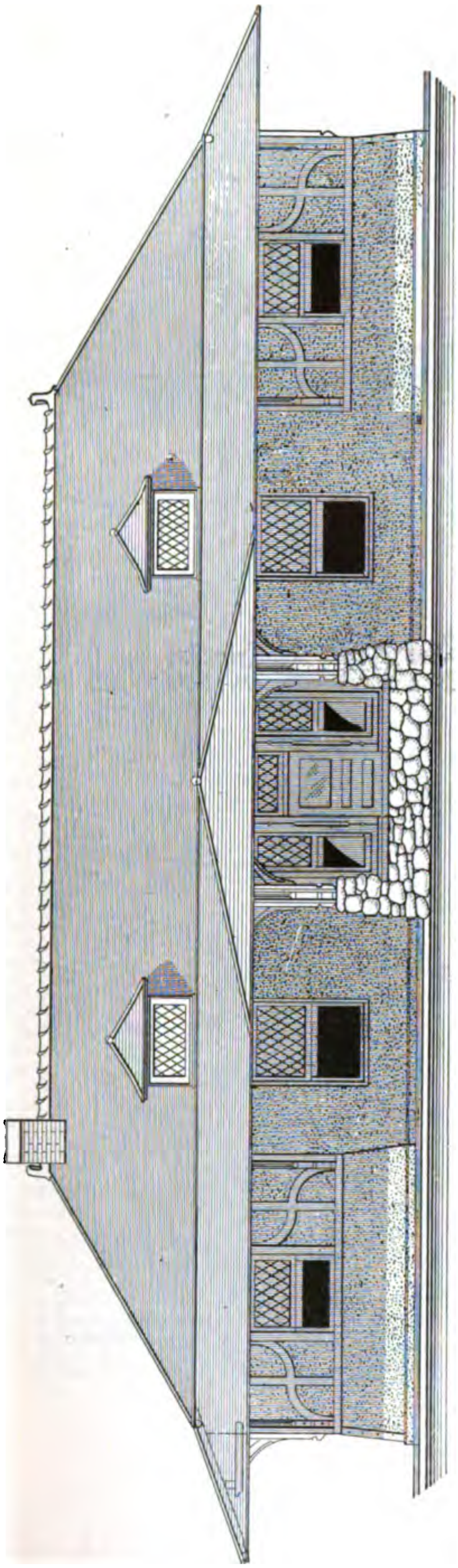


Detail of Sheathing for Waiting Room.—Scale, ⅜ In. to the Foot.

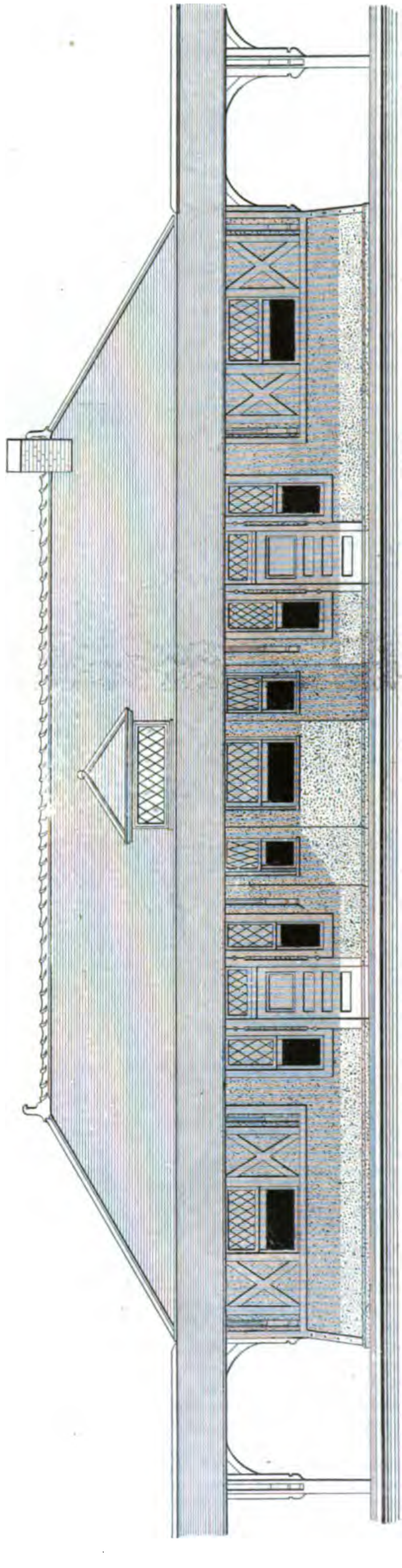


Frame and Cement Plastered Railway Station at Lenox, Mass.—End Elevation.—Scale, 3-32 In. to the Foot.

a plumbing inspector appointed by the City Council of Cedar Rapids. And in the year 1904 one of our public schools was enlarged and remodeled throughout with plumbing. The architect had drawn plans and specifications for a latrine system of plumbing, but as this did not comply with the requirements of our plumbing ordinance exactly I forbade its installation. I permitted, however, the installation of an individual, double siphon closet range. But it was very little better than the latrine system, the only improvement being the enameled



Street Elevation of the Building.



The Track Elevation of the Building, Showing a Portion of the Sheds at Each End.

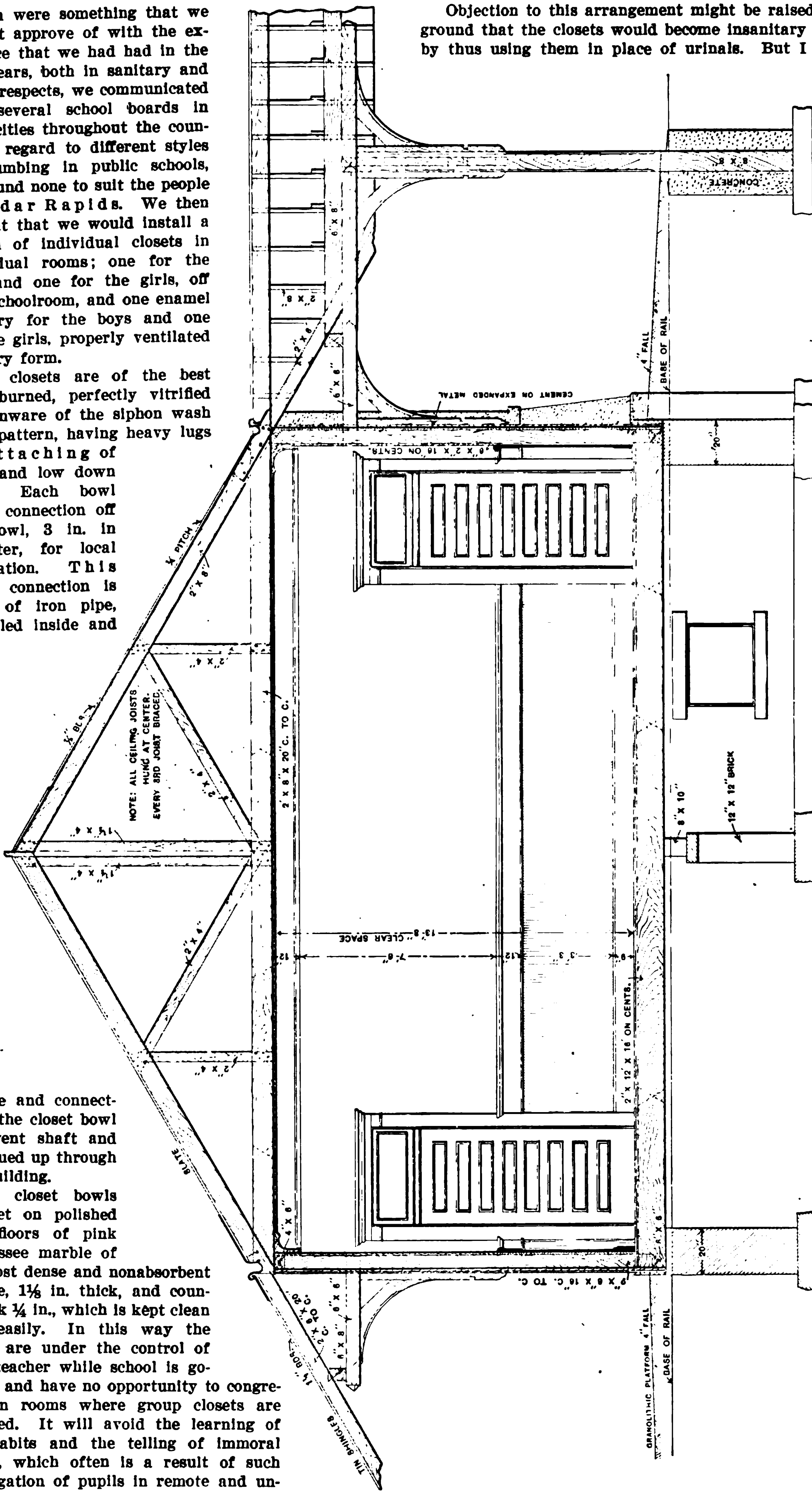
Frame and Cement Plastered Railway Station at Lenox, Mass.—Elevations.—Scale, 3-32 In. to the Foot.

inside, a seal of water in the bowls, and the fact that it was somewhat easier to keep clean.

Two years ago we had another school remodeled, and as the range closets and the individual bowls in group fashion were something that we did not approve of with the experience that we had had in the past years, both in sanitary and moral respects, we communicated with several school boards in large cities throughout the country in regard to different styles of plumbing in public schools, but found none to suit the people of Cedar Rapids. We then thought that we would install a system of individual closets in individual rooms; one for the boys and one for the girls, off each schoolroom, and one enamel lavatory for the boys and one for the girls, properly ventilated in every form.

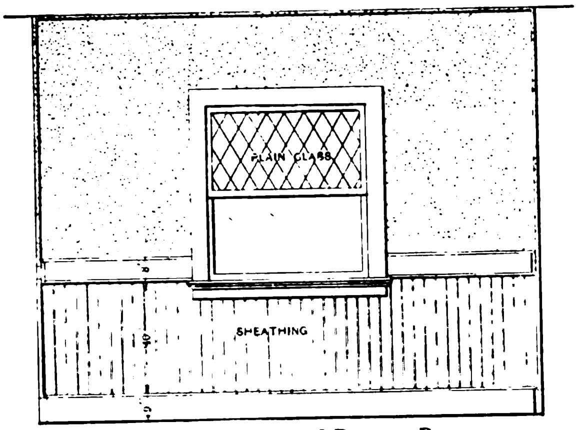
The closets are of the best hard burned, perfectly vitrified earthenware of the siphon wash down pattern, having heavy lugs for attaching of seats and low down tank. Each bowl has a connection off the bowl, 3 in. in diameter, for local ventilation. This vent connection is made of iron pipe, enameled inside and outside and connected to the closet bowl and vent shaft and continued up through the building.

The closet bowls are set on polished slab floors of pink Tennessee marble of the most dense and nonabsorbent texture, 1⅛ in. thick, and countersunk ¼ in., which is kept clean very easily. In this way the pupils are under the control of their teacher while school is going on and have no opportunity to congregate in rooms where group closets are installed. It will avoid the learning of bad habits and the telling of immoral stories, which often is a result of such congregation of pupils in remote and unguarded places. In this way urinals are abandoned entirely, which is quite desirable, I think, as the best of them is an insanitary fixture in school buildings at any time.

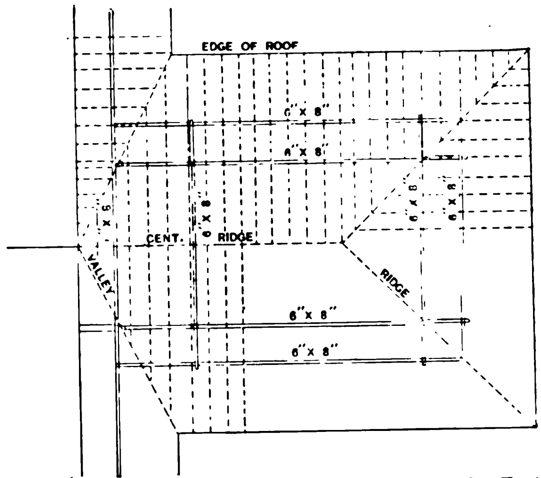


Frame and Cement Plastered Railway Station at Lenox Mass.—Vertical Cross Section.—Scale, 3-16 In. to the Foot.

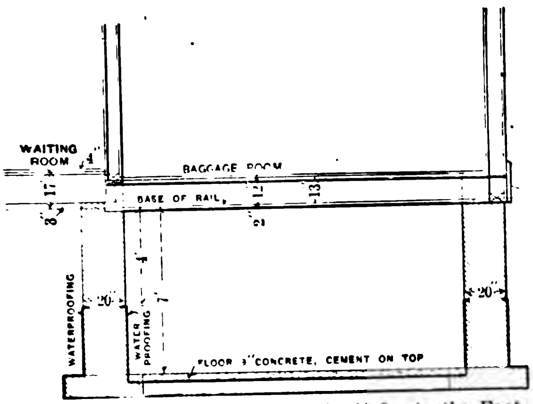
Objection to this arrangement might be raised on the ground that the closets would become insanitary fixtures by thus using them in place of urinals. But I find on close investigation of this system, which has been installed two years, that the closets are as clean as the day they were set, and but very little work is required by the



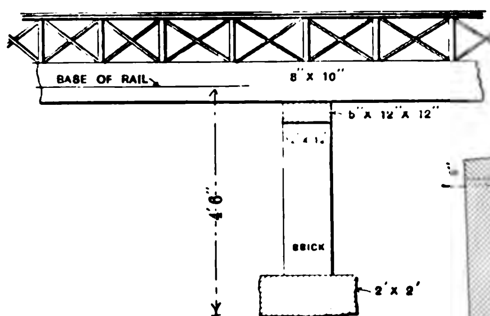
Finish for Toilet and Baggage Rooms.



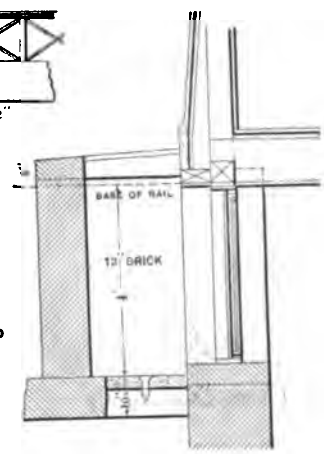
Roof of Porte Cochere.—Scale, 1-16 In. to the Foot.



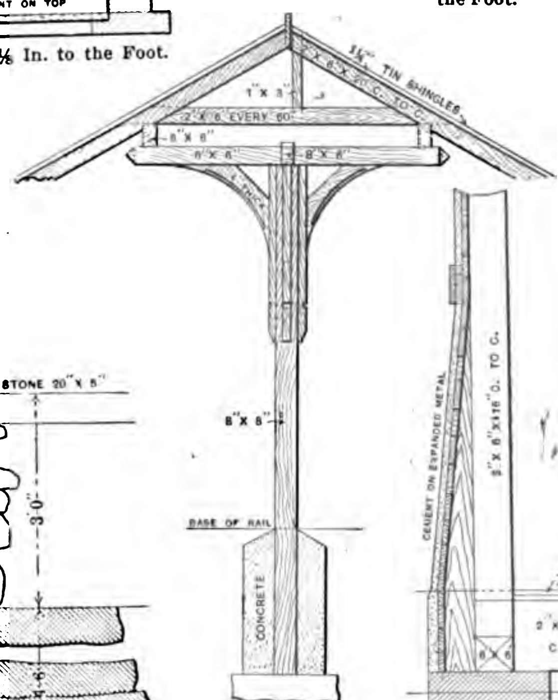
Section Through Cellar.—Scale, ⅛ In. to the Foot.



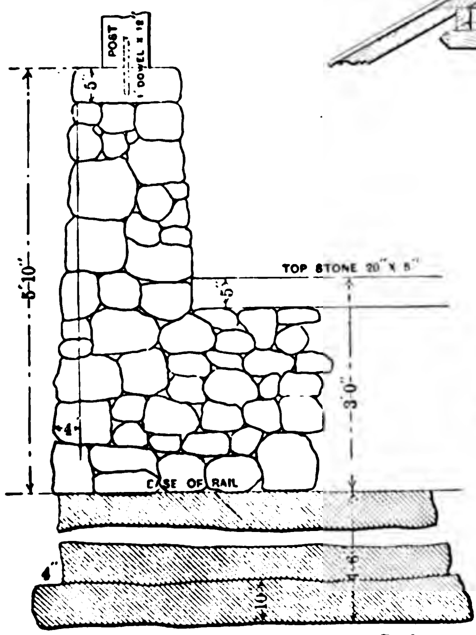
Detail of Pier.—Scale, ¼ In. to the Foot.



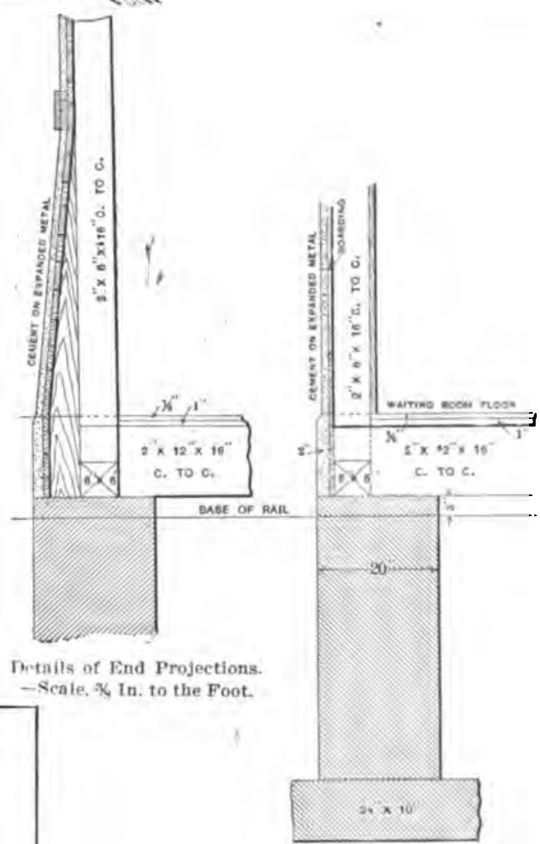
Detail of Area Window.—Scale, ¼ In. the Foot.



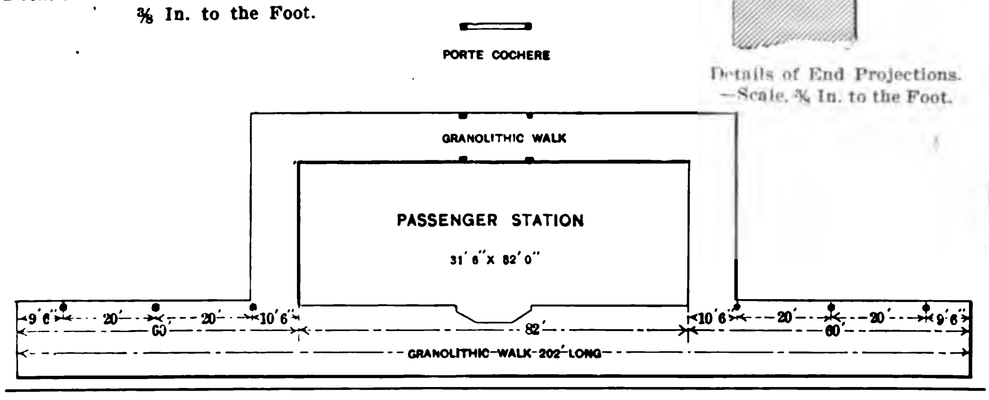
Detail of Shed Post.



Details of Outside of Porte Cochere.—Scale, ⅜ In. to the Foot.



Details of End Projections. —Scale, ⅜ In. to the Foot.



Ground Plan of Station.

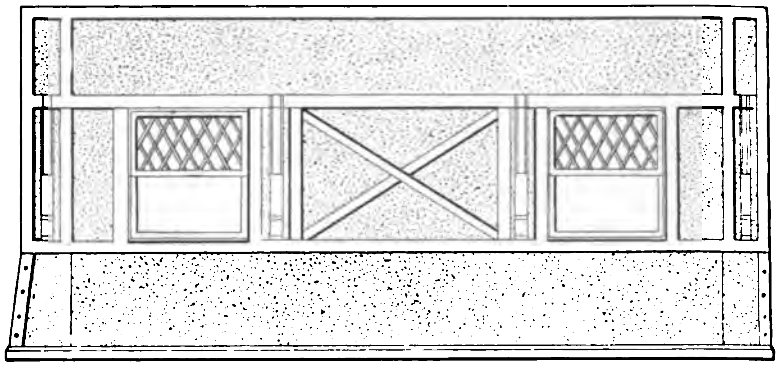
Frame and Cement Plastered Railway Station at Lenox, Mass.—Constructive Details.

janitors to take care of them, and not any more than under any other system. The relief from influences tending to coarseness is an element of the situation that should commend itself to the consideration of any one.

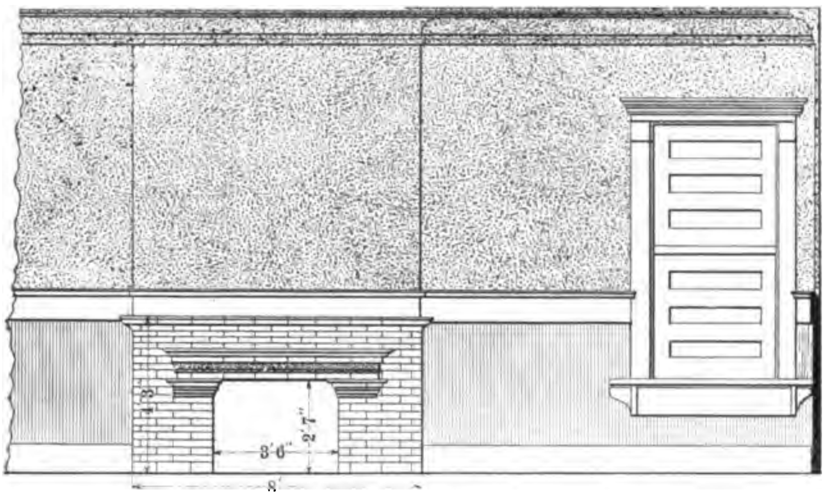
Again, it might be said that the stoppage of a closet of a school room in this style would cause inconvenience to the pupils of the room; but as there is usually an emergency closet on every floor of the building and sometimes two, for the use of the teachers, these could be used by the pupils of the room in which the closet was out of repair until their closets were repaired, which would be only a very short time. Another objection is perhaps this, that the stoppage of a closet would be liable to cause overflow and leakage to the other floor below, but this is a matter that can easily be taken care of while the plumbing is being installed, by the use of safe wastes.

Some might think that all sorts of trouble would be caused by delicacy on the part of the pupils to enter the closets while other pupils were in the room on account of the noise of the water when discharged from the tank, which would be so noticeable that a commotion would be caused in the schoolroom, but as the closets are located far from the schoolroom, the cloakrooms being between it and the toilet room, and as the closets are of the most noiseless construction, it causes no commotion whatever.

Taking it from a sanitary standpoint, a moral standpoint and an educational standpoint, I consider it is a well fitted system for public schools. It will educate pupils to be cleaner and also give them an idea of how plumbing should be used in the schools and at their homes. It will make them more careful about the use of plumbing, for in case one pupil misuses the closet by stoppage or in any other way, or the lavatory, you may rest assured that the next pupil who enters the toilet room will be liable to report what had been done by mischief, for fear that he or she would be liable for the punishment of same; and taking the whole in consideration, I believe it to be the best for public school buildings that I know of.



End Wall of Toilet Room.

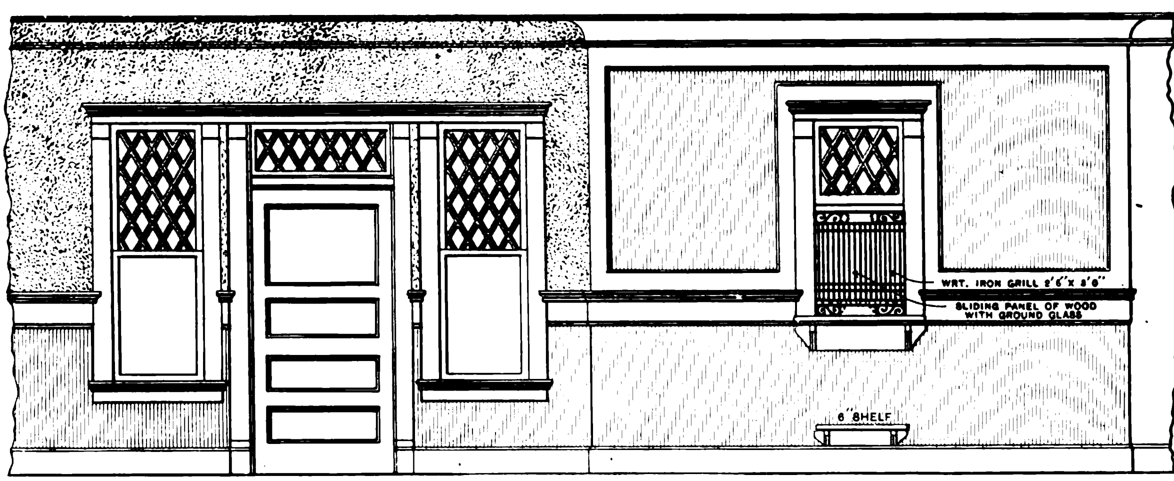


Fireplace and Check Window in Waiting Room.—Scale, 3-16 In. to the Foot.

Another good feature in regard to this system of individual toilet rooms is that the janitor claims that it is a great saving on toilet paper. He claims that since this system has been installed it does require only about half the amount of toilet paper that was used under the group system of closets. It does away with the use of toilet paper for making paper balls and throwing them at each other in the toilet room, and unrolling it off the rack just to be doing something while they are not under the guard of the janitor or the principal of the school building. This system, I believe, is a more homelike system, causing pupils to use it in school the same as they would in their homes.

When we installed this system of plumbing we first thought of removing the toilet rooms to a separate building some distance from the school, but we have seen that plan in operation in other public buildings and realize that it would not answer all purposes for which we want a school building.

We have 12 public school buildings, which contain an average of about 500 pupils to a school and about 36 or 37 pupils to a room. This system is ventilated with a forced ventilation from every toilet room and with local ventilation off the bowl. I have tested the air of the toilet rooms and find it to be much purer than I find it where group closets are placed.



Waiting Room Finish. **Scale, 3-16 In. to the Foot.** **Ticket Office Finish.**

Frame and Cement Plastered Railway Station at Lenox, Mass.—Details of Interior Finish.

Convention of Ohio State Association of Builders' Exchanges.

THE fifth annual convention of the Ohio State Association of Builders' Exchanges was held in Columbus on Tuesday, February 25, in accordance with a call issued by President John R. Squire. In the call it was announced that the meeting would be almost entirely devoted to the consideration of legislation pending in the General Assembly, no social features being planned, but rather a programme entirely devoted to business.

The first session was called to order in the parlors of the Chittenden Hotel at 10.30 o'clock by the president. An address of welcome on behalf of the exchange and the building interests of Columbus was made by Chas. J. Pretzman, Esq., who said that the delegates were cordially invited to visit the exchange rooms in the Brunson Building and make as full use of the same as possible. He remarked that there was no time in the history of the country when there was so great need of concerted action on the part of builders in the matter of legislation as at present. He predicted that unless such action should be taken at once to protect the interests represented at the convention, there would be much hostile legislation enacted in the Assembly of the State.

In response to this address, President Squire spoke briefly, thanking the speaker and stating that the sentiments expressed by Mr. Pretzman were timely and important.

The business of the session was then taken up, the roll of exchanges being called by the secretary, and the following representatives reporting their attendance:

Toledo—S. J. Pickett, W. J. Albrecht, Chas. T. Lawton.

Columbus—Burt Walter, R. A. Edgar, Chas. J. Pretzman, Chas. R. Williams.

Springfield—W. F. Payne, C. A. Schuster, R. L. McIntire, John A. Moore, John D. Roeder, Jas. Robbins, F. E. McDaniel, R. H. Clark, Henry Dixon.

Elyria—T. J. Bates, C. H. Buttenbender.

Youngstown—Jorn R. Squire.

Lorain—A. P. Lagron, M. L. Jackson, J. R. Leighton.

Cleveland—M. J. O'Donnell, Edward A. Roberts, R. L. Queisser and Harry Gillett.

Several additional representatives of the different cities were present in the capacity of visitors, making a good sized audience.

Position of Ohio Association.

Following the reading of the minutes of the last convention and the approval of the treasurer's report, the subject of participation in the movement to organize a National Association of Builders' Exchanges was considered. Correspondence covering this movement and also two other movements of like character was read. The first suggestion related to the association being promoted by Edwin S. Williams, Scranton; the second to the movement started by Walter Drew, Esq., secretary of the National Erectors' Association, for a national chain of employment bureaus in the leading cities, and the third to the strengthening and rebuilding of the old National Association of Builders, with John S. Stevens, Philadelphia, as president, and William H. Sayward, Boston, as secretary. After full discussion it was moved by Mr. Payne of Springfield and seconded by Mr. Buttenbender, Elyria, that the Ohio association remain neutral for the present on this subject, devoting its energies to developing its own organization rather than branching out into a national alliance, until a more clearly defined policy should be adopted.

A communication from the National Association of Manufacturers requesting that the State association authorize James A. Emery, Esq., who is representing that association, as well as several other national and local organizations at Washington, to also represent Ohio builders was presented, and it was moved, seconded and carried that Mr. Emery should be given the support of the Ohio association in his efforts for just and equitable legislation at the national capital.

At this point Mr. Albrecht, Toledo, presented the following resolution, which was adopted by unanimous vote, the secretary being requested to send copies of the same to the various exchanges for use in their respective communities as a means of stimulating the building industry for the coming season:

Whereas, In all of the larger cities of the State there are many workmen out of employment; and,

Whereas, The present conditions are more favorable than for many years for building operations; therefore,

Resolved, That the Ohio State Association of Builders' Exchanges recommends to the public that building operations be encouraged in every way possible the present year, not only as a means of giving employment to workmen, and thus benefiting the State, but also as a means of economy in cost and as promising an improved character of buildings, due to unusually favorable conditions for careful planning and supervision.

A report was then presented by Chas. J. Pretzman, Esq., attorney for the Columbus exchange, on the subject of pending legislation. Mr. Pretzman gave a very interesting review of the measures before the General Assembly, calling particular attention to the Employers' Liability bill, which he vigorously condemned, and also to a bill providing for direct labor in the making of city improvements. He said that nearly a thousand bills had been introduced at the present session, and that there was need of immediate and effective opposition if some of the measures directed against employers were to be prevented from passing. In reply to an inquiry as to what he regarded the most vicious of all the pending bills, Mr. Pretzman replied that in his opinion the worst of the lot was the Employers' Liability bill, which in effect would remove the fellow servant and assumed risk features of the existing law. After some discussion the convention delegated a committee comprising Messrs. Pretzman, O'Donnell and Lawton to prepare a report on this bill and present the same at the afternoon session.

Before adjourning a motion was passed that all the exchanges represented at the meeting be granted the privileges of the convention, whether the same had regularly affiliated with the association or not, the exchanges not already enrolled having expressed their intention of doing so at the earliest opportunity.

Afternoon Session.

The afternoon session was called to order at 2 o'clock and the committee appointed before luncheon recommended the adoption of the following resolution, which suggestion was approved by unanimous vote of the delegates, the motion being made by Mr. Pretzman and seconded by Mr. Albrecht:

Be it resolved, By the Ohio State Association of Builders' Exchanges, assembled in Columbus, in annual convention, that we denounce House bill No. 986, relating to the liability of employers, as unreasonable, ill considered and vicious legislation, the practical effect of which would be to make employers carry individual accident insurance on each workman at rates so high as to be prohibitive, increasing the cost of production to such an extent as to seriously interfere with the ability of our industries to compete with those of other States; further

Resolved, That in view of the well constituted body of law which now fixes the liability of employers to employees in this State, we see no need of further legislation on this subject at the present time.

A motion was made by Mr. Payne that the convention also enter unanimous protest against the passage of the Howe bill, providing for direct labor in the making of city improvements. This motion was passed, and action was then taken referring all other bills to the special committee to oppose the passage of such as were regarded as objectionable.

By special arrangement the privilege of the floor was granted at this point to Wilbur T. Mills, a representative of the Columbus architects, to advocate the enactment of a law calling for competition on public school and State buildings, instead of direct employment of architects for such work. Mr. Mills said that the bill would require the securing of designs in competition for school buildings costing upwards of $1500 in the larger districts and $500 in the small districts, and for State buildings costing upwards of $3000. The speaker delivered an address on the merit of competition as giving to all architects a fair and equal chance on public work, and urged in strong terms the passage of the bill before the Legislature. On account of some conflicting views among the delegates it was decided to refer this bill also to the special committee above provided for.

The election of officers being next in order, it was moved by Mr. Pickett that all rules be suspended, and that Mr. Albrecht be authorized to cast the unanimous ballot of the convention for the re-election of the present officers, as follows:

President, John R. Squire, Youngstown.

Vice-President, P. S. Phillips, Newark.

Secretary and Treasurer, E. A. Roberts, Cleveland.

It was decided, on motion of Mr. O'Donnell, that arrangements be made if possible for the State Association to be represented at Columbus by a legal adviser the coming year, the primary object of this arrangement to be the careful watching of legislation.

At the suggestion of Mr. Buttenbender an invitation was extended to all exchanges throughout the State that are not now affiliated with the State Association to become members of the same.

A motion was made by Mr. Bates that the Ohio State Association extend its thanks to the Columbus exchange for the courtesies and assistance shown the visitors to the convention. This was passed by unanimous vote, after which Mr. Walter invited the delegates to make their headquarters at the Columbus exchange whenever they come to the State capital, and he hoped they would come often.

The business for which the convention was called having been completed, the meeting adjourned, with the understanding that a convention would be held the coming year at such time and place as the officers might designate. The city being most in favor for the next meeting was Springfield.

Following the adjournment the delegates visited the House and Senate, calling upon members from their different localities, and urging them to comply with the requests of the convention in matters of legislation.

The meeting was an entire success and the idea of devoting all the time strictly to business was approved of by every one.

How to Make School Buildings Safer.

The recent holocaust at Collinwood, a suburb of Cleveland, caused the Board of Education of Youngstown, Ohio, to call upon a fireproofing engineer of prominence to formulate a plan for rendering safe the school buildings in that city. As a result of this action William H. Ham, vice-president of the National Association of Cement Users for the Section on Laws, Ordiannces and Insurance, has prepared a preliminary report on the fireproofing of school buildings in which he points out wherein lies the greatest danger in buildings now in use, and makes recommendations as to the most economical method of rendering these structures safe. He states that his recommendations apply to the average school building in any town in the country as strongly as to the schools in Youngstown. We quote from his report as follows:

In view of the calamity that has overtaken Cleveland, there can be no question of the wisdom of the Youngstown Board of Education in taking whatever steps are necessary to make the school buildings that are now in use safe, and to establish definitely a policy hereafter to construct no school buildings which are not absolutely fireproof. How to accomplish these results without increasing the burdens of the taxpayers unduly, is the question of the moment, and to this end the writer makes the following general recommendations:

All school buildings which are not known to be thoroughly fireproof should be examined by the School Committee, the Superintendent of Schools and the chief of the fire department of the city.

Steps should be taken to prevent rapid spread of fire, especially from the corridors to the main rooms. This can be accomplished in all old buildings quickly by the installation of a fireproof partition between the corridors and main rooms, with steel doors having wire glass transoms, or with no transoms.

If possible every school building should have an exit at the opposite end of the building from the stairways. This exit should be protected from fire by brick walls extending at least 6 ft. from the building, no other opening into the space being allowed. Fire escapes should be made of steel or cast iron. The doors to these fire escapes should be unlocked every morning and opened. A fire drill should be instituted using the fire escapes and practice should be constant throughout the school year. In order that the children may not be frightened at the sound of alarm of fire, the practice should be carried out with regular fire alarm each week at no specified time.

Where the School Committee is limited for funds with which to build a fireproof school building, it should be impressed upon the architects that the interior of the building is the most important of all features, and that any saving that is to be made should be made in the looks of the exterior and not in the construction of the interior of the building. It often occurs that for the sake of beautifying the city an elaborate exterior is designed. This is, of course, ideal, but where the maximum amount of space must be built for the minimum amount of money, a plain, almost severe, exterior with thoroughly fireproof floors and partitions, should be the prevailing idea of construction.

If the rooms are not too large, the cost of a thoroughly fireproof building, with reinforced concrete floors and columns, and a neat, brick exterior, can be constructed for approximately 10 per cent. increase in first cost over the construction of a brick and wood building. Insurance will soon bring down the cost of the investment to a point where the city cannot afford to build otherwise than fireproof. In this type of a school building, children could be actually kept at work at their desks while the furniture in one part of the building was burning—there would be nothing else to burn in the building.

Rules Affecting Use of Acetylene Generators Modified.

The rules formulated by the National Board of Fire Underwriters for the acetylene industry have hitherto required outside installation of acetylene generators, and while, as a matter of fact, in by far the largest part of the United States this rule has not been insisted upon, in certain limited sections it has been rigidly enforced.

The existence of a rule prohibiting the installation of an acetylene generator in an insured building was a constant menace and handicap to the industry, and its enforcement in some sections and not in others placed insurance companies in the inconsistent position of insuring property in one State under conditions which it would not accept in another. An investigation by the National Board as to the exact condition of the industry disclosed the fact that in those sections where inside installation had been permitted acetylene was proving itself to be a safer illuminant than those which it replaced.

The National Board of Fire Underwriters, at its Executive Committee meeting on January 30, 1908, held in New York City, after considering the various favorable reports submitted to it by its various committees, amended the rules covering the installation and use of acetylene generators by striking out such words as prohibited inside installation under all conditions and substituted the following: "Generators, especially in closely built up districts, should preferably be placed outside of insured buildings in generator houses constructed and located in compliance with rule 9."

It will be seen at once that while the National Board recommends outside installation as being ideal, in place of the absolute prohibition, the rules now mean that in all outlying districts generators may be placed inside, but in closely built up districts it recommended outside installation as its preference.

Even where outside installation is preferred, the rule regarding construction of generator houses has been modified, and where such houses formerly had to be fireproof, constructed of brick and located as far as practicable from other buildings, such houses may now be located adjoining an insured building, and fireproof construction is not required.

THE New Auditorium to be erected in Denver, Colo., in which is to be held the national Democratic convention on July 7, will be one of the largest buildings of its kind in the country, it having a seating capacity of 12,500. The building will contain 4,500,000 cu. ft. of space, which will be lighted by 5000 electric lights.

THE STORY OF MY CEMENT BLOCK HOUSE.

By W. O. Steele.

THE circumstances that led to the building of my house of cement were the conviction that it was the best and cheapest material for the purpose; the good fortune to own a lot with a great quantity of the very best clean silica sand and gravel of all grades of fineness, making a perfect aggregate for cement or concrete work, and, last, the very reasonable price of cement, which at that time I obtained at about $1.35 per barrel, delivered, in Grenloch, where the house was to be built.

The obstacles to be surmounted were many, but chief among them, the impossibility of getting workmen who knew anything about the work, or a contractor who did know, to do it at a reasonable figure. As a result I became my own contractor and the instructor of my men, who came from the nearby farm. I might add also that I became my own instructor, for there was much to know and few places to find it out. This naturally led us into some mistakes, and it is expected the mistakes will be of quite as much value to the reader as the successes.

In the beginning there was the lot, 100 x 175 ft., with 12-in. good top soil. 24 to 30 in. of yellow sandy loam, and then 18 ft. of graved and sand that would gladden the heart of any "cement block" man. In excavating the top soil was wheeled some distance away and stacked for grading, the loam piled on another part of the lot, and the sand and gravel where it would be most convenient to work up. The last leveling up of cellar bottom made a pile of sand and gravel in the cellar sufficient for our footings, which were 8 in. deep and 18 in. wide, 1 part cement to 7 of sand and gravel, as dug.

Now we came to the problem of molds and blocks. The foundation or cellar wall required something like 500 hollow blocks 12 x 12 x 18 in. in size. The mold was made of seasoned white oak, heavily ironed, all as shown in Fig. 1. The pieces A A were secured to the back face B with brackets, C C, at exactly right angles. The end pieces D D were hinged to these, as shown, so that when the mold was closed the ends were always square with the back face B. After closing the ends the front E was put on, the battens on the extreme ends just slipping over the outside of the end pieces of mold, holding them in place. A strap iron, with an eye on one end, was secured to the center of each end, the eye carrying an eye bolt that slid into slots in the ends of the front E, the whole being drawn tightly together by handle nuts, as shown. There were two ½-in. steel dowels in the bottom edge of the back face B, 8 in. on centers and corresponding holes were bored in bottom boards to receive them, insuring the mold being placed in the same position on each board. In the center of each board were two more holes, 8-in. centers, to receive the two steel dowels in the bottom of the wooden core and centering it in the mold. The core was 5 x 14 in. on top, tapering ¼ in. to facilitate its withdrawal after the block was rammed up.

There were 100 bottom boards 18 x 24 in., made of ⅞-in. white pine "box" boards, battened with two ⅞ x 3 in. battens near the ends. This mold did fine work, but was too heavy for rapidity.

This was mistake number one, as the mold would have been better made of 1½-in. white pine in place of 1½-in. oak. Two men mixed their own material, pumping the water from a 63-ft. well, and rammed up 65 of these blocks in 10 hr., besides wetting the blocks that were curing and moving the green or partly cured blocks off the bottom boards as soon as they were ready. They made good blocks, too, though both men were green at the work, never having had experience with block making or cement work of any kind. Material was sand and gravel, as dug, 5 parts and 1 part of cement, thoroughly mixed dry, then tempered or dampened until there was a strong cohesion but no stickiness.

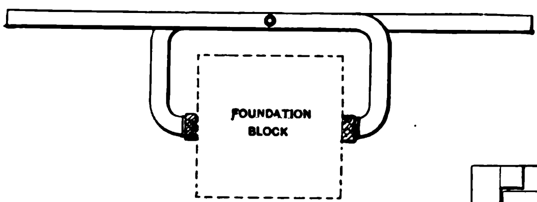


Fig. 2.—Tongs for Moving the Cement Blocks.

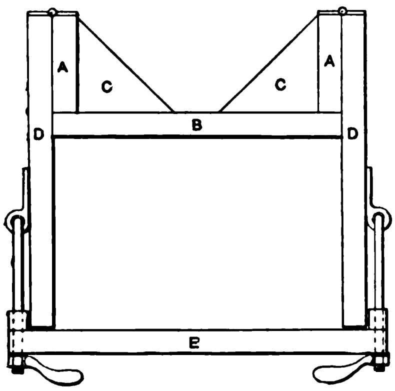


Fig. 1.—Showing Construction of the Mold.

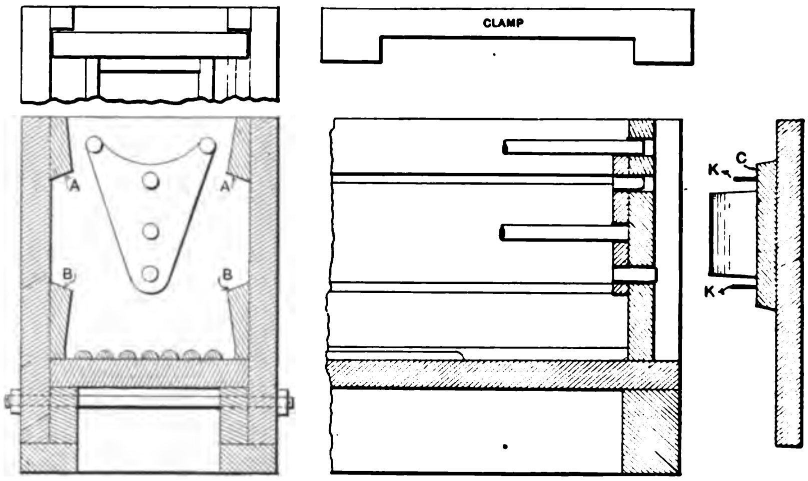


Fig. 3.—Details of Mold for Columns.

The Story of My Cement Block House.

This is a very, very important point, the damper the material can be worked the better, but if just the least bit too wet it sticks to the mold, making a rough surface; also when the mold is removed it sags or bulges out in the center of its own weight, and makes an unshapely and unsightly block. As each block was rammed up the core was drawn and the mold removed, leaving the green block on the bottom board to cure. These blocks were very heavy, and to have attempted moving them would have resulted in cracks, not visable to the eye, but weakening the block nevertheless.

It is also essential that the bottom boards be bedded firmly in a sand bed, so they will not spring under the ramming and weight of the block, and they should be nearly level so the block will not draw itself out of shape. These remarks apply not only to these, but all other blocks.

The blocks made during the forenoon were carefully but thoroughly and evenly dampened just before quitting at night, and again the next morning and at noon. By night they could by exercising great care be moved by the use of a pair of tongs made especially for this purpose and shown in Fig. 2. They were placed on soft beds of loamy sand and thoroughly soaked twice each day for two weeks. The loamy sand was that dug from the cellar, and useless for cement work because of the loam.

It would have been better for these blocks to have weathered six weeks, but it was now October and we had to make haste, so they were laid in the wall at the end of the two weeks. Two masons laid them as fast as three men could supply them, *i.e.*, carry them from the pile to the wall. The total mason work for the entire foundation wall, outside cellar way wall, posts and lintels through center of cellar and chimneys from footings up to top of cellar wall cost $27.50, so it is evident that these blocks made a very fast wall to put up. To carry the blocks and place them on the wall two men carried one block between them with the tongs already mentioned, while the third man got them out of the pile ready.

The top, outside edge of the last course carried a water table 2 in. wide and pitch of ¼ in., the end wall blocks being hollow, as all others, and those in the front and rear wall recessed to receive the ends of the joists. The water table was formed by placing sawed strips the reverse of the ¼-in. pitch with the thick edge against the front E of the mold and the joist recesses by placing a block ¼ in. larger than the joists in the proper position in the mold, one end always against the back face B and leaving out the core.

To properly carry the joists a course of solid blocks 6 x 12 x 18 in. was laid next to the top course. Also these top course blocks were only 10½ in. high, 10 in. for joists, and the balance with mortar joint for the rough wood floor—this brought the floor just even with the tops of the foundation. That portion of the wall where outside doorways were to be placed, had the tops of the blocks cut off 3 in. and roughened, and later the step was molded in place with rich wet concrete to secure density and good wearing qualities.

That portion of the chimneys below the flue were made up of hollow blocks the same as the foundation, the regular chimney blocks beginning with the flue, about 18 in. below the bottom of the joists.

Posts Supporting Partitions.

Posts to support the center partition and lintels that carried the ends of the joists where they met in the center of the building were made on a bottom board of ⅞-in. pine 10 in. wide and 6 ft. 4 in. long with 4 — ⅞ x 4 in. battens across the back of it. On the face were tacked blocks ⅞ x 1⅛ x 4 in., so that when the two side boards, ⅞ x 6 in. by 6 ft. 4 in. were set perpendicularly between them, there was just 6 in. between the faces of the sides, and each side carried a batten close to the end to hold the two ⅞ x 6 x 6 in. end boards; then clamps, shown in Fig. 3, were placed over them to hold them together. This made a box 6 in. wide, 6 in. deep and 6 ft. long—just the dimensions of the posts—with movable sides and ends. There were six bottom boards and one pair of sides and ends. These posts were reinforced with ¼-in. round rods and were made of the same material as the blocks. The lintels were made in practically the same manner and reinforced with ¼-in. rods and band iron.

In using plain round iron for reinforcing it is necessary to "kink" it every 2 or 3 in., otherwise it would simply slip through the concrete without binding it together, for the cement does not adhere to metal. This "kinking" is very important. In using band or strap iron the several pieces were wrapped around a short piece of round iron running crosswise of the block at the ends. Where the ends of the reinforcing rods do not extend beyond or out of the blocks, they are placed by first putting into the mold enough material to fill the mold up as far from the bottom as the reinforcing rods are wanted from the face of the block, then place the rods carefully and put in another course, if there are to be more than one set of rods, and so on until mold is finished. Each course is to be rammed hard, but the surface must be thoroughly roughened up before the next layer is put in or there will be little adhesion between the layers, and you will find the finished blocks splitting apart along these layers. It is these little things that make for success in cement work.

Even before we started to build our mold for the foundation blocks we had designed and nearly finished the column mold. This was a very strongly and carefully made affair, costing in the neighborhood of $25. The columns were to be made "face down"—*i. e.*, the inside or finished face, the outside to be the top of the mold. A part of these columns were to have fluted faces, part of them a heavy bead on each side of the face, and the balance plain. This refers to the columns for the outside walls only, those for the inside being a later development, with two finished faces.

To get back to our first elaborate mold, it may be stated that the bottom board was 1½ in. x 6 in. x 9 ft. 6 in., planed true (there were six of these boards), and onto the face were nailed the "beads" that were to form the flutes in the face of the column. Across the back were four 1½ x 2 x 9 in. battens, extending 1½ in. on each side. The sides were built up to give the desired shape to the column, as shown in Fig. 3, and were very carefully fitted to a close joint against the sides of the bottom board, so the corners of the column would be clean and square. This whole mold was made up of selected white oak, thoroughly bolted together and furnished with suitable means for binding the several members together, making it very rigid. It was then carefully shellaced and made as moisture proof as possible.

Making the Columns.

The first column made in this mold was a beauty—straight, true and clean. The next six, with the mold, had to be thrown away. This was an expensive mistake, but served its purpose, and resulted in saving more than it cost. It is impossible to keep hardwood molds true, the first dampness twisting them out of shape.

There is just one material for this work, and that is white pine; not the expensive kind, but ordinary box boards, usually ⅞ x 10 or 12 in. wide and 16 ft. long, and costs about $33 to $37 per 1000, depending on quality and locality. Make your molds of this, shellac them and then keep them dressed with Bayberry wax, as explained further along, and there will be no twisting or warping. The drawings, Fig. 3, show the new mold and illustrate the manner by which it was held together during the ramming up of the column.

All columns had not the same shape, those inclosing window and door openings differing in that, in place of the projection to hold the panels, there was a recess to receive the wooden stile for windows, with a depression to accommodate the spring sash balances that were used in place of the ordinary sash weight, as requiring less room. These changes were made by removing the pieces A and B and substituting therefor the piece C. From this piece project slender pins K for the purpose of holding the lead expansions in place, by which the woodwork was, later, to be secured to the column. Also there were recesses to be made to accommodate the cast iron brackets that supported the door and window heads, as shown in the description of this house given in the January issue of *Carpentry and Building*. The pieces that formed these recesses, of which there were quite a number, were not permanently fastened to the side pieces of the mold, but held in place by screws, that were unscrewed from the outside after the column was rammed up, leaving them in place to support the cement until it had set, when they were drawn out. Had they been fastened to the side pieces, in removing the latter the green column would be broken out, over or around, the blocks. We found this out by experience and remedied it as above.

In the case of a window column, the piece C was 4 in. longer than the wooden stile would be, and short pieces similar to A and B were used at either end and for "door" column from the top of the door head up so that panels set under the window sills would be securely held in place, as would those also above the window and door heads.

It is essential to success that accurate and carefully measured detail plans be made covering these members, as they must be made to fit, thereby avoiding any necessity for trueing up or cutting away the hardened cement work, as that is both expensive and unsatisfactory. Let me repeat, then, that it is necessary to make your plans and measurements very carefully, so that the pieces will fit together properly, always making an allowance for mortar joints.

(*To be continued.*)

FRAMING DOMES, PENDENTIVES AND NICHES.—II.

By C. J. McCarthy.

NEXT we find the covering of a circular dome when it is required to cover the dome horizontally. Referring to Fig. 24, let A B C represent a vertical section through the axis of a circular dome, and let it be required to cover this dome horizontally. Bisect the base in the point D and draw D B E perpendicularly to A C, cutting the circumference in B. Now divide the arc B C into equal parts, so that each part will be rather less than the width of a board. Join the points of division by straight lines which will form an inscribed polygon of many sides. Through these points draw lines parallel to the base A C, meeting the opposite side of the circumference. The trapezoid formed by the sides of the polygon and the horizontal lines may be regarded as the elevations of so many fustrums of cones, whence results the following mode of procedure in accordance with the introductory illustration in Fig. 18. Produce until they meet the line D E the lines *n f*, *f g*, &c., forming the sides of the polygon. Then to describe a board which will correspond to the surface of one of the zones as *f g*, of which the trapezoid is an elevation, we proceed as follows: From the point *h* where the line *f g* produced meets D E, with the radii *h f* and *h g* describe two arcs. Cut off the end of the board *k* on the line of a radius as *h k* which will always give the butt perpendicular to the joint. The other boards are described in the same manner.

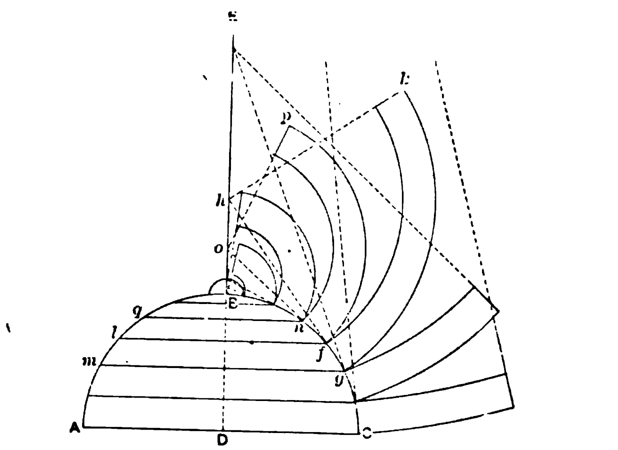


Fig. 24.—Laying Out Horizontal Covering of a Spherical Dome.

The approximate lengths of the boards will be found as shown in Fig. 17 by dividing the circular joint as *g m* into a number of equal parts and setting them off on the curve *g k* of the board.

We will next determine the method of finding the covering of an ellipsoidal dome. Let A B C D of Fig. 25 represent the plan of the dome, and F G H a vertical section through its major axis. Produce F H indefinitely. Divide the circumference as before into any number of equal parts and join the divisions by straight lines. To describe any board produce the side of the polygon corresponding thereto as *l m* to meet the base line F H produced in *n*. With the radii *n m* and *n l* describe the two arcs forming the sides of the board. Cut off the board on the line of the radius as *n o*. The length of the boards are found in the manner described in connection with Fig. 24. Lines drawn through the points of division at right angles to the axis and extended until they meet the circumference A D C of the plan will give the plan of the boarding.

To find the covering of an ellipsoidal dome in horizontal gores the following steps are necessary: The principal in this case being the same as the globe, Fig. 17, we shall merely describe the method of procedure. Let the ellipse No. 1 in Fig. 26 represent the plan of the dome, A C its major axis and B D its minor axis. Let A B C of No. 2 represent its elevation. First to describe on the plan and elevation the lines of the gores proceed in the following manner: Through the line A C of the plan produced to H draw the line E G perpendicular to it. Draw B E and D G parallel to the axis A C, cutting the vertical E G. Then will E G be the length of the minor axis on which is to be described the semicircle E F G, representing a section of the dome on a vertical plane passing through the minor axis. Divide the circumference of the semicircle into any number of equal parts, representing the widths of the covering boards on the line B D, and through the points of division, 1, 2, 3, 4, &c., draw lines parallel to the axis A C, cutting the line B D in 1, 2, 3, 4, 5. Divide the quadrant of the ellipse C D of the plan into any number of equal parts, as *e*, *f*, *g*, *h*, and through these points draw perpendicular to A C the lines *e a*, *f b*, *g c*, in both plan and elevation. These lines will then be the seats of the vertical section through the dome parallel to E F G. Through the points *e*, *f*, *g*, *h*, of the plan also draw lines parallel to the axis A C, cutting E G in *o*, *n*, *m*, *k*. From H, with the radii H *o*, H *n*, H *m*, H *k*, describe the concentric circles *o g g p*, *n* 8 8 *q*, *m z y r*, &c.

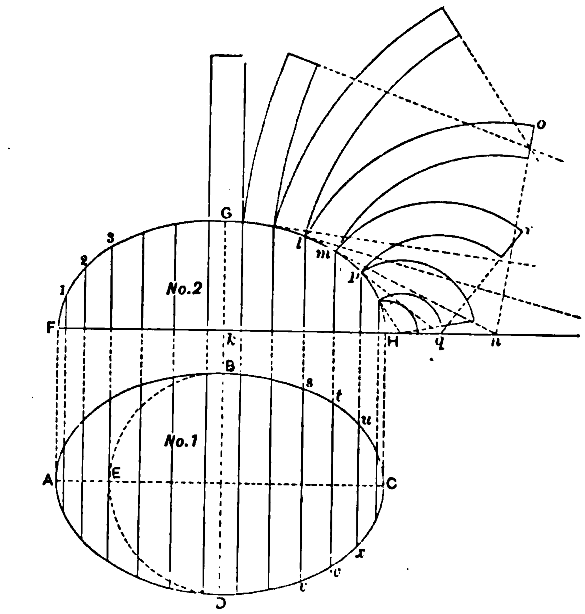


Fig. 25.—Covering an Ellipsoidal Dome.

Framing Domes, Pendentives and Niches.—II.

To find the diminished width of each gore at the sections *a e f b* and *c g h d*, proceed as follows: Through the divisions of the semicircle 1 2 3 4 5 draw the radii 1 *s*, 2 *t*, 3 *u*, 4 *v*, 5 *w*, 6 *x*; then by drawing through the intersections of these radii with the concentric circles, lines parallel to H C to meet the section lines corresponding to the circles, the width of the gores at each section will be obtained. Curves drawn through these points will give the representation of the lines of the curves on the plan.

In No. 2, or the elevation, the lines are more clearly shown. The quadrant E F G is half the vertical section on the line D B and is divided as in No. 1, or the plan. The dotted parallels 5 5, 4 4, 3 3, 2 2, &c., show how the divisions of the arc of the quadrant are transferred to the line D B. The other parallels, *a h*, *b k*, *c l*, *d m*, are drawn from the divisions of the circumference of the ellipse to the line E G and give the radii of the arcs *m n*, *l o*, *k p* and *h g*.

To describe one of the gores draw any line as A B in No. 3 and make it equal in length to the circumference of the semiellipse A B C, by setting out on it the divisions 1, 2, 3, 4, 5, &c., corresponding to the divisions of the ellipse. Draw through these divisions lines perpendicular to A B; then from the semicircle E F G of No. 1 transfer the distance 6 5 to *g n* of No. 3; the distance 9 9 of No. 1 to *f m* in No. 3; the distance 8 8 of No. 1 to *e l* in No. 3; the distance *y z* of No. 1 to *d k* of No. 3 and *x w* to *c h*. Join A *c*, *c d*, *d e*, *e f*, *f g* and A *h*, *h k*, *k l*, *l m*, *m n*, which will give the curve of the sides of one-half of the gore, the other half being obtained in the same manner.

We now come to the method of covering an ellipsoidal dome with boards of equal width. Referring to the portion of the diagram in Fig. 27 marked No. 1, let A B C D represent the half plan of the dome, and A B C of No. 2 a section on its major axis. Draw the circumscribing parallelogram of the ellipse A E F C and its diagonals, E D and F D. In No. 2 divide the profile A B C into equal parts, as 1, 2, 3, 4 and 5, representing the number of covering boards, and through the points of division 1 10, 2 9, 3 8, &c., draw lines parallel to A C. Through the points of division, 6, 7, 8, &c., draw the lines 6 *e*, 7 *d*, 8 *c*, &c., perpendicular to A C, cutting the diagonals of the circumscribing parallelogram of the ellipse in No. 1, and meeting its major axis, A C in *e*, *d*, *c*, &c. Complete the parallelograms of the inscribed ellipses corresponding to the lines of covering as in the diagram.

In order to find the development of the covering produce the axis B D in No. 1 indefinitely. Join by a straight line the divisions in the profile A B C of No. 2 and extend the lines to meet the axis produced. Each division then becomes the frustrum of an elliptic cone, of which the triangles A B 7, 3 G 8, 2 F 9, &c., are sections on their major axes.

Let us now, for example, take the division represented in No. 2 by the triangle 2 3 F 8 9, and in No. 1 by the ellipses *g* 5 4 3 2 1 *f b* and 11 10 9 8 7 6 *p c*. On the minor axis B D, No. 1, produced, lay off the hights *a b* F No. 2, at D *o* G, and draw indefinitely the line *o n* parallel to A C. Point off at random in the elliptic quadrant *f g* the points 1, 2, 3, &c., and draw the radial lines 1 D, 2 D, 3 D, &c. Then from the center D, with the radii D *f*, D 1, D 2, &c., describe the dotted arcs *f m*, 1 *l*, 2 *k*, 3 *j*, &c. Join *m* G, *l* G, *k* G, &c. Make G H equal to G *m*, and with G as center and G *l* as radius describe the arcs *a b* and *a' b'*, each side of G H in No. 3. From H as center and *f* 1 of No. 1 as radius describe the intersecting arcs *c d* and *c' d'*. Through their points of intersection, 1', draw lines to join G. Again, from the center G, with the radius G *k*, describe the arcs *e f* and *e' f'*, and with the points 1' as centers and the division 1 2 of No. 1 as a radius describe the arcs *g h* and *g' h'*. Join their intersections, 2', with G, and so proceed until all the divisions are laid off, when a line swept through the points of intersection of the arcs will give the curve of the lower edge of the board.

To get the curve of the upper edge, lay off on the lines G H, G 1', G 2', &c., the lengths of the lines G *m*, G *l*, G *k*, &c., measured from G to where they are cut by the line *n o*. All the other boards are found in a similar manner.

In order to find the covering of an ellipsoidal dome in vertical gores our method is as follows: Let the ellipse A B C D, Fig. 28, represent the plan of the dome. Divide the elliptical quadrant D C G into a number of equal parts, representing the gores or boards. Take any division, for example, as G *w v*, and draw the chord *v w*, producing it beyond *w*, and perpendicular to it from G, draw the line G H indefinitely. Divide the quadrant A D G into a number of equal parts, and draw the ordinates, 1 *a*, 2 *b*, 3 *c*, &c. Produce the line G H to E, and perpendicular to it draw the line G F equal to G D. Draw the chord A E, and parallel to it, the dotted lines *e f*, *d g*, *c h*, &c., and from *f g h i j* draw, indefinitely, lines parallel to C F. Transfer 1 *a* to *j* 1', 2 *b* to 2', 3 *c* to *h* 3', &c., and through the points thus found draw the curve F 1 2 3 4 5 E. From G on the line G H, lay off the divisions *j i h g f* of the line G E, and draw the lines *k l m*, *n o p*, *g r s*, *t u x* , *y z* 6, parallel to the chord *w v*. Also, on the line G H, from where it cuts the periphery of the ellipse, lay off the divisions of the curve E 5 4 3 2 1 F, and from the points draw lines parallel to the chord *v w*. Now transfer the length *k l m* to *k' l' m'*, *n o p* to *n' o' p'*, *q r s* to *q' r' s'*, *t u x* to *t' u' x'*, *y z* 6 to *y' z'* 6', and through the points *v* 6' *x' s' p' m'* and *w' z' u' r' o' l'* draw the two curves meeting in H, when *w v* H will be the required gore. All the other gores are found in a similar manner, always remembering to draw the working diameter, as E G E' perpendicular to the chord of the division, as *v w*.

Both the horizontal and vertical mock ribs in the panelling of dome ceilings, when they are to be finished in wood, also the veneering of niches, either vertically or horizontally, are found in accordance with the above described methods. A little study of the different diagrams presented herewith will also show the method of cutting shingles or slate for conical roofs and copper or tin for roofs of double curvature. The curvature of clapboards for circular walls may also be found by this method.

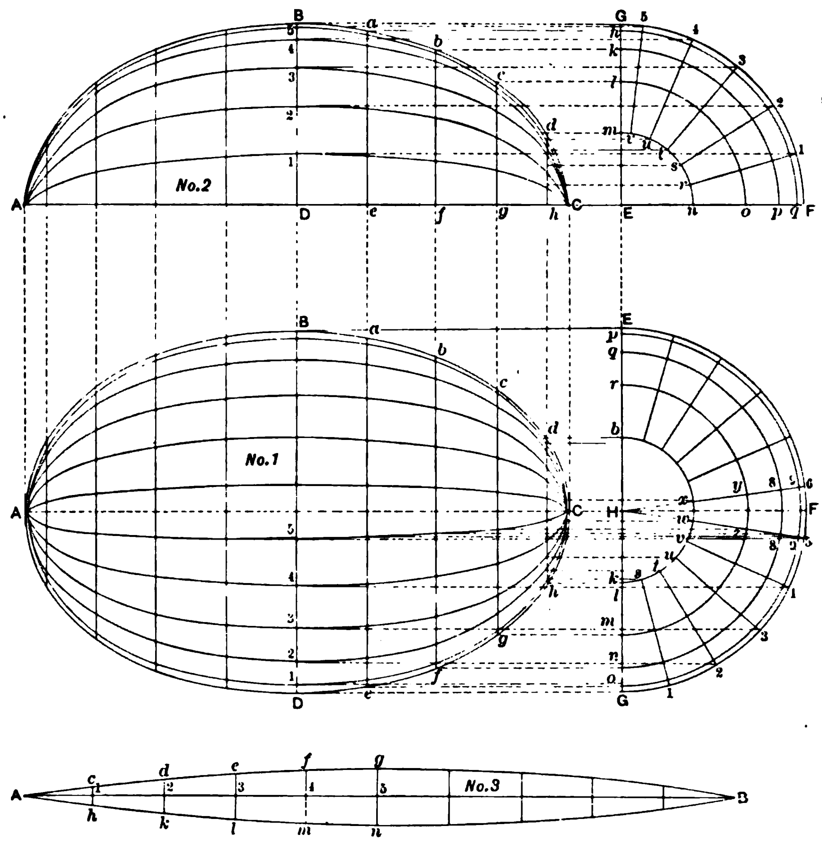


Fig. 26.—Covering of an Ellipsoidal Dome with Horizontal Gores.

Framing Domes, Pendentives and Niches.—II.

An Artistic Monolith Concrete House.

Many interesting examples of concrete dwellings are now to be found scattered over the country bearing striking testimony to the growing popularity of cement concrete for constructive purposes. One of the most notable examples of this character and which embodies novel features, both as regards construction and the effects produced, is a residence recently erected for Albert Moyer, C. E., at South Orange, N. J., and described by him in *Municipal Engineering*. The residence was designed by Architects Tracy & Swarthout of New York City to accord with the natural surroundings and the material employed. It is referred to as original and not a copy of something already executed. In his comments Mr. Moyer says:

A recognizable and original style of architecture is a rational expression of the principal characteristics of the people for whom the structure was erected, modified by the requirements of the structure and the available building material. If you employ concrete, let it look like concrete, design for concrete, eliminate all thought of stone, brick, wood or plaster. Let the house stand up and be able to say to the casual observer, "I am solid, strong, substantial, durable, beautiful and am of concrete." That which looks right to the practiced and trained eye is right. For country residences particularly, where there are winding roads, trees, a hillside and possibly rocks, concrete treated as concrete looks right. Convenience and adaptability seem to point to concrete as a material best suited to assist in developing what I am pleased to call American architecture.

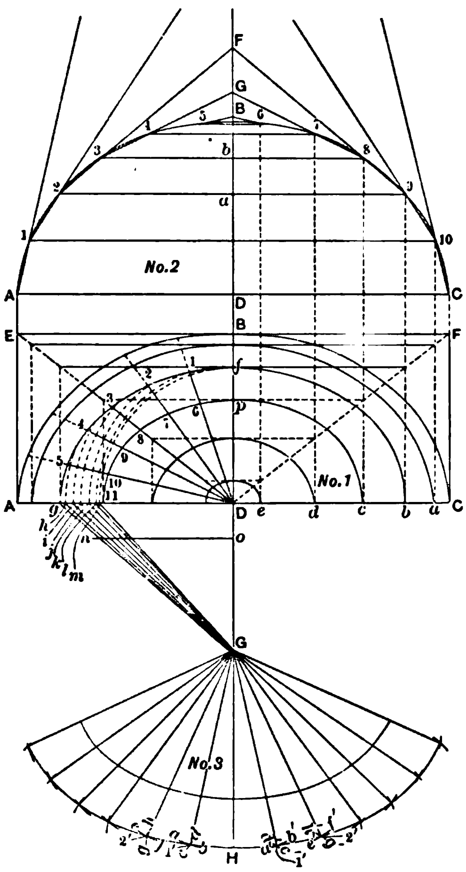


Fig. 27.—Covering of an Ellipsoidal Dome with Boards of Equal Width.

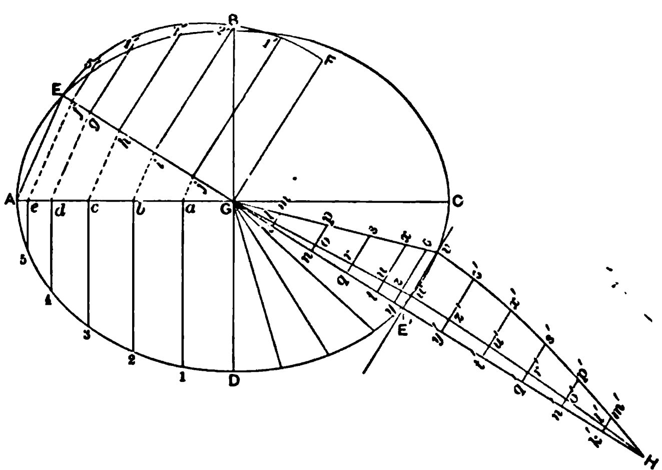


Fig. 28.—Covering of an Ellipsoidal Dome with Vertical Gores.

Framing Domes, Pendentives and Niches.—II.

In using concrete for country residences I wish the reader to eliminate from his mind all thought of concrete, such as he sees about him in retaining walls, bridge abutments and other work where concrete has been employed, but to try to picture a concrete made of selected materials, the molds or forms taken off as soon as possible while the concrete is yet green, the surface scrubbed with a scrubbing brush, or if the concrete is too stiff a wire brush, water being sprayed on with a hose, thus removing all the mortar which has come to the surface, and exposing the larger pieces of aggregates; in fact, throwing them slightly in relief, giving a rough surface of accidentally distributed colored stones.

As the walls are erected in different courses, the lower courses are from necessity stained by surplus water runnin down from the upper forms. This is very readily removed by washing off the walls after the house is completed with commercial muriatic acid, 4 to 6 parts water, which further brightens up the different particles of stone and removes any cement stain which may be on the outside surface of the stone or the mortar which bonds the stones together.

The aggregates used in the house on Ridgewood road are composed of 1 part Vulcanite Portland cement, 3 parts limestone and white marble screenings about the size of sand, 5 parts of ¾-in. trap rock and 1 part of 1-in. white marble chips. When the boards were taken down the surface had the appearance of the ordinary dead mouse-colored concrete, but as soon as scrubbed and washed with a hose all the particles of trap rock and white marble chips, bonded together by light colored mortar, were exposed, giving a surface which was slightly roughened, and a color effect and texture which is beautiful. Photographs do not do justice to the color of this wall. It is bright and full of life. The material used is concrete honestly employed and the source of strength is evident. Durability, honesty, simplicity and strength are the prominent characteristics. It is a true, artistic, picturesque, monolith concrete house.

This treatment of concrete surfaces removes practically all the board marks where one course of concrete is bonded onto another. It eliminates the danger of temperature cracks, hair cracks, &c., showing on the surface, and gives a wall which is 100 years old on the start and which will age beautifully. Vines will add to its beauty and if moss gathers on the north side it will be still more beautiful. The effect is the same as that produced by a century of age.

The foundation walls of this house on Ridgewood road are 14 in. thick, resting on footings 20 to 22 in. wide, the ground having been previously thoroughly tamped. Chimneys were built entirely of concrete, the flue lining being provided for by 8 x 12 and 12 x 12 flue linings, which acted as an inside form, thus making the construction of the chimneys very economical. Supporting piers and columns were also built of concrete.

Dampproofing to cellar was provided for by an outside drain carried all around the house just below the cellar floor level, the outside walls being painted with two coats of a waterproofing paint, then plastered with mortar, forming a permanent protection to the waterproofing.

The walls above the first floor beams were lined with porous, hollow 2-in. terra cotta furring or partition blocks. This was accomplished very economically at the cost of about 10 cents per square foot complete. These blocks were set inside the forms or molds similar to laying brick, the concrete being tamped in between the outside forms and terra cotta blocks, the blocks having been previously thoroughly soaked with water. It was found that the blocks bonded perfectly to the concrete and could not be torn loose in any place.

To avoid any possibility of dampness, these blocks were waterproofed with two coats of the waterproofing paint, which not only clings with a perfect bond to the porous terra cotta blocks, but the plaster for the inside of the house hangs to it far better than to any lath which has yet been devised. This furnishes a wall which is solid and substantial, warm in winter, cool in summer, dampproof, and eliminates all possibility of condensation from the inside.

This wall was reinforced where necessary, particularly over windows, and four horizontal courses of ¾-in. wire cable were imbedded in the concrete, running all around the building, tying the walls together perfectly, acting as a reinforcement against temperature stresses and making the house practically earthquake proof.

The concrete was very carefully mixed by hand. As each shovelful was turned, it was raked with an ordinary garden rake. This was repeated until an intimate mixture resulted. Mixing was first done dry, then wet, sufficient water being added to produce a medium wet concrete, which was thoroughly tamped in the forms in 6-in. layers, each course being carried to the hight of about 3 ft. at a time, and allowed to set hard before the next course was put on top.

The selected aggregates used composed all of the concrete. They were not put against the outside forms by hand, but were mixed all through the concrete, thus giving an accidental distribution of white and dark particles far more beautiful than if the arrangement of the particles was deliberate.

The walls above the water table, are 10 in. in thickness; 8 in. of concrete and 2 in. hollow porous terra cotta furring blocks.

Appearance of Finished Surfaces.

In describing the effect of this surface to the eye, it is almost impossible to present the color effect produced even by means of a photograph. Before viewing the house some architects criticised this method, stating that it would give too rough an appearance, others did not think it practicable from an economical standpoint, others expected efflorescence, and all kinds of trouble, but after viewing the house their opinions were changed, and it is now believed by some of the best architects and engineers in New York to be the correct method of treating concrete economically and artistically.

The difference between stucco finish and mortar face concrete and exposed selected larger aggregates, is that the stucco finish even though scrubbed or treated with acid would present to the eye too fine a grain for the large space of wall. This fine grain surface, even though of good color, becomes monotonous. Some will say that the finished block of granite shows a fine grain surface which is beautiful, forgetting that when set in a wall the surface of the wall is from convenience and necessity broken by the mortar joints. The surface of exposed selected larger aggregates gives a "Basso Relievo" effect, and their accidental, therefore natural, distribution throughout the concrete not only avoids monotony, but brings about extreme beauty.

The window openings were provided for as the concrete was placed, by temporary wooden forms so arranged as to form a rebate all around the window frame on the inside of the concrete wall, so that a permanent frame could be set in this space, making the window water tight. The windows being set in the inside of the wall, show shadows and depth of wall, thus forming part of the architectural scheme. The sills were not placed until after the walls had been entirely completed. These were scrubbed on the sides but troweled on the top.

The south porch with its square pillars and plain caps ornamented with hand made various colored tile is noteworthy. The roof of this porch is a 6-in. slab reinforced with bars and expanded metal. The top of the slab is painted with two coats of dehydratine on which was placed a mortar coat troweled and finished, and cut in squares as in sidewalk paving. This has proven to be perfect waterproofing, and acts as a floor to the open porch above. The floor of the lower porch is a 6-in. reinforced slab finished on top with a 1-in. red mortar coat marked off in small squares.

The fireplace on this porch was built up with the walls. It was afterward decorated with the tile mosaic of the "Indian Making Fire," which was designed by Henry C. Mercer. This pattern, which is 20 in. in diameter, consists of pieces of clay burned in many colors superficially or throughout the body and unglazed. The tesseræ are not rectangular, as in Roman or Byzantine mosaics, but are cut in multiform shapes to suit the potter's process, and their contours themselves help to delineate the design.

As the lead in stained glass holds together the glass units, so does the Portland cement in these tile mosaics. The fireplace is, furthermore, a good illustration of a concrete design. No one could think of this design in marble, brick, granite, wood or other material.

The same may be said of the balcony under the large front window. This is also decorated with hand made tile of various colors. The balcony was first carved out of clay as a model, the molds being made of wood in accordance with the scale of the clay model.

The fireplaces inside the house are solid concrete, which, however, does not show, as usual wood mantels of plain design are used; the breasts around the opening being covered with hand made Moravian tile in colors and various designs. The hearths are of concrete in which are laid hand made Moravian tile, glazed and unglazed. The mortar joints were not pointed; in fact, were purposely roughened.

There is no woodwork outside of this house which touches the ground, or comes anywhere near the ground. The roof is of dull red Japanese pan tile, the tile being taken from the run of the kiln, so that there were colors all the way from dark purple to salmon, the general effect being a dull red.

The beams supporting the roof were tied to the walls by means of bolts set upright in the concrete. The same method was employed in tying the floor beams and girders to the walls, so that no "battering ram" action could take place in case of earthquake. The floor beams were not set in the concrete, but rested on and were spiked to 4 x 4s fastened to the concrete by means of bolts set every 15 in., these bolts being firmly anchored. When the inside forms were taken off these bolts protruded 5 in. The 4 x 4s to be used were then placed up alongside these bolts, and marked where they came. Holes were then bored through the 4 x 4s, which were slipped over the bolts, each bolt fitting in its proper place and being screwed very tight by means of nut and washer. This method on first glance was open to criticism on account of shrinkage of the wood, but on further thought the shrinkage would not be as much as the pressure of the nut against the wood, they having been screwed very tight.

The concrete back of these 4 x 4s was dampproofed with the waterproofing paint. This method of providing for the floor beams was very economical and convenient, serving the purpose admirably.

Decoration of Outside Walls.

Decoration and color of the outside walls were provided for by primitive hand made colored clay tile, both glazed and unglazed. All tile mosaics were designed by Henry C. Mercer, and furnished by the Moravian Potteries at Doylestown, Pa. These tiles were set in design and placed inside the forms before the concrete was dumped in.

The size of the panels and their distribution were from drawings furnished by the architects. When the forms for the concrete walls were taken down these board negatives were left in the concrete until the wall had been scrubbed. They were afterward removed, thus leaving a 1-in. recess conforming to design, in which the hand made tiles were placed, they being set in mortar, sometimes light colored mortar, sometimes darkened.

Each panel of hand made tile produced most artistic results and forms a very handsome combination with the color and texture of the concrete surface. The color effect produced is glorious and yet unobtrusive, being of earth color and pastel shades of a very primitive nature.

With no straining for oddity, simply to be original, this house can well be said to be unique in this country. It is simple, dignified, the countenance is full of expression and alive with purpose, and it harmonizes with the natural surroundings and gives a feeling of strength and repose.

WE understand that a movement is on foot looking to the organization of an Ohio State Association of Builders' Exchanges, the prime mover being the Columbus Exchange.

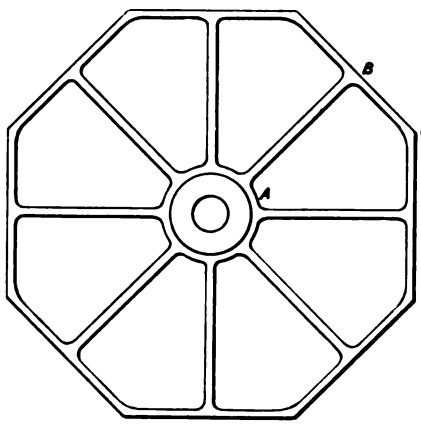
THE ART OF WOOD PATTERN MAKING.—IV.

By L. H. Hand.

As a further illustration of the problems which arise in a pattern shop we will next consider a set of castings for a "boilermaker's piano," now being built in the shop where the writer is employed. This instrument is a hollow octagonal cylinder of suitable length to hold the flues from a locomotive boiler which are cleaned of lime deposits, &c., by rolling over each other and knocking together as the cylinder revolves. The ordinary way of making it is to bolt wooden staves to cast iron octagon wheels, the staves being further strengthened with iron bands so arranged that one stave can be taken out to fill the cylinder.

The full set of patterns consists of one end pattern, one bottom box, one top box, one large gear wheel and one small gear wheel. This in our opinion will if carefully studied sufficiently illustrate the making of wheels, boxing and gear work. Beginning with the end casting, which in this case was a 34-in. octagon wheel for 2 7-16 in. shafting, with an 8-in. hub, the first step was to make a full sized working drawing after the style indicated in Fig. 50, or what is equally as good, a sectional elevation, as indicated in Fig. 51. Taking this drawing as a guide we next saw out of 2-in. stuff a section of the hub 8¼ in. in diameter, as shown at A, Fig. 50. this being turned up in the lathe to 8 in., thus giving suitable draft. Now, with the lines B, C, D, Fig. 50, make a pasteboard pattern of one-eighth of the web. Next, make up a block of eight ¾-in. boards and lay off upon it the pattern, cutting through the entire block with a band saw, giving as a result the shapes shown in Fig. 52. Take off one piece of the web in order to allow for any possible variation and dress the remaining block true on all sides with a plane. The rim being in eight sections we proceed to make a pattern of it, locating the joint in the rim at the corners of the octagon, thus breaking joints with the joint in the web. The rim also was cut from 2-in. stuff, as shown in Fig. 53. In cutting the inside the saw table was tilted 6 degrees for draft. It was then smoothed with a spoke shave and sandpapered, after which the wheel was glued up, placing the points of the web pieces exactly at the center of the hub. The first seven were glued up without any additional fitting, and a very little fitting on the eighth section made everything tight. The wheel was then turned over on the trestle board and the spokes fitted in and glued fast, each spoke being placed exactly over the joint in the web. The spokes were made of ¾-in. stock dressed to ½ in. on the outside, to give plenty of draft. When the glue was dry the outside of the finished wheel was given a very little draft with a sharp smooth plane and stop core prints put on for bolting staves to the rim. When several similar stop core prints are required it is best to get out a strip of molding of the required shape, which is cut to the proper length by using a gauge on the band saw, or fine cut off saw, or in a miter box with an adjustable stop. I mention this particularly because of the fact that I have repeatedly seen good patternmakers get out each core print separately by pattern, dressing and smoothing up each print in the vise with chisel and sand paper, regardless of the number required, when the same result could be obtained in one-fifth of the time by the other method, especilaly when one has a disk sander to finish the ends of the prints. Next, if we have suitable stock, turn up the extension for the hub, allowing sufficient material for a 2¼-in. core print, as shown at A, Fig. 51, for the shaft hole. I find it very convenient to save up blocks of old pine bridge timbers, &c., for work of this class, often saving hours of time required for gluing up thinner stuff. The core print for the face or follow board side should be turned with a tenon and left loose, as will be seen at B, in Fig. 51.

In work of this kind it is customary to round out all sharp inside corners by putting in a small cove called a fillet. These are put in with certain kinds of wax, leather, wood, etc. In this case I procured from the coach painter a quick setting hard drying putty used for glazing any rough places in locomotives, tanks, coaches, &c., using a small gouge instead of a putty knife to apply it to the work. The result was satisfactory in every way. This pattern being large and not difficult to draw, was painted with two coats black shellac, only core prints light, and not polished very much.



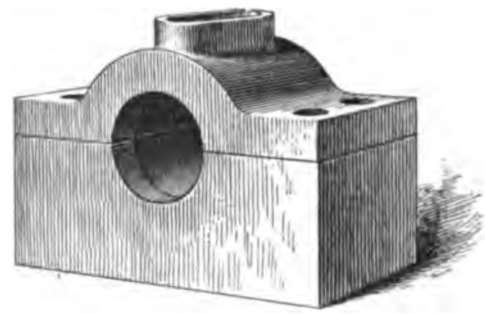
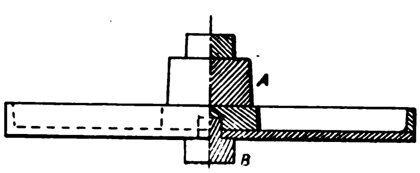
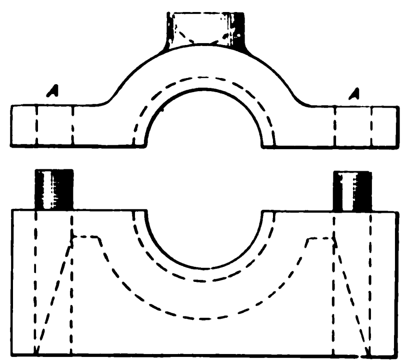


Fig. 54.—General View of Boxing.



Figs. 50 and 51.—Elevation and Section of "Boilermaker's Piano," or Tumbling Barrel.



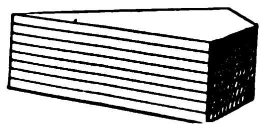


Fig. 52.—Block of Eight Boards.

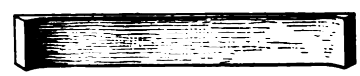


Fig. 53.—Shape of the Rim.

Fig. 55.—Details of Upper and Lower Boxes.

The Art of Wood Pattern Making.—IV.

Next in order comes the boxing illustrated in Fig. 54, which was cast to hold a babbit metal lining. This can be accomplished either in the pattern or with a core box. It was made with the core box. Consulting the working drawing, Fig. 55, it is readily seen that the upper box is easily made from a solid block of proper dimensions while the lower one being hollowed out on the bottom to save metal is easier made of three pieces glued together. Supposing that suitable stock is at hand take for the caps a block 5 x 8 x 2¾ in., on the edge of which lay out the working drawing, including the oil cup. Cut this out on the band saw and fit blocks back into the ends of the oil cup, gluing them to place. Bore the bolt holes A A and give them plenty of draft on spindle sander. Smooth up carefully and put on core prints for shaft hole 2 7-16 in. full, as these are not bored out for babbited boxing. Smooth up and finish, as before explained.

The lower box is made of one block 4¼ x 8 x 3 in. and two pieces ⅝ x 3 x 8 in. Cut away the surplus wood from the piece forming the middle section of pattern and smooth up before gluing on the side pieces. As it will be noted that the bolt holes will not draw so readily in this as in the upper box I think best to core them out. The core box comes next. and being a type that will have to be turned out very frequently will try to make its construction very plain.

It will be noted that the core must be large enough to hold ¼ in. of babbit metal for the shaft bearing. Hence the core will be 2 7-16 at the ends and 2 15-16 in the center. To make this kind of a box I get out one center box 2 15-16 in. diameter and two end boxes 2 7-16 in. diameter, and fasten them all to one thin plank B, as illustrated in Fig. 56. To hold the babbit metal firmly in place I fitted small strips (⅛ x ¼ in.) into the core box so the core would come out of the box with the strips in the sand, which were then removed, leaving a channel to receive molten metal, as will be seen in the sectional view, Fig. 57.

It is customary to leave a core box or pattern unpainted where the strips or loose portions go, so that the molder may know where to place such loose portion.

Having completed this much the next step to consider is the gear wheels. In actual practice few gear wheels are made in small shops. However, a patternmaker always will have special gear wheels to make, and should know how to lay out gear work.

Gear wheels are laid out from an imaginary line called the pitch line. This pitch line is the line where the two gear wheels would touch if they were both plain wheels. The circular pitch of a gear wheel is the distance from center to center of cogs on the pitch line. The length of a cog is 7-10 of the circular pitch. The thickness at the pitch line is 48-100 of the circular pitch. And the cog is located on the pitch line so that 3-7 of its length is outside and 4-7 inside of the pitch line. The pitch diameter of a gear wheel is the diameter at the pitch line. If the reader will take pains to commit this simple formula to memory he will never have any more trouble about laying out plain gear work.

Not wishing to be tedious, we will take up the making of the large gear wheel only, which has a pitch diameter of 28 in. with a 4-in. face. The driving pinion is 7 in. pitch diameter. For practical purposes the circumference of this wheel at the pitch line will be 88 in. (87.9648); the circular pitch 2 in.; number of cogs 44; length of cog 1.4 in.; thickness .96 in.; diameter of wheel at base of cog 27.2 in., adding 1-10 of an inch per foot for shrinkage we will figure the diameter of the pattern at the base of the cogs as 27 13-30 in., which for all practical purposes we will again throw away the odd fraction and call it 27½ in.

To build this wheel in the simplest manner make the draft all one way. First prepare a suitable face plate for the lathe and lay out a full sized working drawing on it, omitting the cogs. Next lay out the pattern for one-sixth of the rim, allowing sufficient stock for truing up on the lathe. This wheel should have a rim about ¾ in. thick and 4-in. face. With a beam compass set at 13⅞ in., strike an arc indefinitely, A B of Fig. 58, and without moving the point on the beam lay off the length C D, and draw the lines C E and D E. Move one point of the compass back the thickness of the rim (1 in.) and strike the arc F G. With the pattern so produced lay out 30 sections of 13/16 stuff and cut them out on the band saw.

Next with stout wood screws, put in from the back of the face plate, secure the first round in position, making all end joints tight, using glue on joint only. A suitable disk for the hub may also be put on at this time, and this much of the work turned up to correspond with the drawing on the face plate. Take the face plate back to the bench and put on the next round, gluing it firmly and further securing with brads or screws. Turn up as before and repeat the operation until all the five rounds are in place.

I might add that all the best patternmakers of my acquaintance work this way, but it is possible to build the entire rim in the rough and turn at one operation, but much more difficult to make exact work and hard to turn perfectly smooth.

Next cut gains in hub and rim to receive the spokes and fit them snugly into place with glue, when the wheel will appear as shown in Fig. 59. Get out enough molding exactly the shape of the cogs to cut out 44 pieces 4 in. long. Next cut a hole through a piece of thin veneer exactly the size and shape of the required cog, and with a sharp block plane put a very little draft in each cog, passing each cog through the hole in the veneer to see that they are exactly alike and have the same draft. By this time the wheel can be taken from the face plate.

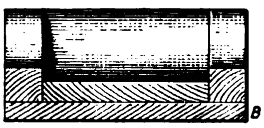


Fig. 56.—Box Fastened to Board.

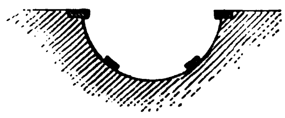


Fig. 57.—Sectional View of Core Box.

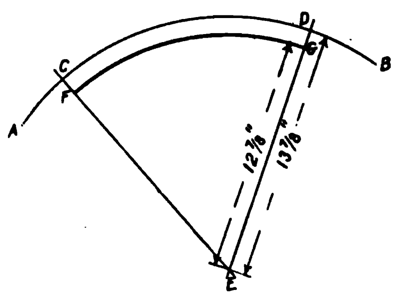


Fig. 58.—Laying Out Pattern for Segment of Rim.

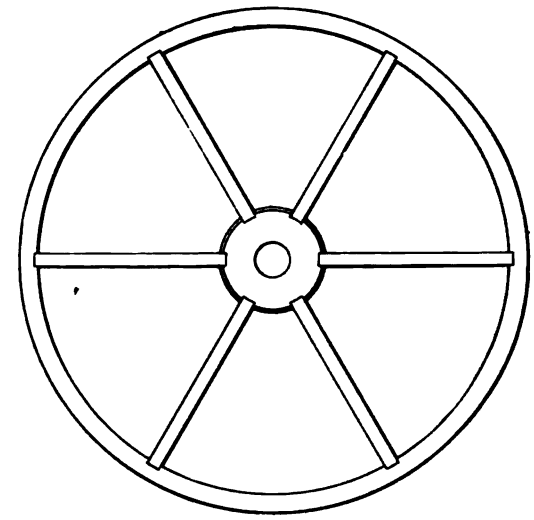


Fig. 59.—Wheel as It Appears Put Together.

The Art of Wood Pattern Making.—IV.

With the compasses divide the rim into 44 spaces and glue the cogs in place, using brads to hold them until the glue dries. Put on core prints in the usual manner for the shaft hole and provide a suitable core box. Some shops depend on the foundry furnishing standard sizes of straight cores and neglect to send core boxes, but the cost of a plain core box is so light that it is unwise to risk a delay. I always make them.

No. 1 dry pattern stuff costs in Chicago from $60 to $90 per 1000 ft. One evening the superintendent came to me in great haste and told me that they had to have a chafing iron for an engine which had to go out right away. In exchanging tanks the coupler had to be 4 in. lower than the old one, requiring a large, heavy casting, represented in Fig. 60, which would have cut into a great amount of pattern lumber if made up solid in the

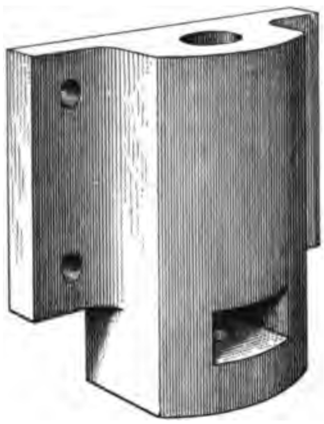


Fig. 60.—Casting for Which Pattern Was Required.

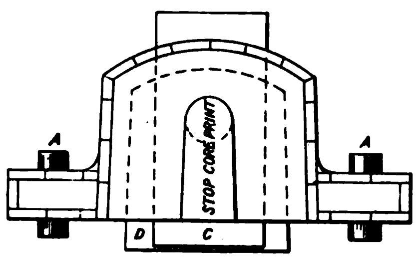


Fig. 61.—View of Pattern Showing Bottom End.

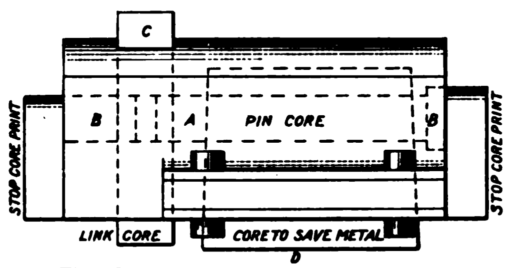


Fig. 62.—View Showing Location of Cores.

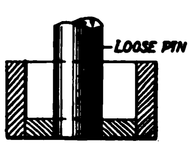


Fig. 63.—Cross Section of Core Box for Link Core C.

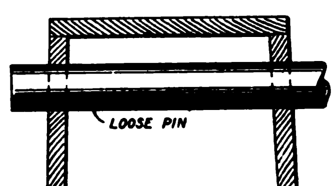


Fig. 64.—Cross Section of Core Box for Core D.

The Art of Wood Pattern Making.—IV.

usual manner. Having all night to think it over I decided to save something on material. As the one casting was all that was required the pattern would then become simply scrap.

The following morning I picked up the top of a large basswood packing box from which by tacking three pieces together I was able to cut out the foundation blocks for my work at a single cut of the band saw. I then put a gauge on the band saw and from 2 in. pattern stuff cut out enough ½ x 2 in. strips to sheet it clear around, as shown in Fig. 61, which was done without any dressing whatever except to fit the joints over the curved face using prepared glue on the joints, thus making a hollow box of the shape required, except the cavities for link hole, bolt holes, &c., which were to be cored out. To save material I was instructed to core out as much metal as possible without weakening the casting, hence it will be seen that the core for the pin hole extended directly through the core for the link and also the core for the cavity in the iron, which will be readily understood by looking at the side view in the working drawing of the casting, Fig. 62, with all the cores in position. It will be noted that the core prints for the coupling pin will have to be for stop cores at both ends, so that the pattern may be readily drawn out of the sand. When the glue had had time enough to set sufficiently the pattern was dressed up all around with a sharp plane and sandpaper, nail holes puttied, &c., and painted with black shellac. Suitable core prints were then provided and finished in light shellac and afterward nailed on. This pattern required six core boxes—one half box for 1½-in. bolt holes A A of Fig. 61, one half box for center of 2¼-in. coupling pin A of Fig. 62, one stop core box for each end of pin B and B, one core box for link hole C and one core box D for the cavity in the casting made to save metal. Both of the latter must have holes in them to hold the cores for the pin. A cross section through each of these boxes is shown at Figs. 63 and 64. The construction of these boxes is very simple. Boxes of the shape and size shown by the dotted lines in the working drawings Figs. 61 and 62 are made in the usual manner, and a 3¼-in. pin fitted to turn easily in the holes to form the hole in the core in which rests the ends of the cores for the coupling pin, the one pin being used in both boxes. It will be noted that while this manner of making the pattern requires quite a number of cores there is a great saving of both labor and costly material over any method which could be devised of making a pattern of solid stuff to form its own cores, and as the pattern was only to be used for a single casting it was not important that the construction should be as good as if it was a standard part to be used hundreds or thousands of times over; also it will be seen that the core boxes could be made of thin material in one-fourth of the time that similar cavities could be mortised and smoothed up in a solid piece. I may mention that the foundry foreman was much pleased with this pattern.

Before going further I should mention that for pattern making it is essential that the working drawing be invariably made full size by the shrinkage rule, which I am afraid I have forgotten to mention. This is a rule designed especially for the patternmaker's use. The engineer's drawing or the desired casting is measured by a standard rule, and these measurements transferred to the wood pattern by the shrinkage rule making the wood pattern enough larger, so that the casting when cool will be of the required size.

It may not be generally known that "Portland" cement takes its name from the Isle of Portland, in southern England. Here are located ancient quarries, which at one time produced a superior quality of building stone. An Englishman named Joseph Aspdin of Leeds, the father of the modern cement industry, in 1824 patented a process for mixing and burning certain proportions of lime and clay. When the resulting material was moistened and allowed to harden, it so closely resembled the stone of Portland that he called it "Portland cement," and the name has persisted for nearly 100 years.

Carpentry and Building

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(Entered at the New York Post-Office as Second-Class Mail Matter.)

APRIL, 1908.

Competition in Two-Family Houses.

For the information of those among our vast army of readers who have been making anxious inquiry with regard to a decision in the Competition in Two-Family Houses, we desire to state that it is the present expectation to publish the announcement of the findings of the committee having charge of the contest, together with the design which shall be awarded the first prize, in the issue of the paper for May. The responses on the part of our architectural friends to the invitation to participate in this contest were so generous as to render the results in point of numbers, at least, the most successful competition ever conducted under the auspices of this journal. The widespread popularity of two-family houses has been clearly demonstrated, and from the builders' certificates accompanying the multitude of studies submitted, it is evident that practically every section of the country is represented. The labor involved, however, in determining the relative merits of the designs submitted to it for consideration has been such as to prevent the Committee of Award from completing its work in season for its decision to be announced in the current issue, although this was our expectation at the time the conditions governing the contest were published.

Schools for Industrial Education.

Just at the present time widespread interest is being manifested in the promotion of industrial education, the idea being to afford facilities to the youth of the country for acquiring a better knowledge of industrial trades and placing them in a position to more successfully meet the problems of life. Reference has frequently been made in these columns to the progress along these lines, and to the successful outcome of many of the movements which have been undertaken to the end in question. The matter has been taken up by the country's representatives at the National Capital, and mention may be made of the Industrial High School bill introduced by Congressman Davis of Minnesota, which provides for an appropriation to be paid by the Government to each State and Territory " for the maintenance of instruction in agriculture and home economics in agricultural high schools of secondary grade and instruction in mechanic arts and in home economics in high schools of secondary grade." The measure provides, in fact, for technical, industrial and practical education as distinguished from the old theory of educating all alike regardless of the type of youth or the life he was to lead. The character of education proposed by the bill in question will touch the realities of life direct, and in the process cultivate the mind as well as manual dexterity. It is designed that the measure shall bridge the gap between the education of the schoolhouse and the education of the home, farm and the shop. The point is made that heretofore our education has lacked unity, has been too much centered about the literary and the nonindustrial, and that its forms and substance have been too little co-ordinated with the training of the home, of the shop, of the farm and of the great outdoors. Through technical training it will keep our youth out of a peasant or submerged class, and by encouraging the States to spend some money for education it will greatly increase general as well as technical education.

Alien Workmen and Accident Liability.

The employment of great numbers of immigrants has raised the new and important question under the employers' liability acts of several States as to whether ignorance of the English tongue is a sufficient reason in the eyes of the law to relieve an injured employee of the burden of his own negligence or that of a fellow workman. The question is yet to be decided to the point of established practice; in the several cases so far reported the courts have been inclined to avoid this aspect of plaintiff's contentions. Sufficient progress has been made, however, to indicate that under certain circumstances the plea of ignorance of English may be sustained. In a New York case the court held that failure to understand English is not the negligence of the master where the work is simple. An Illinois court has decided that the master is not obliged to give warning to a servant in his language unless he knows that the servant does not understand English. The question, however, in a large sense has yet to be fought out in its constantly varying aspects until substantial precedent has been established to govern the future conduct of cases in which this element of ignorance is present. The laws regulating liability for accident to a workman generally agree that when the man is injured through his own negligence his employer is not responsible for damages; and that where an accident results from the negligence of a fellow servant the burden rests upon the fellow servant and not upon the employer. The injured man may recover from his fellow servant, but not from their employer, excepting when the fellow servant is vested with authority, as in the case of a superintendent or foreman. If a foreman should put a man to work on a job, pointing out its dangers, and the man should be hurt because he did not heed the warning, there would be no liability. In the eyes of the law he had assumed the risk and the fault was his own. There are general principles of law, simply stated, but the new contention of ignorance of English introduces an element of doubt as to whether the workman can be considered to have assumed a risk he did not understand because he had not comprehended the warning; and whether another workman injured through his absence of understanding can be deprived of the right to recover from the employer on the ground of negligence of a fellow servant. A thorough discussion of the questions involved develops apparently limitless intricacies of law. The general contention, however, is a warning to employers of alien workmen, that they may safeguard their interests by strict precaution against possibilities of similar happenings in their works. The courts may eventually decide that as a principle of law ignorance of English is the misfortune of the workman, and not a reason for negligence on the part of the employer or his agents. In the meantime, however, it would be well to consider the matter as one of grave doubt, and act accordingly. Where a polyglot population constitutes the source of labor supply interpreters should be developed, preferably among the workmen themselves, a course followed in many industrial establishments, not only because of the danger of accidents through failure of understanding, but because a workman must be intelligently instructed in order to do his work well and quickly. Superintendents and foremen should be held strictly to account for this important part of their duties.

New Quarters for Building Trades Employers' Association.

Arrangements have been completed whereby the Building Trades Employers' Association will occupy on May 1 its new quarters in the structure known as "The Builders' Exchange" at 29 to 35 West Thirty-second street and running through to 30 to 34 West Thirty-third street, Borough of Manhattan, New York. The building, which has just been completed, has a frontage of 100 ft. on Thirty-second street and 50 ft. on Thirty-third street. The quarters of the association will occupy the entire top floor of the building, being approximately 12,000 sq. ft. of floor space.

An important feature of the new quarters will be a permanent exhibition of building materials and appliances, to which the entire second floor of the building will be devoted. We understand that the association has assurances from many large manufacturers and material dealers in the building trades that an exhibition hall centrally located would fill a want that has long existed in the building industry. The exhibition will be in charge of an expert, and every effort will be made to render it as comprehensive and practical as possible. The new building is conveniently located with regard to present and future transportation facilities, and is regarded as most convenient to the building interests of the city.

Meeting of Executive Board of New York State Council.

The Executive Board of the New York State Council of the United Brotherhood of Carpenters and Joiners of America held a meeting in the city of Troy on Saturday, February 15, for the purpose of tabulating the referendum vote taken to decide the question of whether or not a State council should be formed. There is at present a total membership in the council of 8500, all of which became affiliated between October 1, 1907, and the end of the year, since which time there have been several local unions which have adopted the constitution and by-laws.

Many matters of trade interest were taken up and disposed of, the principal one relating to the woodworking mills of New York State, a request having been presented to Labor Commissioner Williams to use his best endeavors to have proper protection afforded the men working in these mills, especially those working at the planers and buzz saws. It was also requested that rubber mats be provided in front of all machines. The point was made that these steps were necessary owing to the great number of men injured while working at machines of this kind—not alone members of the organization in question but mechanics engaged on this class of work in general. It was expressed as the sense of the meeting that the employer would be benefited by a measure of this kind equally as well as the employee, inasmuch as it would possibly be a preventative of numerous suits for personal injuries.

Washington State Association of Builders' Exchanges.

The Washington State Association of Builders' Exchanges was organized early in February, at a meeting held in the rooms of the Seattle Builders' Exchange. It is said to be the intention of the new State Association to organize local builders' exchanges in Bellingham, Everett, Walla Walla and other of the larger cities throughout Washington, with a view to having them affiliate with the parent body. A committee of two, consisting of A. M. Goddard of Tacoma and J. J. Franklin of Seattle, was appointed to draft a constitution and by-laws, to be submitted for approval and adoption at a meeting of the new organization to be held at a later date:

The officers elected for the ensuing year were:

President, E. C. Cornell, Tacoma.
Vice-President, E. J. Duhamell, Seattle.
Secretary, J. J. Franklin, Seattle.
Treasurer, J. E. Bonnell, Tacoma.

We understand that as soon as the work of organization of local builders' exchanges throughout the State is completed the State organization will apply for membership in the National Association of Builders' Exchanges.

Interstate Builders' and Traders' Association.

The members of the Builders' Exchange of Baltimore met in joint convention with the Employers' Association of the Building Trades of the District of Columbia at the rooms of the association, 1333 G street, N. W., on the evening of February 16 and organized the Interstate Builders' and Traders' Association of Maryland and the District of Columbia, electing the following officers:

President, Joseph Richardson of Washington.
First Vice-President, Theodore F. Krug.
Second Vice-President, E. C. Graham, Washington.
Secretary, I. H. Scates.
Treasurer, W. H. Morrow.
Directors—Washington: C. C. Graham, Charles Langley, W. A. Nolan, W. T. Galliher and Joseph Richardson.
Baltimore: John K. How, Frank G. Boyd, John Trainor, Theodore Mottu and William H. Morrow.

The principal object of the organization is to encourage, advance and protect building and manufacturing interests and to avoid and adjust, as far as practicable, any controversies or misunderstandings that arise in the trades.

Association for Exhibiting Building Materials.

A recent meeting was held by the concerns having exhibits of building materials in the rooms of the Master Builders' Exchange, Philadelphia, Pa., and they organized by forming what is known as the Exhibitors' Association of the Master Builders' Exchange. The idea is to work for the advancement of general trade interests and for the improvement of business conditions. Exhibitions of various kinds, including those of the work of architects, will be held.

The following officers were elected:

President, Benjamin K. Nusbaum.
Vice-President, James V. Royal.
Secretary, M. R. Alexander.
Treasurer, Charles H. Ehrenzeller.

The following committees were also appointed:

Rules: A. H. Conover, James V. Royal and W. E. Miller.

Membership: M. R. Alexander, Edward A. Shallcross, P. F. Osborne, George Carderman and L. B. Mellor.

Cement Houses in Brazil.

According to South American advices it is the intention of the municipal government of Rio Janeiro and Sao Paulo to erect a large number of cement houses for the accommodation of the labor element in the population, who in the past have been badly housed. It is understood that in Rio Janeiro alone there will be erected 5000 houses at a cost approximating $9,000,000. Frederick C. Turner, a builder and contractor of Sao Paulo, has closed a contract with a New York company for the use of its patents on cement construction and machinery, which he states will enable him to reduce the cost of cement dwellings in Brazil by one-third.

CORRESPONDENCE.

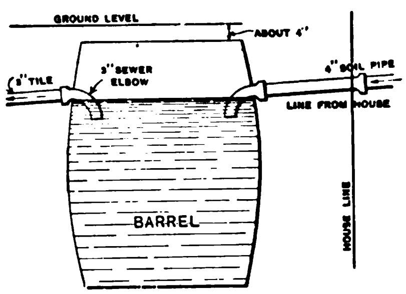
Barrel for Septic Tank.

From C. A. R., Corning, Cal.—In reply to "M. D. H.," Mt. Vernon, Ill., in the correspondence columns of the February issue I am sending a sketch of the first septic tank I put in, and the one I referred to in the issue of the paper for December last. The barrel is about 4 in. under the surface of the ground and about 2 ft. from the house. The plumbing fixtures comprise a closet, bath, lavatory, sink and a three-part laundry tray. There are no trap vents, only a main trap or fresh air inlet. The stack vent is 2 in. in size. This has been in for seven years and never has given any trouble in the least.

Have put in 10 or more during the past seven years, and with the exception of one have worked all right, and in the case of the exception trouble was not with the septic tank, but with the main drain, which did not have sufficient fall, and grease would therefore collect in the pipe. When I replied to the correspondent from Texas I was in hope that others would give their experiences. Those that I have installed are all for dwellings, except one for a small hotel, and in that the sewage goes through tanks of masonry work and is then pumped into a ditch by a power pump. Should "M. D. H.," wish, will answer any questions I can.

Finding the Bevels in Truss Construction.

From J. A. K., Detroit, Mich.—Allow me a little space in the Correspondence columns to ask my brother mechanics, who have had experience in this line of work, how to get, with the steel square, the bevel in a truss between the straining beam A and the brace B at their intersection, C. I send a sketch of such a truss to illustrate my meaning. The rise is 6 in. to the foot run. I wish to say that in Hodgson's work on "The Steel Square and Its Uses," edition of 1883, page 77, Fig. 53, he says: "Take the length of the brace and mark it on the edge of a board; then take half the rise of the brace on the tongue, lay it to one of these marks, and move the blade to the other; then the tongue gives the cut for both straining beam and brace."

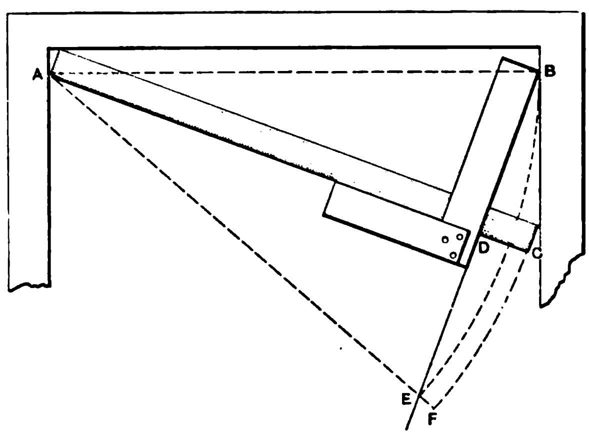


Barrel Used as a Septic Tank.

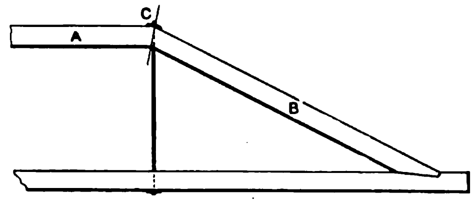
Now on 10-in. timber the joint would be open about ⅜ in. at the top, so this rule, to my mind, is not exactly right. I hope those mechanics who are familiar with this kind of work will give through the Correspondence columns their methods of properly obtaining this bevel.

Cutting a Board to Fit Between Two Walls.

From C. J. M., St. Johns, Newfoundland.—For the better enlightenment of "J. J. P.," Cleveland, Ohio, who, on page 64 of the February issue of *Carpentry and Building*, gives a method of ascertaining the length of a molding to fit between two walls, I send the accompanying diagram, with a few words of description which would almost seem unnecessary, so clearly does the diagram tell the story. Referring to the sketch, let A C represent a board or molding which it is desired to cut to fit between the two oposite walls, A and B. It will be seen that the outside corner of the board touches the wall only at the point A. Now let us lay the board on the floor, as indicated in the diagram, and make the point B the same distance from the adjacent wall as is the point A. From the point B draw on the floor the line B E at right angles with the board A C, and make D E equal to D B, thus forming an isosceles triangle. Now as the adjacent sides of an isosceles triangle are equal, the dotted lines A B and A E must be equal; therefore by swinging the board off until it coincides with the dotted line A E, the point E gives the length of the board.



Cutting a Board to Fit Between Two Walls.



Finding the Bevels in Truss Construction.

If carpenters or those who are trying to make a living by putting bits of boards together would pay more attention to the principles of practical geometry there would not be so many of those "cut-and-try" carpenters described by "J. J. P." in his letter in the February issue.

Estimating Cost of Buildings.

From Arthur W. Joslin, Boston, Mass.—In the last issue of the paper I noticed the inquiry of "R. G. D.," Worcester, Mass., asking for information as to the approximate cost of a structure 40 ft. in width by 70 ft. in length and 20 ft. in hight. He states that the structure has a flat roof, plain finish throughout and cheaply built of light materials.

At first glance I should say in reply to his request that such a building was worth about $.02½ per cubic foot. The cubic feet may be computed by multiplying the size of the building as given, 40 x 70 ft., by the hight of structure from grade to the average hight of the roof. Assuming the structure to be built upon posts 7 or 8 ft. apart, the bottom of sill to be about 1 ft. from grade, the roof to have a pitch of ½ in. to 1 ft., the ridge running parallel with the length of the building and the building being 20 ft. high from bottom of sills to extreme hight of roof, there is a total hight—grade to average hight of roof—of practically 20 ft. Thus 40 x 70 x 20 ft. gives the number of cubic feet in building, making 56,000 cu. ft., which at $.02½ per foot makes $1400. In this manner an approximate cost is arrived at quickly, but you must be in possession of cubic foot costs that have been worked out in other structures in order to determine about what price to use.

Now to analyze this building for approximate cost a little more thoroughly and thus see how near the mark we come when assuming a cost of \$.02½ per foot let me demonstrate another short cut in estimating.

I will assume a foundation of posts about 8 ft. apart, set about 3 ft. 6 in. in the ground around the entire outline of the building; also two rows of posts, same spacing, the length of the building for girders under floor joists. This would make 60 posts, which, set in place and cut off to receive sills and girders, would be worth at least \$1 each, making \$60.

Next there is a floor area of 2800 sq. ft. Joists could not be much less than 2 x 8 in. placed 20 in. on centers, and if of this size and spacing each square foot of floor area would require 4-5 ft. B. M. of frame. In order to cover sills, girders and waste, I call it 1¼ ft. B. M. per square foot of floor. Now work out a cost per square foot for first floor complete, thus:

Frame: 1¼ ft. B. M. in place	\$.0375
Under floor: cheap sq. edged stock, ⅛ waste, 1⅛ ft. B. M.	.028
Upper floor: No. 1 maple or A Rift Ala. pine, ⅓ waste, 1⅓ ft. B. M.	.073
Total approximate cost per sq. ft. of floor	\$.1385

This comes out so near to \$.14 per square foot that I figure the 2800 sq. ft. at that price, making \$392.

Now I take the outside walls. The perimeter of the building is 220 ft. This multiplied by the hight, which averages about 19 ft. 6 in., gives us the area of the walls, same being about 4290 sq. ft. I will assume 2 x 4 studding 20 in. on centers covered with some form of siding, and work out a price per square foot as follows:

2 x 4 in., 20 in. o. c. = 2-5 ft. B. M. to each square foot of wall.

Allowing something for waste, I call it ½ ft. B. M. per foot, costing in place	\$.02
1 sq. ft. siding, plus ¼ waste, = 1¼ ft. B. M. per sq. ft. of wall. Same or coarse pine or cypress, \$.04 per ft. in place	.05
Total approximate cost per sq. ft. of walls	\$.07

4290 sq. ft. at \$.07 per square foot makes \$300.30.

I now take up the cost of the roof, assuming that there is a 40-ft. span, which will require either trusses or columns and girders to support same. I will call the rafters 2 x 6 in., 18 in. on centers, which equals 2-3 ft. B. M. of frame per square foot of roof. Without going into a lot of figuring to determine accurately how much lumber would be required for trusses, I assume a quantity equal to that already figured out for rafters, thus making each square foot of roof take 1 1-3 ft. B. M. net of frame. Add something to this for waste and call it 1½ ft. B. M., and work out a cost per square foot of roof.

1½ ft. B. M. frame. in place	\$.045
1¼ ft. B. M: ⅞-in. match spruce or hemlock covering (waste allowed) per sq. ft. of roof, in place	.0325
1 sq. ft. ready roofing, in place	.03
Total approximate cost per sq. ft. of roof	\$.1075

Allowing for slight overhang of roof I call area of it 2900 sq. ft., which at \$.1075 per foot makes \$311.75.

I next consider the doors and windows. Six windows complete I figure as worth about \$5 apiece, not stopping to go into an analysis of the cost, knowing without doing so that anything in the shape of a double hung window of average size is worth at least that amount. This makes \$30 for windows. There are to be three doors, and these I figure at \$8 each, complete, making \$24. Now I allow something, say, \$40, for such outside finish as would be required, and the whole ground, except painting, is covered with sufficient accuracy for an approximate cost.

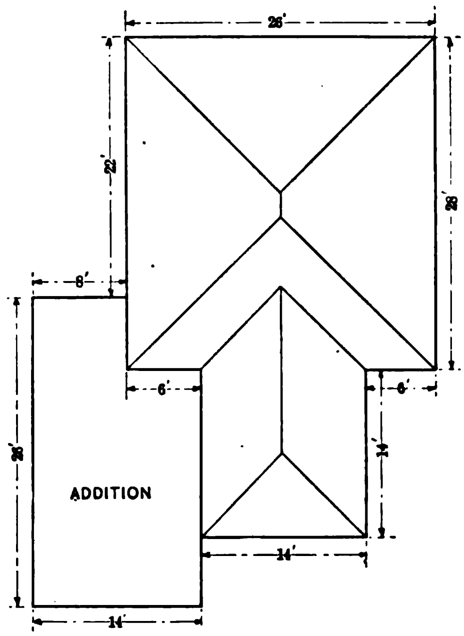
Assuming that walls would have two coats of paint outside and that there would be some little painting inside about doors and windows, I refer to my wall area (4290 sq. ft.) and immediately call this 500 sq. yd., which at \$.12 per yard for two coats of cheap paint makes the cost of painting \$60. Thus I have as costs:

60 posts set complete	\$60.00
2,800 sq. ft. first floor, complete	392.00
4,290 sq. ft. walls, complete	300.30
2,900 sq. ft. roof, complete	311.75
6 windows, complete	30.00
3 doors, complete	24.00
Outside finish, &c	40.00
Painting	60.00
Total	\$1,218.05

To this total must be added something to cover overhead expenses and for profit, and I should consider 10 per cent. little enough, so I add \$121.80 to the approximate net cost of \$1218.05, making \$1339.85. Having arrived at this last amount as representing the cost of the structure plus a fair profit, I would be prepared to tell a prospective owner or architect that a building of this character and size could be built from \$1200 to \$1400, the exact price depending upon circumstances of site, size and spacing of timber, quality of materials used, &c., and the amount of profit a contractor happened to want at the time of figuring.

Since writing the above I have looked back in my estimates for something similar in the way of a building and found my estimate made in April, 1907, for a structure of the same character, which we built in Wonderland Park, Revere, Mass. This building was 30 x 98 ft., and practically 23 ft. high, and on the basis of our bid figured out \$.02¾ per cubic foot. The building was erected upon 12 to 14 ft. spruce piles, driven into the marsh by a hand machine, and the façade was quite ornamental. Otherwise, the similarity between the two buildings is very marked, if I draw correct inferences from the correspondent's description of his proposed structure. Our price as above gave us a reasonable profit.

I have taken some time and used a good many words in describing this method of making an approximate figure, but I made the actual computations in about 6 minutes before starting to explain them, and if the correspondent is half a mathematician he can do likewise.



Problem in Roof Framing.

A Problem in Roof Framing.

From J. E. D., Milton, Iowa.—I am sending a sketch representing the outline of a house on which I am about building an addition, and desire the views of some of the readers as to the proper method of framing the roof. The house is one story in hight and covers an area 26 x 28 ft. It has an "L," or extension, at one end, 14 x 14 ft., with hip roof. Now I am going to put on to one side of the house an addition 14 x 26 ft. The "L" on the main house is directly in the center, leaving a space 6 ft. on each side. The addition I am putting on runs past the "L" 6 ft. and extends 6 ft. beyond the main house, all of which is clearly indicated in the diagram which I send. Now I want to know how to roof this part without disturbing the main roof. As will be noticed, the main house and "L" have the hips and valleys indicated on the sketch, but they are not indicated on the addition, and just how to roof the latter is the problem which I desire the practical readers of the paper to solve.

Cost of Building Materials.

From C. S., Atlanta, Ga.—There has been more or less talk about the cost of erecting buildings in the recent past, some claiming that little or no reductions have been made in materials, while others have called attention to an appreciable shading of prices. It therefore may be interesting in this connection to state that in this city we can build much cheaper just now than we could last summer. At that time common brick cost $9.50 to $10 per 1000, while now we can buy common brick delivered for $6.50. Last summer we had to pay for sized framing lumber $22 per 1000 ft., while now we can get it for $16.50. Again, last summer we were obliged to pay for inside trim $25 and now we can buy it for $17.

Problem in Roof Truss Construction.

From J. F. W., Danville, Pa.—I am sending a drawing showing one of a pair of trusses which I have constructed for a building and I would like to have some of the many readers of *Carpentry and Building* give me some information on the following points: How many pounds will such trusses safely carry, and are the timbers and rods indicated of proper size for a truss of this character? I would like to have an answer in the next issue, if possible.

Answer.—With no desire to anticipate the comments which we trust our practical readers will furnish for publication, we present the following from a well-known writer:

Referring to the diagrams, truss A is practically a Howe truss with an inclined member for its top chord instead of being parallel with the lower chord, as often constructed. The truss diagram shows the positions of the chords, struts and ties, and their relation to one another is indicated by the arrows marked on each member. Two heads pointing toward each other indicate a piece in tension, and, opposed to one another, a piece in compression. The trusses are assumed to be spaced 12 ft. apart on centers.

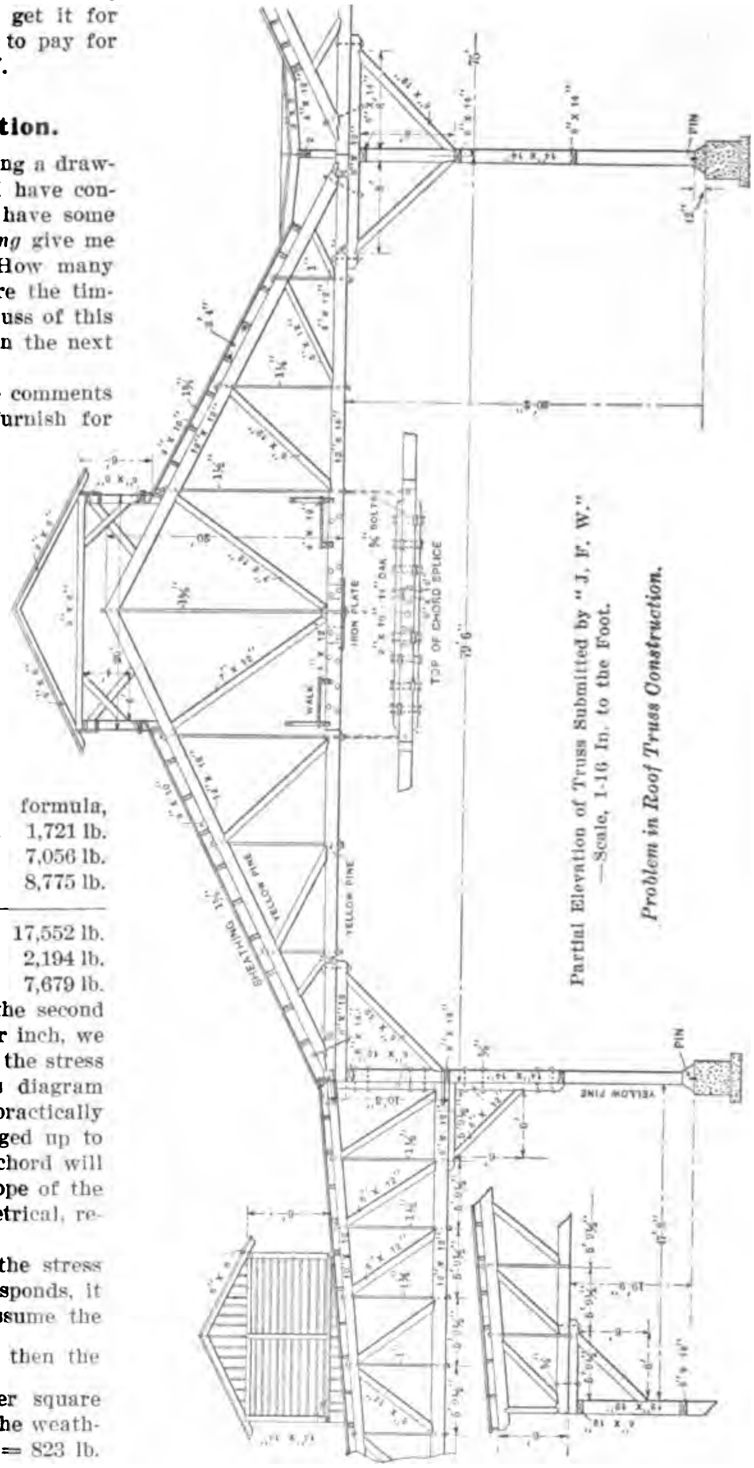
The truss weight, according to the usual formula, amounts to	1,721 lb.
Roof covering	7,056 lb.
Snow load	8,775 lb.
Total roof load	17,552 lb.
Panel load	2,194 lb.
Effective reaction at each support amounts to.	7,679 lb.

Laying off each panel load of 2194 lb. on the second stress diagram, drawn to a scale of 4388 lb. per inch, we find the loads in the usual way as indicated on the stress diagram. It will be noticed from the stress diagram that the portion of the truss marked A A is practically a redundant member, as it has no stress charged up to it in the stress diagram. Stresses in the top chord will have their line of direction indicated by the slope of the top chord, and this, making the truss unsymmetrical, requires a complete stress diagram as shown.

Proceeding in the regular manner to find the stress in A W, the stress diagram notation *a w* corresponds, it is found, to be 11,848 lb. in compression. Assume the least dimensions as 6 in.; then $\frac{l}{d} = \frac{84}{6} = 14$; then the ultimate strength of the piece is 4114 lb. per square inch, or as all the parts are openly exposed to the weather, the safe load per square inch is 4114 × 0.2 = 823 lb. per square inch, or $\frac{11,848}{823} = 14.4$ sq. in.; but owing to notching, framing and boring for bolts, &c., this area should be increased to 25 sq. in., or a piece 4 x 7 in. This is the greatest stress imposed on any diagonal.

For the upper chord in compression, *d r* shows the greatest compressive stress of 16,674 lb. The least dimension of the piece as given is 10 in., its length about 6 ft., so that $\frac{l}{d} = \frac{72}{10} = 7.2$, which corresponds to an ultimate strength of 4638 lb. per square inch, or a safe load of 4638 × 0.2 = 928 lb. per square inch, or $\frac{16,674}{928} = 18$ sq. in. theoretically, or practically 30 sq. in., or, say, a piece 3 x 10 in. To test this let $\frac{l}{d} = \frac{72}{3} = 24$, which corresponds to 3240 lb. per square inch ultimate strength, or 3240 × 0.2 = 648 lb. per square inch, or 648 × 3 × 10 in. = 19,440 lb., while our stress is 16,674 lb., which proves the assumption a safe one.

To strain the diagonals 6 x 12 in. to their safe compressive stress, with an extreme length of, say, 9 ft., or 108 in., we have $\frac{l}{d} = \frac{108}{6} = 18$, which corresponds to an ultimate stress of 3748 lb. per square inch, or safe strength of 750 lb. per square inch, or 72 × 750 = 54,000 lb., or $\frac{54,000}{11,848} = 4.7$ times greater load than our stress diagram calls for.



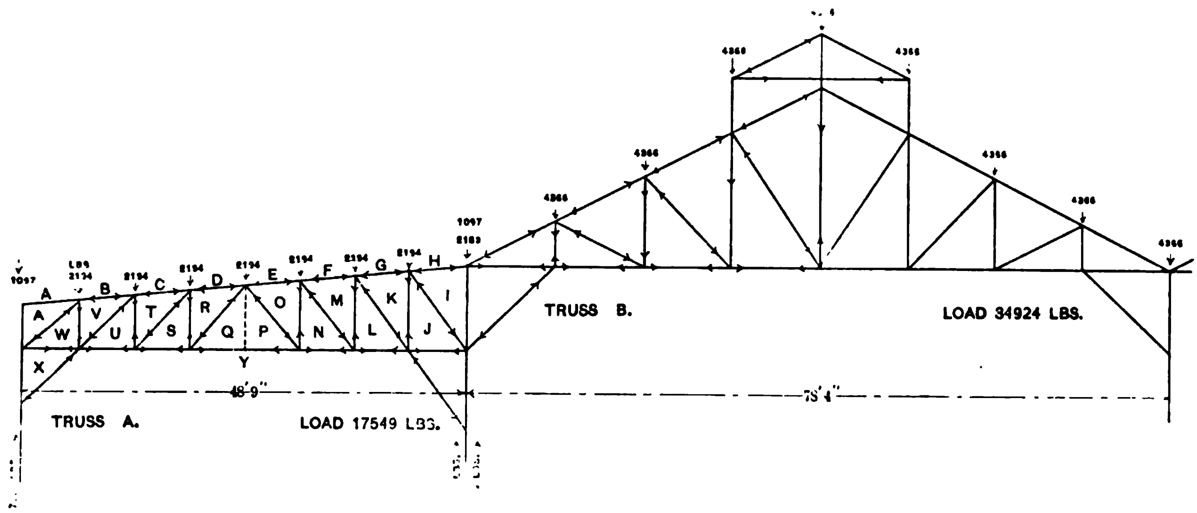
Partial Elevation of Truss Submitted by "J. F. W."
—Scale, 1-16 In. to the Foot.
Problem in Roof Truss Construction.

The tie rod having the greatest stress is *j k*, or 6143 lb. Allow 16,000 lb. per square inch for safe tensile stress in medium steel, the size required is $\frac{6143}{16,000}$ = 0.384, which would require a ⅝-in. rod upset at ends to ⅞ in.

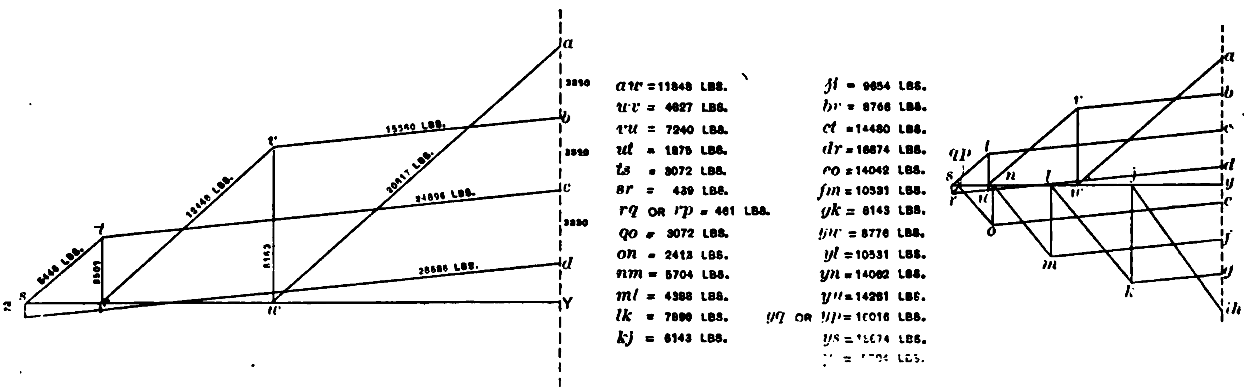
The tension on the lower chord at point of greatest stress is at *y s*, or 16,674 lb. Allow a safe stress per square inch for yellow pine is 1200 lb., $\frac{16,674}{1200}$ = 13.9

the tendency to lateral motion across the building due to wind pressure on the roof and side. The wind pressure has not been taken into consideration, except to estimate the binding moment on the large post. The wind pressure on the shed supported by truss A would be not worth considering, except its uplift on the posts.

The dimensions given in the truss elevation would permit of much greater loads than called for in the stress



Partial Elevation of Truss Diagram.



Panel Load = 3890 Lb. Panel Load = 2194 Lb.

Stress Diagrams with Loads Supported by the Different Panels.

Scale of Loads, 3890 Lb. = ⅜ In.

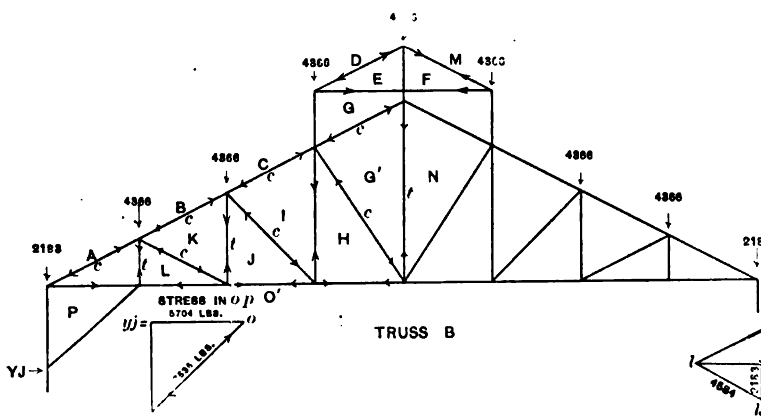
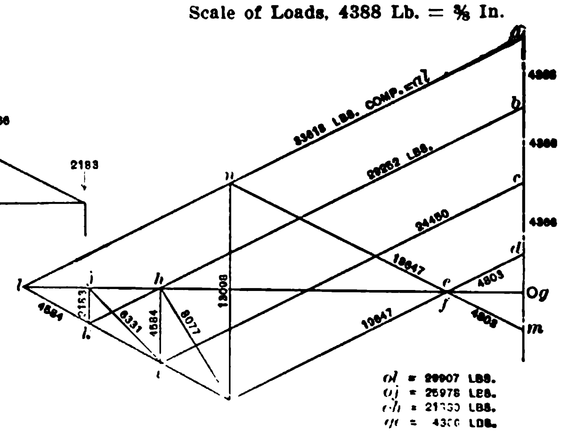


Diagram of Truss B.—Scale, 3-64 In. to the Foot.

Scale of Loads, 4388 Lb. = ⅜ In.



Problem in Roof Truss Construction.

Stress Diagram.—Scale of Loads, 4366 Lb. = ⅜ In.

sq. in.. increase the section two-thirds for framing, or practically 28 sq. in., would give a piece 4 x 7 in. or 4 x 8 in.

To strain the lower chord to its safe limit would require a section starting at 87 sq. in., or a stress of 104,400 lb., which would work up to a section 12 x 12 in., as shown by "J. F. W."

In the diagram for truss A there are shown two struts or knee braces, which are set in order to provide against

diagram, but take the first stress diagram where the load is figured at 50 lb. per square foot, a liberal estimate, the panel load would be 3890 lb., and part of truss A has been worked out to show the difference in the stresses between corresponding members. Thus in *d r*, with a panel load of 3890 lb.. the stress is 28,686 lb., almost double the stress in the same member when the panel load is 2194 lb. The area required is $\frac{28,686}{928}$ = 31 sq. in..

or practically 51 sq. in., or a piece 6 x 10 in. would answer all requirements. Thus testing back $\frac{l}{d} = \frac{72}{6} = 12 =$ $4297 \times 0.2 = 859 \times 60 = 51{,}540$ lb., which would be more than ample to meet the stress. The other stresses are marked on the diagram.

As to the supporting posts, the principal ones: Unsupported length = 13 ft. section 14 x 14 in., in which $\frac{l}{d} = \frac{156}{14} = 13 = 4206 \times 0.2 = 841$ lb. per square inch safe load as a column, or 164,836 lb. The actual load on this post is equal to the sum of the reactions, or 25,141 lb. in one case, and 34,924 lb. in the other case.

The wind load on truss A will practically be of no account. On truss B it will be about 208 lb. per square foot of roof surface, or 10,980 lb. This load may be considered as acting on the post as equally distributed. The safe load on the column acting as a beam is equal to $\frac{2R}{3L} \times S$, in which R = the sectional modulus, or 457; S = 1200, and L = 13 ft., which amounts to 25,560 lb.

In truss B the member $a\ l$ has the greatest compressive stress, or 33,618 lb.; $\frac{l}{d} = \frac{120}{12} = 10$, which corresponds to an ultimate strength of 4297 lb. per square inch, or $4297 \times 0.2 = 859$ lb. per square inch safe load and $\frac{33{,}618}{859}$ = 39 sq. in., theoretically or practically 65 sq. in., a piece 8 x 8 in. or 6 x 12 in. The greatest stress in the lower chord is at $o\ l$, or 29,907 lb., which divided by 1200, the safe tension value of yellow pine, equals 25 sq. in., theoretically or practically 42 sq. in., which would require a piece 7 x 7 in. or a 6 x 8 in.

The greatest stress in any tie rod is in $g'\ n$, or 13,098 lb., requiring a ⅞-in. rod upset to 1¼ in. at the screw ends. Three-quarter inch rods will answer elsewhere.

The member H G' in compression has a stress of 8077 lb., a stress about one-fourth that in the upper chord at A L, and its value $\frac{l}{d} = \frac{192}{6} = 32 = 2677 \times 0.2 = 535$ lb. per square inch safe load, or would require a section of $\frac{8077}{535} \times$ = about 16 sq. in., theoretically or practically 27 sq. in., or a 4 x 8 in. piece.

It can be seen from the above figures that some of the members are unusually heavy, and that the large truss is better proportioned than the small one.

A six-paneled Howe truss similar to truss A, spaced 12 ft. apart, with a total hight of 8 ft. 8 in., has a top chord 8 x 8 in., a bottom chord 8 x 8 in., an end brace 8 x 8 in., the second brace 6 x 8 in., and third brace 4 x 8 in., and rod nearest outermost brace 1⅝ in., second rod ⅞ in., and center rod ¾ in., but none of them with upset ends.

It is customary to make the lower chord as heavy as the top chord, although being in tension, theory does not require so heavy a section.

The stress in O P is affected by the thrust from $y\ j$ of truss A, and laying off $y\ j$ = 5704 lb. obtained from truss A, and drawing $o\ p$ parallel to O P, it will terminate in the line of reaction of the support and measured by same scale as $y\ j$—o is drawn, its value is found to be 7635 lb. It would also be affected as a knee brace under a wind load, so that it would be advisable to make it of same dimensions as J I in truss A. C. P. K.

Framing a Hip Roof.

From M. L. A., Syracuse, N. Y.—I noticed in the December issue of *Carpentry and Building*, page 390, a diagram by "O. D. S.," Marshfield, Ore., illustrating the methods for obtaining the cuts and bevels in framing a hip roof. He tells us that in getting the length of the ridge of any building to "subtract the width of the building from the length," and the remainder will be the length of the ridge.

I would add to this length the thickness of the ridge and place a common rafter against the ridge, as indicated in Fig. 1. By this method the end and side common rafters will be the same length. Again, the method given by "O. D. S." for obtaining the cut of the top of the hip rafter to fit the ridge is not correct. The method I use is indicated in Fig. 2, where $a\ b\ c$ or $a\ d\ c$ is the bevel to fit against the ridge on the back of the hip rafter. Cut $a\ g$ and $c\ g$ and g will touch the corner of the ridge and will be the proper cut to fit the common rafter.

I do not see any method of getting the bevel for the back of the hip rafter in order to allow the roof boards to properly fit. Where the hip rafter is thick it is very necessary to bevel the back of it as in Fig. 3. Referring to the diagram A F and A G represent the wall plates and A D the hip. Take the distance $b\ x$ equal to $a\ b$ and draw B x and x C; then B x C will be the bevel for backing the hip rafter. If the roof planes are not of the same pitch, always draw the line B C at right angles to A E. Where roof planes are of different pitch there will be two bevels to the cut on the hip to fit the ridge, which can easily be obtained by the method already indicated in Fig. 2.

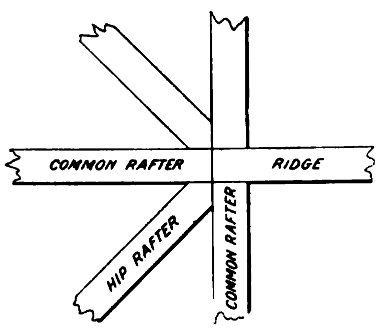


Fig. 1.—Method of Placing Common Rafter Against Ridge.

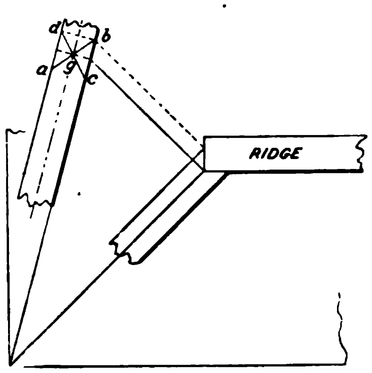


Fig. 2.—Finding Cut of Top of Hip Rafter.

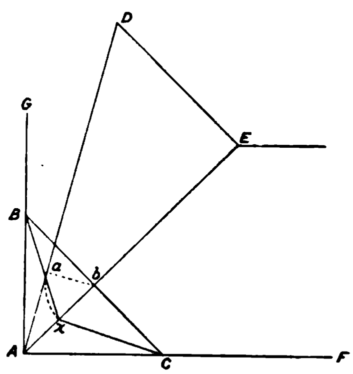


Fig. 3.—Backing Hip Rafter.

Framing a Hip Roof.—Sketches Accompanying Letter of "M. L. A."

Constructing a Dumbwaiter.

From H. H. W., Conesville, Ohio.—Will some one tell me through the correspondence columns how to construct and put in a "jumper" or dumbwaiter at a reasonable cost? I would like to have the correspondent answering the question give sketches as well as descriptive particulars.

Portland Cement and Sand for Plaster.

From H. H. W., Conesville, Ohio.—I would like to have some of the practical readers tell me if Portland cement and sand will make a good interior wall plaster. If so, what proportions shall I use.

WHAT BUILDERS ARE DOING.

WHILE there are many intimations from the smaller places of the country of a most hopeful feeling as regards the immediate building outlook, yet reports at hand from the leading cities, covering the month of February, indicate a continuance of the shrinkage in the value of improvements for which permits were issued, as compared with this season a year ago. While February is naturally a month of comparatively little building, the falling off in projected operations as compared with 1907 is so heavy as to be somewhat disquieting. In such places as Chicago, Philadelphia, Milwaukee, Cincinnati and Minneapolis there has been a slight gain, but in one instance at least the increase is due to appropriation by the city for municipal improvements, and with a view to affording work for those who would otherwise be idle. In the great majority of the leading cities the falling off in building has been heavy, the shrinkage in the Boroughs of Manhattan and the Bronx in Greater New York being about 80 per cent. and in the Borough of Brooklyn about 70 per cent.; Pittsburgh shows a falling off of 25 per cent.; Detroit over 60 per cent.: St. Paul over 50 per cent., and so on through the list. Thus far the labor situation has not been a disturbing factor.

Atlanta, Ga.

The leading concerns engaged in the building and allied industries in the city of Atlanta, and representing a combined capital of something like $6,000,000, held a meeting in the rooms of the Chamber of Commerce on Wednesday afternoon, March 3, and organized the Builders' Exchange. Those present were very enthusiastic over the movement, and George B. McMillen, president of the Builders' Exchange of Cleveland, Ohio, who was present, spoke on the objects of the organization, which may be summarized as follows:

1. The revision of laws to improve the general construction work under better laws and strict inspection.
2. The encouragement of apprenticeship for American boys, as over 65 per cent. of the employees of building firms are either of foreign birth or have received their technical training in countries other than the United States.
3. The establishment of trade schools which will furnish a technical as well as practical training.
4. The revision of the present mechanics' and material men's lien law, so as to protect property owners' and builders' interests from dishonest contractors and unscrupulous supply dealers.
5. To co-operate with local authorities to improve Atlanta's streets, parks and public buildings.
6. Methods for the general beautifying of Atlanta so as to make all improvements more permanent and of a better quality.

The membership is to consist of three classes, namely, corporate, noncorporate and associate.

D. A. Farrell was appointed temporary chairman and V. H. Kreigshaber secretary. The temporary chairman was authorized to appoint an organization committee of seven to look after the preliminary work incident to the permanent organization of the exchange.

As regards the building situation the outlook is based more on hope than fact, as the figures for February are anything but encouraging. According to the figures compiled in the office of the Building Commissioner there were 255 permits issued for buildings costing $147,215, while in February, a year ago, 310 permits were issued for buildings valued at $602,411.

Boston, Mass.

The Master Builders' Association held its annual dinner at Young's Hotel on the evening of February 25, there being present over 150 members and guests, the latter including many architects of local prominence. The guests were welcomed by President S. F. Hicks, who introduced William H. Sayward, secretary of the association, as toastmaster. Mr. Sayward gave a brief sketch of the association, which grew out of the old Merchants' Exchange, and then urged architects to keep up their time honored standard.

The principal speaker of the evening was James A. Emery, secretary of the Citizens' Industrial Association of America, his theme being Labor and Industrial Issues. These he discussed in a most interesting manner, pointing out that what the country needed was industrial freedom. He condemned corporations and combinations of capital which threatened the fundamental principles of the Government fully as much as he did the labor organizations. The great struggle of the past 10 years, he stated, had been to bring the corporations of the country under law. In his opinion the decision of the Supreme Court in the recent Danbury hatters' case had outlawed all labor organizations.

Chicago, Ill.

The February record of building operations in the city of Chicago, as reflected by the permits issued, shows a moderate increase over the corresponding month of last year, and is in excess of the showings of any similar month for the past 10 years, save February, 1906, in both frontage and cost. Permits were issued in February, 1908, for 520 buildings with frontage of 14,723 ft., to cost $3,634,600. In the same month last year permits were taken out for 510 buildings, to cost $3,159,130. Under the stimulus of favorable building weather, which has characterized the opening weeks of March, more activity is developing, and plans hitherto dormant are being revived. While no building boom is expected yet, everything points to a fair amount of business for the season.

The proposed new building for the Builders' and Traders' Exchange is still a live issue, and as soon as $500,000 shall have been subscribed a company will be formed and the project pushed to completion. Fourteen representative contracting and material firms have already subscribed $5000 each toward this enterprise; $5000 is the maximum sum permitted in any one subscription, the minimum being $1000. It is proposed to purchase or lease a site in the vicinity of the county and municipal buildings and erect thereon a building 12 or 15 stories high, modern and up to date in every respect, and which when completed will be one of the finest office buildings in the city and a credit to its erectors. While plans for the building have not been fully completed it has been suggested that the space be devoted as follows: First floor, stores; second, bank; third, permanent exhibition of building material; fourth, exchange, clearing house and offices; top floor, clubroom and a restaurant; the remaining floors to be divided into suitable offices.

At the annual election of the Builders' and Traders' Exchange, Chicago, held January 20, the following officers were elected; President, John Pawle; first vice-president, W. L. West; second vice-president, H. F. Bremer; secretary, J. F. Daggett; treasurer, J. C. Deacon. New members elected to succeed those retiring from the Board of Directors were C. A. Flanagin and T. Wilce.

Cleveland, Ohio.

While no large building projects for the present year have as yet been launched the general situation has improved during the past few weeks, and the outlook is now regarded as fairly good. The present indications are that there will be considerable building of medium priced residences, apartment houses, and small store buildings. A general movement has been started throughout the State by the Ohio State Association of Builders' Exchanges to encourage building operations this year. In support of the movement a resolution adopted at the recent meeting in Columbus is being given publicity in all the cities of the State. The resolution calls attention to the fact that new building operations would give employment to many men out of work in the larger cities, and to the fact that conditions are now very favorable from the standpoint of economy to carrying on building operations.

The Cleveland Builders' Exchange recently inaugurated a series of noonday discussions on topics of special interest to the members, to be held at the noon hour Mondays during March. The meetings are proving an attractive feature of the exchange.

Louisville, Ky.

At a meeting of the Builders' Exchange of Louisville, held in January, directors for the ensuing year were elected as follows: George T. Cross, W. C. Bittner, Arvid Norall, Alfred Struck, W. P. Bannon, John Lips, Fred W. Hardwick, J. B. Alberts, T. B. Duncan, W. C. Magruder, Henry L. Balke and J. A. Holmboe.

These directors held a meeting on February 6 and organized by electing the following officers for the ensuing year:

President, E. G. Heartick.
First Vice-President, W. C. Magruder.
Second Vice-President, W. B. Pell.
Treasurer, Alfred Struck.
Assistant Treasurer, J. G. Sater.
Secretary, E. A. Quarles.

Mr. Heartick succeeded President Otto Yost, who was ineligible for re-election, owing to the fact that he recently became city buyer. The retiring president made an unusual record. Mr. Heartick, his successor, has been untiring in his efforts to bring the Builders' Exchange to the position it now occupies. As chairman of its Entertainment Committee for three years he made the social features of the organization one of its strongest points of its general excellence. He was also a member of the committee of five which secured the installation of a Permanent Department of Exhibition of building materials. In addition to this he is the leading member in the Louisville branch of the National Association of Master Sheet Metal Workers, an organization numbering over 70 members, and which has accomplished much good for the trade.

The officials of the exchange realize that there is much hard work ahead of them if they excel last year's record, but the new officers are determined to accomplish this if possible. It is felt that 1908 will not perhaps equal any of the three preceding years, but that there will be a sufficient volume of business to make a fair aggregate.

Memphis, Tenn.

The shrinkage in building operations for February was quite marked, being little more than one-half what they were a year ago. There were 149 permits taken out for buildings to cost $264,228, while in February, 1907, there were 181 permits for improvements costing $479,257.

The annual meeting of the Memphis Builders' Exchange was held on February 4, at which officers for the ensuing year were elected, the contest being the most spirited ever held by the organization. There were several tickets in the field, but the final choice was as follows:

President, W. W. Fischer.
First Vice-President, Charles W. Holmes.
Second Vice-President, E. W. Waymon.
Treasurer, J. R. Clemans.
Secretary, O. O. Howard.

At the same time T. S. Denton, W. I. Harrison, I. N. Chambers, E. F. Dowling and W. T. Hudson were elected directors. These, with G. W. Lewis, J. W. Williamson, E. O. Cubbins, J. J. Bishop and John Castner, who held over from the year before, will constitute the Board of Directors for the ensuing year.

After the election had been concluded the new officers and directors were installed and short addresses were made. A number of needed reforms were briefly discussed and great enthusiasm for the year's work was manifest. The retiring president, I. N. Chambers, spoke of the advantages of the Builders' Exchange, pointing out that it had been a valuable educator and that the lessons learned by the members would enable the exchange to take advance steps in the future. He referred to the importance of the State and national work and recommended that the Memphis Exchange push its good work into other sections of the State and affiliate with the National Association of Builders' Exchanges.

Newark, N. J.

The Master Carpenters' Association of Newark, N. J., held its twelfth annual banquet at the Continental Hotel on the evening of February 11, there being present nearly 300 members and their friends identified with the building and allied industries. President George Varley was toastmaster, and after the good things provided by the Entertainment Committee had been duly considered he introduced Commissioner Cressey, who has attended the banquets of the association for many years past. His remarks were confined to congratulations on the growth of the association and its work on behalf of bettering trade conditions. President Hugh Roberts of the New Jersey Chapter of the American Institute of Architects responded to the toast, "Our Architects," pointing out the importance of his profession and that of the building industry. C. O. Smith spoke on the subject of concrete building. Much of the success of the affair was due to the energetic work of the Arrangement Committee, of which H. R. Doremus was chairman.

Building operations showed a falling off for February, the figures being 123 permits for improvements, costing $271,-901, as against 132 permits for buildings costing $520,320 in February last year.

New York City.

The local building situation has remained very quiet during the month just past, and there is practically nothing new to chronicle. The outlook for spring business is full of hopefulness, although the cold facts in the way of permits issued by the Bureau of Buildings are anything but encouraging. The figures show that not only in the boroughs of Manhattan and the Bronx, but also in Brooklyn, where heretofore much new work has been done, a heavy shrinkage in the value of contemplated improvements has taken place. This falling off is measured in Manhattan and the Bronx by practically 80 per cent., as compared with February last year, while in Brooklyn the decrease is nearly 70 per cent. As intimated above, builders are hopeful of a fair season's business, the feeling of confidence being strengthened somewhat by the slow, but gradual improvement in the supplies of mortgage money for builders' use.

At a recent public hearing before a committee of the Building Code Revision Commission the theme of the speakers was limiting the hight of skyscrapers in New York City.

Consensus of opinion was to the effect that a uniform hight should be adopted, and Ernest Flagg, architect of the Singer Building and several other prominent structures, recommended that the general hight ought not to be more than once and a half the width of the street, and in no case more than 100 ft.

Philadelphia, Pa.

The report of the Bureau of Building Inspection showed a decided improvement in the volume of business started during the month of February, brought about largely by work started under city contracts, permits being taken out during the month for a new school building, additions to the Municipal Hospital and several minor buildings, the estimated cost of which was about $340,000. The records show that permits were issued for 507 operations at an estimated cost of $1,217,980, a gain of $263,470, when compared with the value of the work started during the previous month, and an increase of $230,522, when compared with February of last year.

The building of new dwelling houses, however, continues of small volume, and under existing conditions not a great deal of improvement is anticipated during the coming spring months. During February the new work started in two and three story dwellings amounted to $260,500, while during the same month last year they reached nearly $500,000, while the total for January and February this year shows a falling off of $600,000 for this class of work, when compared with the same two months last year. Considerable work was done during the past month in general repairs and alterations; in fact, this class of work showed the largest individual expenditure, amounting to $203,695. Manufacturers in many cases are taking advantage of the dullness in business to make needed repairs and alterations to their plants, so that when trade revives they will be the better enabled to take care of the business which comes out.

Under ordinary circumstances February is one of the dull months of the year, and, while it is not expected that the volume of spring business will be as large as last year, there should be an increase shown from month to month during the first half of the year at least. It is hardly likely, however, that the same proportional gain will be made in dwelling operations as has been experienced in the past few years, as financial conditions, while greatly improved, are hardly satisfactory as yet, from the viewpoint of the prospective builder. There will, however, be considerable city work to be given out. The Board of Education is arranging to begin work on a new high school to cost about $500,000, while some $400,000 will be expended for alterations and improvements to the present school buildings. Several other large municipal improvements are contemplated, and it is believed that work of this character will go a long way toward making up any great deficiency in building during the next three or four months.

The trade on the whole is not very actively engaged at the present time. In some cases builders are fairly well employed, while in others the amount of new work being undertaken is rather light. Labor is not very fully employed and there is a plentiful supply of mechanics of all classes.

For the purpose of celebrating the twenty-first anniversary of the Master Builders' Exchange more than 200 members and men prominent in the building and allied industries assembled at the Hotel Majestic, on the evening of February 17, and discussed the steps that had marked the progress of the organization, and eulogized the men living and dead who had contributed so largely to that progress. After greeting the members and guests President Borgner turned over to Thomas F. Armstrong the duties of toastmaster. From former President John S. Stevens to the present incumbent of the office, all had some interesting bit of history to relate that was linked with that of the city. Mayor Reyburn, Director Clay and Congressman Moore all paid tribute to the exchange and its members.

Toledo, Ohio.

At the annual meeting of the Builders' Exchange, held on March 2, Samuel J. Pickett was re-elected president, C. Peck was re-elected first vice-president and J. B. Gerkins was elected to succeed W. W. Bright as second vice-president.

The directors chosen were A. Milmine, John W. Lee, Thomas Skelding, Frank R. Stahl, M. D. May and R. Hattersley. Directors Lee, Skelding and Stahl succeed themselves.

At a subsequent meeting the board organized and selected W. J. Albrecht, the present incumbent of the office, as secretary.

Washington, D. C.

According to the report of Acting Building Inspector John P. Healy, building operations in the district during February were nearly 300 per cent. greater than for the previous month. Permits were issued for the erection and repair of 275 buildings involving an expenditure of $726,187, while for the previous month 238 permits were issued calling for an outlay of $263,183. The largest involved permit was that for the administration building for the Carnegie Institute, estimated to cost $225,000.

Worcester, Mass.

The twentieth annual banquet of the Builders' Exchange of Worcester was held in the State Mutual Restaurant on the evening of February 27, when members and their guests to the number of nearly 200 came together and enjoyed an occasion which went far to strengthen the bonds of good fellowship existing between those identified with various branches of the building industry. The banquet itself was an elaborate function and reflected great credit upon the committee having charge of the affair. The festivities were inaugurated at 6.30 with an informal reception in the parlors of the Commonwealth Club, where many members of the exchange were presented to the out of town guests, greeted Mayor Logan and renewed acquaintances with fellow members who are not regular visitors in the rooms of the exchange at 518 Main street. At 7 o'clock the party proceeded to the main dining room of the restaurant where they were confronted with tastefully arranged and attractively decorated tables. At each plate was a souvenir menu card carrying an excellent likeness of Henry W. Sweetser, the genial secretary of the exchange.

After the many good things provided had been duly considered the toastmaster, Edward J. Cross, a past president of the exchange, introduced the several speakers of the evening. One of the most interesting addresses was that of M. W. Alexander of the General Electric Company, who spoke on the subject of the apprenticeship system, explaining in detail the extensive system in operation in the company's plant at Lynn. Among other things he stated that by the system in vogue at the company's plant boys gave four years to the trade, the first two months on trial. The company has about 150 apprentices, for which there are three teachers. As soon, however, as a boy gets a little advanced, he is set to teach his younger and less developed associates. It has been found, he said, that these pupil-teachers are more valuable as instructors than highly paid adult teachers, owing to the fact that boys will ask questions of another boy that they would not through pride ask a teacher. A school is maintained in connection with the shop where the boys are taught mathematics and physics and are paid for the hour and a half they attend this school daily precisely the same as they are in the shop. The last two years of their apprenticeship they secure actual shop experience, being moved from one department to another until they learn the various phases of the trade. Mr. Alexander spoke for an hour and congratulated Worcester upon having fallen into line in connection with the movement for municipal industrial commissions.

The next speaker, who occupied nearly an hour and a half, was James A. Emery, secretary of the Citizens' Industrial Association. His address was devoted to the dangers that menace the republic and expressed himself in no uncertain terms in relation to the combinations of capital and labor, pointing out that unless a prompt effort was made not only to overthrow but to strangle the rising tide of socialism and contempt for the courts the republic would fall, as fell France at the time of the French Revolution.

The occasion was one long to be remembered by those present and by some was regarded as the most noteworthy in the history of the exchange.

The Present Cost of Building.

The question of the cost of building is of supreme importance just now, but there is a wide difference between what prospective builders would like to have it and what architects and contractors are able to do, and no one regrets this more than the architects, as it would mean a great deal more work, says a recent issue of *The Economist.* Some of the leading men in the business, however, according to the following views, seem to agree that this is a good time to build.

Edwin A. Renwick of Holabird & Roche, has recently made extensive investigations as to the cost of construction. He has interviewed over 100 contractors on the subject, and figures out that the reduction amounts to between 10 and 15 per cent. There is, after all, little change in the cost of building materials. Iron and steel products are substantially the same; there may, however, be a saving in fabrication. The only reductions which he can observe are due to the anxiety of contractors to get the work and the increased efficiency of the workmen. Labor represents about 50 per cent. of the cost of a building, and it is estimated that the increased efficiency of workmen amounts to 20 to 25 per cent. Mr. Renwick considers the prospect for an active building season fairly good.

Leo G. Fisher, Chicago manager for the Thompson-Starrett Company, states that, so far as he is able to judge, building construction is at a low ebb. The reduced cost of building, in his estimation, amounts to not more than 10 per cent. He says that he would not be inclined to take contracts at the present time which they figured on last year at a reduction of 10 per cent. The margin is too narrow. He has not discovered any drop in the cost of steel, but there may be slight changes in the quotations on lumber and masonry. Their most extensive operations at the present time are in New York City and in San Francisco, particularly in the latter city, where they have in process of construction 11 buildings. He is of the impression that there is a great deal of work under cover in the architects' offices in Chicago and elsewhere ready to come out in the spring, or just as soon as conditions are more settled.

W. J. Clark, resident manager of Shepley, Rutan & Coolidge, feels that this is a good time to build because of the reduction in cost. He has just refigured a building. It was figured in September, and an estimate has now been taken for the second time, placing the reduced cost of construction from 12 to 15 per cent. In addition, he states, one can get much better work now than at any time in eight or nine years. Workmen are more efficient. Architects are able to do much better by their clients than at any time since the great period of activity which set in just after the lockout of 1900.

Alfred B. Andrews of Bulley & Andrews, general contractors, states that conditions are such that a number of contractors, like themselves, are not enthusiastically competing for every job that is reported. The competition is already too keen, and the element of making an error in striving to get close to the danger line of prices has been enhanced. This, however, seems to act as a stimulus to the majority of builders, and they strive to reach rock bottom as though the building in question was the last to be erected. This competition in itself depresses prices. In addition, Mr. Andrews says, the prices of all materials are more or less off. Brick is selling at $5, or practically cost. This is occasioned by the brick war. Brick should be about $6 a thousand. Lime, sand, and gravel are all slightly depressed. Cement is down over 20 per cent. Lumber has dropped at least 15 per cent. since last summer. Much yellow pine is being delivered here at cost. Interior finish factories are slack, and are cutting prices to get work. The price of labor per hour remains the same, except that of masons, which is off on an average of about 5 per cent. To-day, however, it is only the very best mechanics who are able to retain positions, and the individual's efficiency has been considerably increased, due to stress of circumstances. "From figures made by us during the past month," Mr. Andrews says, "we find that masonry and carpentry are off about 15 per cent. from the prices of last year. Other building branches about the same. We do not see how prices can go lower, and the moment better times come they will certainly advance."

Sheet Metal Buildings in San Salvador.

According to Consul-General Samuel E. Magill of San Salvador, there are a few opportunities for the use of American corrugated sheet steel and other sheet metal work in that country. Being in the tropics and in the earthquake belt, the system of construction in this country is of the lightest consistent with the climatic conditions. Few buildings exceed one story, but churches, public buildings and a few business blocks reach two and some three stories.

The method of construction of a one-story residence is about as follows: On a foundation wall 2 to 3 ft. in depth of stone and cement are laid wooden sills which hold the uprights. Between these uprights are nailed double strips of wood about 6 in. apart. When the framework of the house is thus prepared, the spaces between the strips are filled with a combination of dirt and water, into which are injected pieces of broken tiling, brick, &c. This is allowed to dry. Meanwhile the roof joists are placed and the roof, consisting of either tiling or sheets of corrugated iron, is put on. When the filling of mud is dry it is covered inside and out with a coat of mud plaster, which is all that the walls need preparatory to the finishing touch, which may consist of another coat of cement or sheets of corrugated iron on the outside of the structure, and for the inside either paint or paper, according to the taste of the owner. All material used is native except the cement, corrugated iron, nails and paint. The sheets of corrugated iron come chiefly from England, a fair proportion, however, from the United States, due to the special efforts of the few American houses located here. The freight rates from English ports are about $3 per ton less than the freight from New York. About 100,000 sheets are marketed here annually.

A New England contractor, who has had much experience in concrete construction and who has carefully noted the cost of his building operations, has compiled some most interesting figures showing the relative cost of what may be termed "mill construction" and reinforced concrete. In the case of six buildings on which he figured last year, both in mill construction and in reinforced concrete, there was a showing in every case in favor of the latter, varying from 4 to 11 per cent.

Approximate Cost of Mill Buildings.

While the cost of buildings for manufacturing purposes must of necessity vary with their design and locality, certain fundamental relations exist between different types, which, if known, are of great assistance in the planning of new plants. To a very great extent these relations, although generally determinable by calculation, are intentionally or otherwise the professional and trade secrets respectively of the architect and the contractor. True it may be that conditions frequently give but little latitude for choice in design or construction, but just as truly the owner seldom finds available information which aside from the ideas of his individual architect will enable him to judge independently of relative costs.

A generous contribution to the general dearth of public knowledge of this subject has been made by Charles T. Main, well known as a mill engineer and architect of wide experience. In his paper on the "Approximate Cost of Mill Buildings," his discussion refers solely to ordinary mill construction, with brick walls and heavy timbered floors and roof. In this paper he showed as one of his conclusions that in a building of this type the minimum cost per square foot is practically reached with a four-story structure. The relation is somewhat affected by the length of the building, as well as by its width and hight. A three-story building is slightly more expensive, while a one-story building is obviously the most costly. From the data presented by Mr. Main, in a number of diagrams, the accompanying individual set of curves has been prepared to show the relative cost per square foot of gross floor space for different hights of a typical building 300 ft. long, of different widths. From this it is at once apparent that the difference between the costs for three, four and five story buildings is so slight as to exert but a secondary influence in determining the hight of a building. In fact, the hight may be determined by other factors, principal among which will naturally be the available ground area and the ground rent or fixed charges thereon.

The Cost of Elevation of Material

is sometimes regarded as a factor requiring consideration. But calculation will at once show the infinitesimal power expenditure for this purpose required even in the largest plant. Suppose the weight to be lifted in the course of a year through a distance of 15 ft. to be 100,000 tons, the work done will be equivalent to 3,000,000,000 ft.-lb. If this work were performed continuously during 300 working days of 10 hr. each, the work per minute would be 1667 ft.-lb., which is equal to only 0.05 hp. On a basis cost of $30 annually per horsepower, this would represent the insignificant sum of $1.50 actually expended for this purpose during the entire year. The real cost of elevation is manifestly in the equipment and its maintenance. It is evident that the equipment provided for a two-story building will serve additional stories with but slight increase in the cost of construction. Of course, where under the modern conditions of transportation by traveling cranes the multistoried building is not permissible without excessive waste in hight, the nominal single-story construction must prevail. But this, as in the case of the gallery type of machine shop, may be in effect a two-story shop throughout about two-thirds of its width.

Roughly speaking, if the cost per square foot of floor in such a building is 1, it will be about 1.25 in a similar design of one-story only, and from 0.8 to 0.9 in a three-story building approaching it in structural design.

The saw tooth or monitor systems of lighting have considerable effect upon the cost of a single-story or gallery type building as compared with one of several stories where side lighting must be depended upon. Generally speaking, for adequate lighting from the sides the hight of the stories must increase with the width of the building. The windows should run up as near the ceiling as possible. Distribution of light will be greatly improved by the use of ribbed glass, or, better still, by prismatic glass, but the latter is decidedly objectionable if subjected to the direct rays of the sun. Windows running down to the floor have but little effect upon the general lighting where lines of machines run close to the walls and cut off the light which might otherwise be diffused.

While window area may be less expensive than wall surface, it necessarily increases the cost of heating. An ordinary window is generally classed as having about four times the transmitting power of a 16-in. wall. In other words, on this basis it would require, roughly speaking, about four times the heat for a building entirely of glass as compared with one having solid 16-in. walls. Of course, the heat penetrating effect of the sun in the case of the transparent glass would greatly modify this relation.

After all is said and done, the manufacturer requires, above all, the building best suited for the manufacture of his particular product. Its construction may or may not conform to the most economical type, but if it is such as to insure the production of the maximum profit it is certainly warranted.

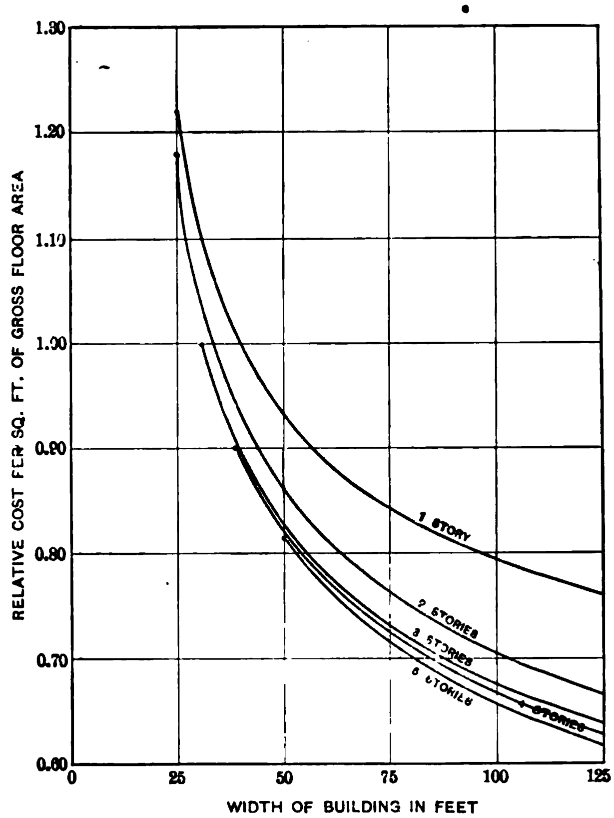


Diagram Showing the Influence of Width and Hight on the Cost of a Building 300 Ft. Long, of Ordinary Mill Construction.

The Cost of Building Construction.

Convention of Brick Manufacturers' Association

The twenty-second annual meeting of the National Brick Manufacturers' Association was held at Columbus, Ohio, February 5, 6 and 7, and was the most largely attended in the history of the organization. Great interest was manifested in the proceedings, the various papers read being followed with the closest attention and the discussions, while not long drawn out, were directly to the point, so that much valuable information developed. The first session was convened on the afternoon of February 5, when the delegates were welcomed to the city by Mayor C. A. Bond, the response being made by M. E. Gregory of Corning, N. Y.

President William Conway of Philadelphia then delivered his annual address, in which he touched upon many topics of interest to the members. He laid special emphasis on the subject of trade schools, expressing the belief that from the information available the establishment of schools for the teaching of trades to young men is on the increase, and that before many years it will be a part of the regular public school system throughout the entire country.

The president's address was followed by the report of Treasurer J. W. Sibley, which showed a comfortable balance on the right side of the account, and after it was accepted the officers for the ensuing year were elected as follows:

President, M. E. Gregory of Corning, N. Y.

First Vice-President, Lemon Parker of St. Louis, Mo.

Second Vice-President, W. P. Blair of Terre Haute, Ind.

Third Vice-President, C. M. Crook of Youngstown, Ohio.

Secretary, Theodore A. Randall of Indianapolis, Ind.

Treasurer, John W. Sibley of Birmingham, Ala.

The election of a member of the Committee on Technical Investigation resulted in the choice of W. D. Richardson, who succeeded himself.

The new officers were then duly installed, each official making a few remarks expressing his appreciation of the compliment paid.

After the secretary had read several letters from absent members, the regular order of business was taken up by the presentation of a paper entitled "The Outlook," by Victor Cushwa. In it he referred to the gradual restoration of confidence and pointed out that no country is so prosperous as the one whose prices maintain a healthy and uniform standard. "This state of affairs," he stated, "is coming to us. Forty years ago, when labor was 100 per cent. less than now, we sold common handmade brick at $9 per 1000 for building, or run of kiln, and for selected arch or red faced from $10 to $12. Lumber then and until 10 years ago we bought for $10 to $12 per 1000 ft. for yellow pine. To-day in our market it is bringing $26 to $50 per 1000 ft. Better brick than were made 40 years ago are selling from $6.25 for common builders, and $8 to $10 for selected arch and red, and from $12 to $15 per 1000 for pressed."

Another paper on the same subject was by C. N. Adams of Alexandria, La., in which he briefly stated that the outlook for the brick and building industries of his section of the country is very good. Due to a combination of causes "not the least of which is the fact that following the example of the N. B. M. A., the brickmakers of Louisiana have formed a State association and meet now annually, and by concerted action are able to do some things of benefit to all that we were not able to do when we acted singly and alone." He cited as one instance that they had brought about a reform in the matter of the size of brick, having adopted the standard size as recommended by the National Association.

Dr. S. C. Dickey, dean of the Winona Technical Institute of Indianapolis, then delivered a brief but very interesting address on the subject of trade schools for American boys, in which, among other things, he pointed out that an effort is being made to establish in his city a trade school for bricklayers. The building for the school is of brick, about 50 x 120 ft. in size, the lower floor being devoted to the new department, while the second floor is occupied by the metal trade school. What Dr. Dickey had to say was followed with close attention, and the subject brought out some very pertinent discussion in which many participated. The convention then adjourned until the following morning.

In the evening the members enjoyed an illustrated lecture on "Clay Industries of Central Ohio," by Prof. Edward Orton, Jr., of Columbus.

The second business session, on the morning of February 6, opened with a paper by Lambert Haigh on "Electricity as a Power for Clay Working Manufactories." This was followed by a discussion in which several members participated. Other papers were then presented, including one by W. G. Buckles of Coffeyville, Kan., on "Setting Brick by Machinery," in which he described at length the modus operandi and illustrated his remarks with numerous pictures showing just how the work was done. As might naturally be supposed, this paper brought out much interesting discussion. Another paper was by Walter Hull on "Factory Output," which was discussed at some length, and the meeting adjourned until afternoon.

The time of the afternoon session was taken up with reading of papers and discussion thereon, the list including one on "The Definition and Application of Terra Cotta," "The Survival of the Fittest," and "The Life of Portland Cement."

After a general discussion a Committee on Resolutions was appointed, after which W. E. Dunwody presented some facts on the "Market Side of the Brick Business." These were followed by a paper entitled, "The Use of Hollow Tile in Dwelling Construction," by J. E. Mecusker, Warren, Pa., which covered some very interesting points and which we hope to publish at another time.

The fourth session was held on the morning of February 7 in the auditorium of the university, with President Gregory in the chair. He introduced Prof. William H. Siebert, dean of the College of Arts, Philosophy and Science, who extended a welcome to the delegates, the address being responded to by W. A. Eudaly of Cincinnati.

A little departure was made from the programme and a paper on "Strength of Brick" was presented by James E. Howard of Watertown, Mass. This paper covered a number of interesting tests all tending to show the results of tests recently made at the Watertown Arsenal. The paper was illustrated by a number of diagrams from which lantern slides were made.

Following a general discussion, a loving cup was presented to W. D. Richardson by six of those who were employed by him 20 years ago and whom he instructed in the art of brickmaking.

The report of the Committee on Technical Investigation was then presented by Professor Orton, Jr., followed by a general discussion, after which was the report of the Committee on Resolutions. Among other things the report urged the members to contribute as liberally as possible to the founding of the scholarships necessary for the prosecution of the work at Winona, and indorsed the work of the Committee on Trade Schools, suggesting that the committee communicate with the secretaries of the various Builders' Exchanges of the country regarding the matter of trade schools for the teaching of bricklaying similar to that now being established at Winona.

After the appointment of a Publicity Committee the convention adjourned.

New Publications.

Estimating.—By Edward Nichols, architect. 112 pages. Size, 6¾ x 9¾ in. Numerous illustrations. Bound in board covers. Published by the American School of Correspondence. Price $1, postpaid.

This work, as indicated by the title, is a guide to systematic methods in taking off quantities and making up estimates of cost of building operations, together with prices for materials and labor. The subject is one which it is necessary for the builder to thoroughly understand in order to make a success of his business, for upon the accuracy of his estimate of a job of work depends the question of profit or loss. While much attention has been given to the subject, it seems by no means to have been exhausted, and contributions to the literature of estimating are constantly being presented to the attention of the craft.

The work under review is comprised in three chapters, the first of which deals with preliminary principles. Here are discussed approximate and detailed estimates, measurements of lines and surfaces, estimating by the square and by quantities, together with comments on profit, percentage, duplication of parts, &c. The second chapter has to do with prices of labor and materials and gives, among other things, scale of wages in various trades, cost of labor by the square and by the piece, and the cost of all the various kinds of work entering into the construction of a building.

One of the most important features of the work, and one which is of vital interest, is the making of a detailed estimate. This is done usually in a number of ways, as no two persons seldom arrive at the same conclusion or follow exactly the same methods. The author takes for consideration a wooden colonial residence of which plans and elevations are given, and then carries the reader step by step through the various stages of the work, giving figures and prices as he proceeds. The concluding pages are given up to an index, alphabetically arranged. The illustrations are in many instances halftone engravings directly reproduced from photographs.

Building Trades Employers of Cleveland.

At the annual meeting of the Executive Board of the Building Trades Employers of Cleveland, held in that city on January 22, Chairman Stephen Mills presented his annual address, in which he briefly reviewed the work of the year just passed, referred to the aggressive stand for the "open shop," described the important strikes and other disturbances in the city, and covered other points of interest to those engaged in the building business.

In this connection it may be remarked that the Executive Board is composed of regularly elected delegates from the Carpenter Contractors' Association, the Master Painters' Association, the Mason Contractors' Association, the Cleveland Master Plumbers' Association, the Sheet Metal Contractors' Association, the Electrical Contractors' Association, the Steam and Hot Water Fitters' Association, the Slate Roofing Contractors' Association, and delegates at large from the Builders' Exchange, these being all of the associations of employers in active operation at present in the building trades in Cleveland. The board has from the first been fostered and supported by the Builders' Exchange, all of the facilities of that organization being constantly at its command. The purpose of the board is to provide a medium for united and effective action by employers for the protection of their interests, and the maintenance of peace and harmony in the industry.

In regard to the attitude of the various associations toward the open shop Mr. Mills said: "Although all of the associations connected with the board have not declared for the open shop, it has been patent to every one that the building industry of this city has been operated during the past year on this basis. The generally understood principle of the open shop as applied to any particular building operation is that workmen in the various trades will accept employment at such building and perform their work regardless of the affiliations of other workmen who may be employed on the same job. Except in a very few instances this method of procedure was followed during the year 1907. At the same time a bolder stand for the open shop principle has been taken by two of the associations—namely, the Sheet Metal Contractors' Association and the Master Painters' Association. By vote of the members of these two organizations a resolution was adopted defining their policy on this subject and notifying architects and the general public that these members would only estimate upon specifications or become parties to contracts where such contracts could be peacefully carried out by any competent men irrespective of their connection with any particular organization. Lists of the members were printed and were distributed for the purpose of making clear the stand taken in the matter. We believe that this action had a good effect upon the general situation and that it has encouraged other trades in their attitude toward the same subject."

In discussing recommendations for 1908 the chairman in his report said:

"It is very important that this board be kept in active operation during the present year. In addition to affording means for the employers in the different trades to act together on labor matters, it can wield a strong influence in other important directions. Every effort should be made by the board and the affiliated associations to prevent the enactment of proposed laws at Columbus hostile to the interests of employers, especially such laws as are recognized to be of a vicious character. The members of the associations should communicate with our representatives and make known in the strongest possible ways their sentiments toward these pending measures. Another matter that should receive attention by the board is the starting of the new Technical High School, for which an expenditure of approximately half a million dollars has been authorized by the Board of Education. Unless this school shall provide facilities in either day or night classes for teaching young men the practical trades and thus assisting them to earn a living, it will not be fulfilling its possible mission for good in the community. We believe that steps should be taken to develop this school after the manner adopted in Philadelphia, where classes in the practical trades have been established in a similar school. Only by a vigorous effort on the part of employers, who must take an interest in this movement, will such a desired result be obtained."

THE Baron de Hirsch Trade School held its annual exhibition of students' work January 28 at the school building, 222 East Sixty-fourth street, New York City. In the carpentry class nine members acquitted themselves with honor. Among the examples of work was a miniature house in which every style of carpentry work was shown, from roof framing and boarding to finished siding, window frames and doors. The roof was of shingles, with hips and valleys. Each member of the class on graduating was given a "kit" of tools by the school.

WE are advised by the Department of Agriculture that an error occurred in the figures giving the lumber cut of the United States in 1907 and sent out in a late circular of the Forest Service. The amount of lumber cut in the United States last year should have read 37,550,736,000, but through some inadvertence the three ciphers were omitted.

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FRAME AND CEMENT PLASTERED RAILWAY STATION AT LENOX, MASS.

WILLIAM S. BABCOCK, Architect

Carpentry and Building

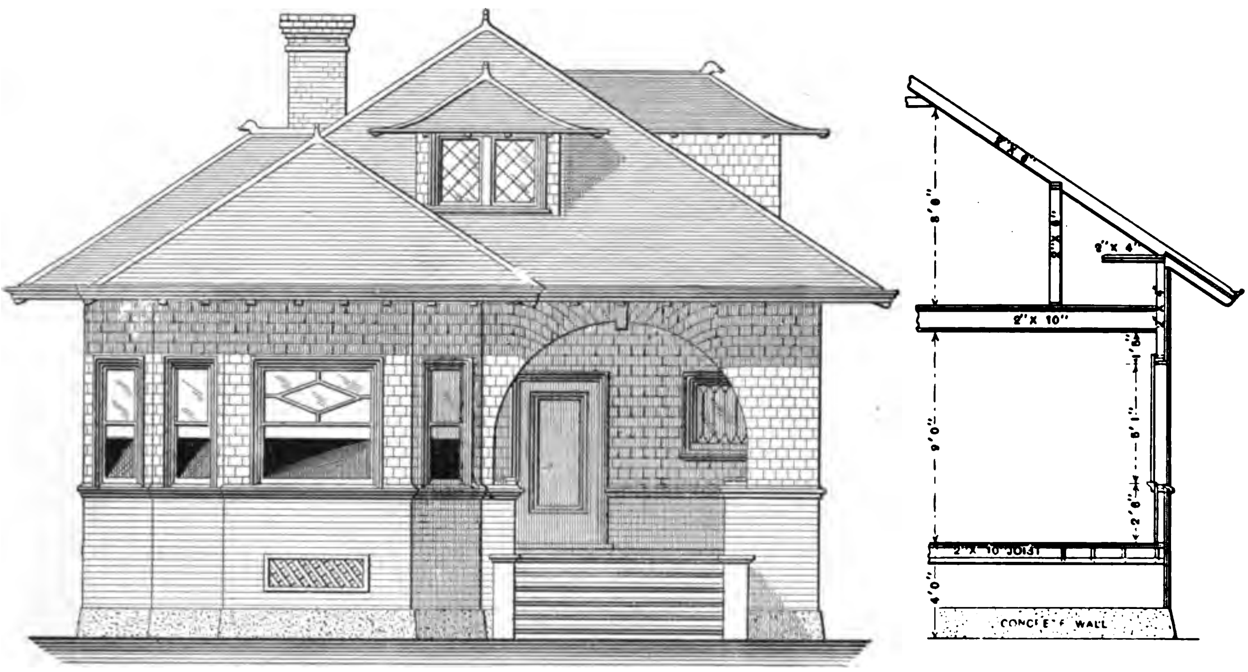
NEW YORK, MAY, 1908.

A Northern California Bungalow.

MUCH interest is at present being manifested in all parts of the country on the part of architects, builders and prospective house owners in that class of dwelling or cottage designated as "bungalow," and, with a view to affording our readers an idea of a type which is very popular on the Pacific Slope and especially in northern California, we present herewith the plans and elevations of such a building, the appearance of the finished structure being shown in the pictures, which form the basis of one of our half-tone supplemental plates. It will be observed from an inspection of the plans that the majority of the rooms with bath are on the ground floor, the attic portion being of comparatively small area, yet sufficient to afford facilities for two sleeping rooms. In constructing the building the plans were slightly modified, thus accounting for the apparent discrepancy between them and the pictures made from the photographs. In the original plan the bathroom was in the rear of the house, the water closet being in the laundry, an arrangement calling for three windows on the right side instead of two as shown in the picture. It is pointed out by the architect that the facilities for heating, while entirely sufficient for a cottage of its kind in California, might possibly be inadequate if the building was located in the Eastern States, and, therefore, additional equipment might be required.

According to the specifications the foundation is of concrete up to the sills. The base of the chimney stack is built of concrete from the floor of the kitchen to a level with the kitchen floor, the center being left hollow to serve as an ash pit, which is provided at the bottom with a close fitting cast iron door to serve as a "clean-out." The walls have a footing 16 in. wide. The sills running lengthwise are 6 x 6 in., bedded in cement mortar, while the cross sills, bedded in the same manner, are 8 x 10 in., and are halved over the side sills. The joists are 2 x 10 in., fitted down over the sills to rest on the walls, are placed 16 in. on centers, and well bridged with 2 x 3 in. cross bridging. The joists are doubled under all bearing partitions, such as under the sliding doors at the fireplace and between the kitchen and pantry. All studding are 2 x 4 in. pine, while the ceiling joists are 2 x 10 in., all placed 16 in. on centers. The rafters are 2 x 6 in., placed 24 in. on centers.

All framing timber is of pine. The outside of the building is lined with ⅞-in. surfaced lumber put on diagonally and covered with building paper. The lower portion of the house is finished with three-lap rustic extending up as high as the window sill, above which the main story is covered with shingles laid 5 in. to the weather and finishing against the cornice frieze. The house has a raking cornice with exposed rafters. The gutter is formed as a box fitting in back of the 4-in. crown mold and lined with Flintcote roofing, running up under the shingles about 5 in. and fastened to the top of the crown mold with a ⅞-in. half round, nailed at close intervals.



Front Elevation and Section Through Building.—Scale, ⅛ In. to the Foot.

A Northern California Bungalow.—Will S. Fitzell, Architect, Eureka, Cal.

The roof is covered with redwood shingles laid 4½ in. to the weather. The corners of the hips are covered with shingles 4 in. wide on each side of center line, and the ridge is finished with a 5-in. saddle board, covered at top with a full round, ending in a finial at the different points as shown.

The front steps are of Oregon pine 1⅜ x 11½ in., with round noseing and cove under same, with risers of ⅞-in. redwood, finished at the ends with a bold buttress.

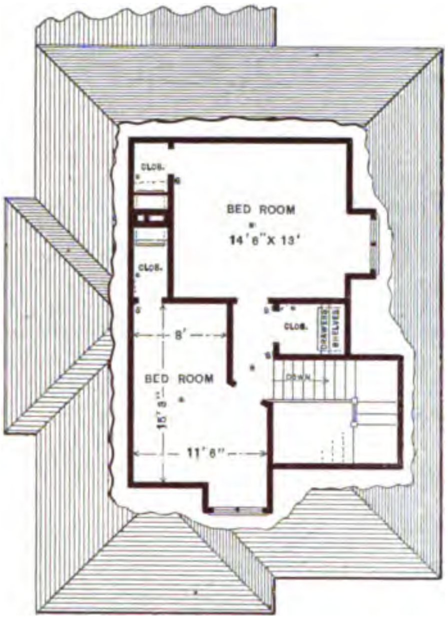
The interior finish is redwood, hand smoothed, and sandpapered to a satin finish, all the doors being of the same material and finish. The kitchen and pantry are wainscoted 3 ft. high, with neat cap. The bathroom is wainscoted 4 ft. high, with Enamatile, with a neat cap and base. The back of the sink in the pantry is finished in same manner as bathroom. The plumbing consists of an enameled cast iron sink in pantry, 5½ ft. bathtub and wash basin of the same material in bathroom, and a wash-down closet, and a galvanized set of wash trays in laundry, all being neatly fitted with nickel plated trimmings. All the inside hardware is of a neat pattern, sand blast copper finish.

The house is fitted with electric lights, with switches conveniently placed.

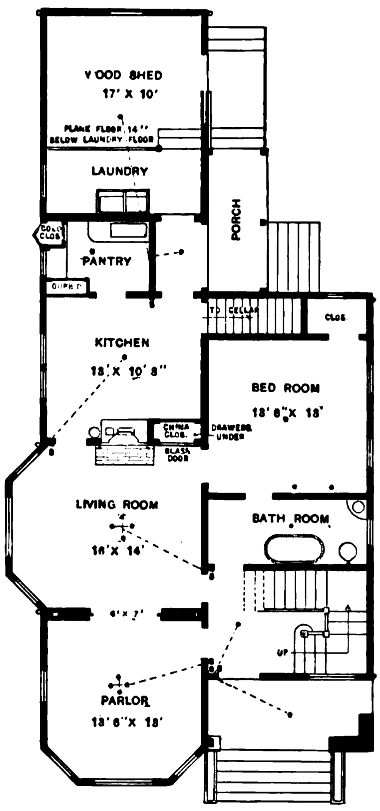
All the woodwork in rooms, except the first-floor bedroom, is finished in weathered oak, the bedrooms below and above being painted white. There is in the living room a neat hardwood mantel finished in mahogany, with open fireplace, hearth and facing of a light mottled green, with a brass frame.

The walls of the parlor and living room are covered

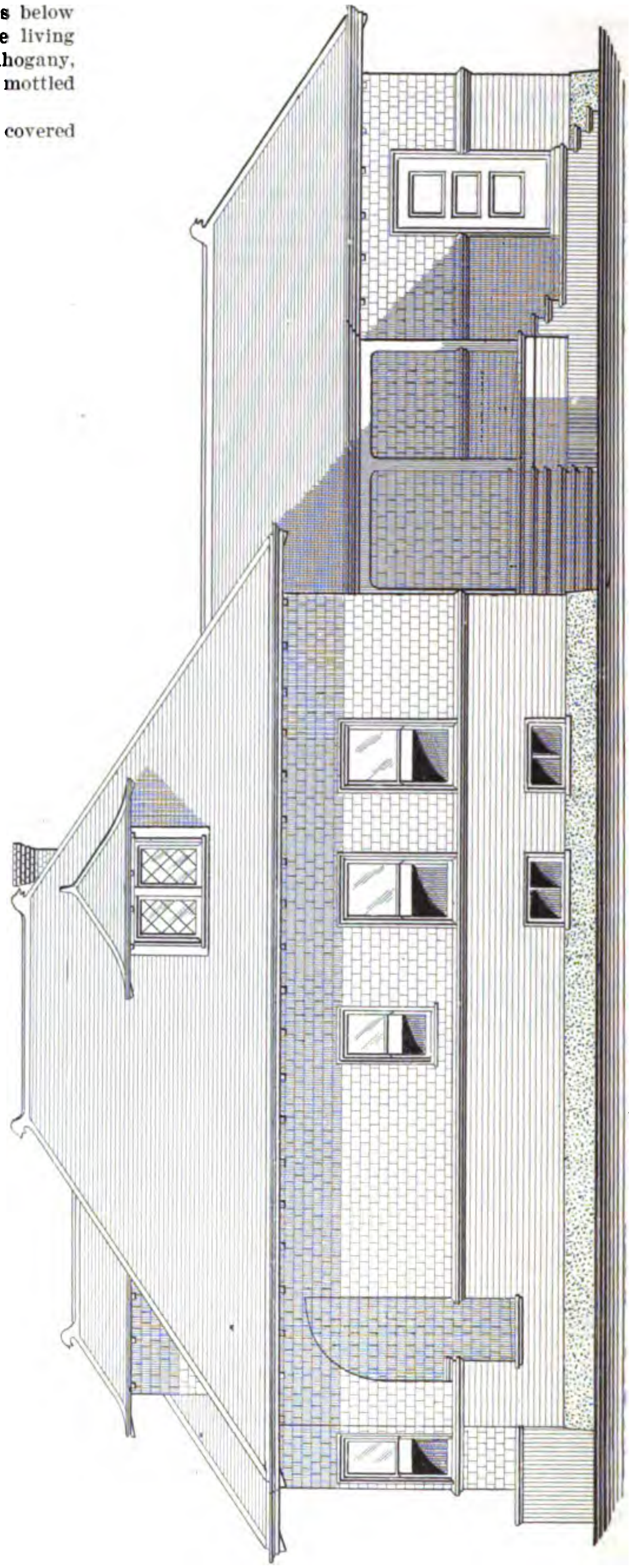
The outside of the house is stained below the window sill a light yellow and above the window sill a dark brown. The roof is a dark olive green. The outside work is stained with Dexter creosote stains.



Attic and Roof Plan.



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



Right Side Elevation.—Scale, 1/8 In. to the Foot.

A Northern California Bungalow.—Plans and Elevation.

with a dark olive green tapestry paper, with a drop ceiling of a light colored paper, finished at joint with a neat picture mold, blending with the paper in colors. All the other rooms are treated in the same manner, only in different colors. The kitchen and bathroom are papered with varnish tiles paper.

The building cost complete without cellar, as this, according to the architect, is not used in California, was approximately $2000. The bungalow here shown was erected by days' work for Joseph Russ, in accordance with drawings prepared by Architect Will S. Fitzell, Eureka, Cal.

Use of Hollow Tile in Dwelling Construction.

Among the papers presented at the twenty-second annual convention of the National Brick Manufacturers' Association, held at Columbus, Ohio, was one by J. E. Mecusker, dealing with the use of hollow tile in dwelling construction. The subject is one of such obvious interest to a large class of our readers that we present copious extracts from it, as follows:

The subject of fireproof building is just in its infancy. While architects are recognizing the desirability of the use of hollow clay tile for that purpose in public buildings and in our modern skyscrapers, they do not seem to have given its use in private house construction the consideration the subject demands. Where the owner is building a house for his own use they do not seem to have taken into consideration the possibility of this form of construction, especially from the important points of both fire and sanitation. This form of construction being absolutely vermin, fire and sound proof, and of very little more expense than the usual form of wood construction. As to cost, I will treat on that later.

There is another point in favor of this form of construction, especially in its use in partitions, and that is making heat conductors or pipes out of ordinary partitions by setting the tile, where the heating pipes come, directly over each other. A flue or heating pipe can be formed in this way that is better in every way than tin, and at the same time forms the partition as well. Have done this myself and know whereof I speak.

Partition tile should be set on end, as the tile have a greater strength set that way. In my own house the main partition, built of 4-in. tile, carries the second floor joist, setting on a brick wall in the basement. The pipes from the furnace enter the wall through a thimble, the same as used for chimneys. Then where the register on the second floor comes in the partition above the baseboard (as they all do) a tin pipe connects the tile with the register. Should the lower partition come directly under the upper no tin would be required. Special tile could be made for this purpose and do away with the tin entirely.

A very little thought on this line will easily demonstrate to the average manufacturer of fireproofing how easily all this can be accomplished.

In my house, which, by the way, is only a small, insignificant affair, the saving of tin pipes was $25, and the pipes are indestructible. Now you will understand that this applies only to houses using hot air furnaces.

Now as to cost. We will take a small cottage of eight rooms and bath, with outside dimensions of 28 x 32 ft., using a 6-ft. span of arch. A flat arch of 6-in. tile is thick enough for residence construction. An arch of this thickness of good tile will carry a dead load of 600 lb. per square foot. The usual load requirement is 75 lb. per square foot. There would be required 10 6-in. I-beams, 27 ft. long, the center resting on a brick wall in the cellar, ends on outside walls. These would weigh 12¼ lb. per foot, and cost about $2.60 per 100. Four angle irons, same length, costing about $10; about 150 ft. ¾-in. tie rods, costing about $15, or a total cost for steel of $110. In both floors 1560 sq. ft. of 6-in. arch, set in floor, at 10 cents per square foot, or $156 for tile. About 4 cu. yd. of cinder concrete at $3.50 per cubic yard, to hold floor strips, costing about $14, making a total cost for the steel, tile and concrete, complete, of $280.

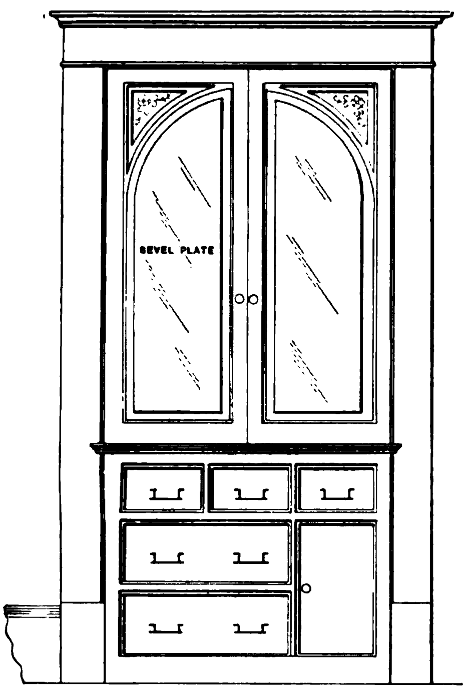
On the lower floors, where the partitions in part carry the weight of the upper floor, and also the heating flues, 6-in. tile should be used. For partitions on upper floors 2 or 3 in. tile are heavy enough. All partitions should be of porous terra cotta, so that they can be nailed readily, saving plugging the walls for casings, picture moldings and baseboards.

The cost of partitions exceeds studdings and lath but very little, if any.

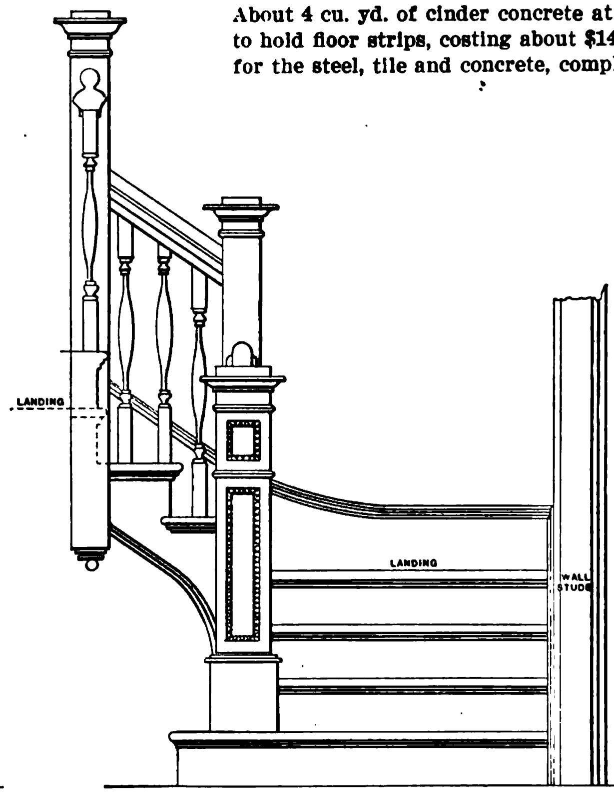
Where electric wires are installed they, as well as all pipings, can be run in the partition tile.

The figures given here can be easily verified, and, while in different localities may vary some, will prove approximately correct. With the very small additional cost would not most all of our home builders use this form of construction? Especially when one takes into consideration the fact that it is absolutely vermin, sound and fireproof.

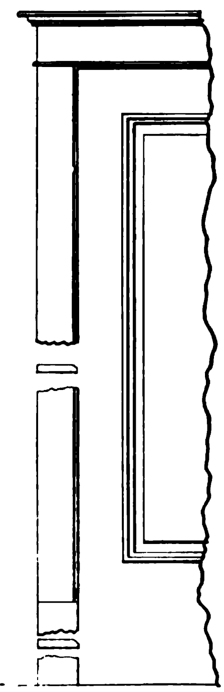
The time has come when the price of all wood makes its use very expensive, and building must be done with some other material. What building material is there, both from durability and artistic points of view, that fills the requirements like burned clays? The manufacturer of burned clays, as well as the prospective users



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



Partial Elevation of Main Stairs—Scale, ½ In. to the Foot.



Detail of Interior Trim.—Scale ½ In. to the Foot.

Miscellaneous Constructive Details of a Northern California Bungalow.

thereof, hardly realizes the cheapness, as well as the many other points of superiority they possess, and the great additional market their use in home building would make possible were people educated more fully to their use.

The average prospective builder seems to think a brick house is about the most expensive construction one can start on. And should one talk fireproof construction he would be ready to throw over the whole proposition. It will take a long time and lots of missionary work to educate the public to this form of building, but come it must, and the sooner the better for our craft.

The subject of cheap fireproof home construction has become of such moment that it has brought forth the best thought of some of the most learned men of our time. When such men as Thomas A. Edison give a subject their thought it certainly deserves consideration. But Mr. Edison has designed and patented a fireproof house, and a company has already been organized to develop his plans of fireproof residence construction. While not of burned clay, it seems to me worthy of mention here, showing the trend of the times. The clayworker certainly has one of the oldest, as well as the best, of materials for the purpose, and the only requirements to advance its use are a proper application, as well as the educating of both the erecting contractor and the prospective builder.

Caisson Construction.

Probably the most wonderful engineering feat in skyscraper construction is the work on the foundation by the pneumatic caisson or cofferdam system. The problem to the lay mind would seem insuperable, because the surface of lower Manhattan is underlaid with beds of quicksand and ooze from 45 to 75 ft. thick, heavily charged with water that rises and falls with the tides of the rivers. This water, usually found from 10 to 20 ft. below the surface, became a serious handicap only when the sky piercing building came into existence 20 years ago.

The enormous weight of the steel frame structures which became popular early in the nineties, the treacherous character of the soil, the absolute necessity for deep and waterpoor cellars to accommodate machinery and steam plants, and, above all, the shallow foundations of the adjoining buildings, brought the engineers face to face with the problem they are solving in such an amazing way, says a recent issue of the *Bulletin* of the Building Trades Employers' Association.

This solution is the caisson, or simple airtight bottomless box, sunk through the quicksands to bedrock, the water being kept out by compressed air as the caisson descends, and the interior being afterward filled up with cement.

They were first used in lower New York in 1892 for the Manhattan Life Building. Adopted later for the American Surety, Empire, Washington Life and Standard Oil buildings and the Commercial Cable Annex, they have since become the recognized foundation of skyscrapers in the district.

The most elaborate system is probably found in the foundations of the Singer tower. There are 34 caissons sung to bed rock about 90 ft. below the sidewalk and systematically arranged in an area covering about 9000 ft. Upon this base rest 36 steel columns holding the gridiron or beams and girders and distributing the enormous weight of 18,365 tons over the bearing surface with mathematical uniformity.

While these were elaborate, the sinking of the caissons for the United States Realty Company Building was the more spectacular. There were 87 caissons sunk to bedrock 75 ft. below the surface, and all were finished in 60 days, thus creating a world's record. Before that the record was held by the Trinity Building, where 50 caissons were completed in 57 days. Some hint of the enormous, though varying, cost of these foundations for a modern skyscraper may be obtained from the bill for the United States Realty Building foundations. The 87 caissons meant an investment of $500,000, or a little less than $6000 each.

The foundations of the Singer tower may be elaborate. the sinking of the caissons for the United States Realty Building may have been spectacular, but of all the great office buildings, the foundations of the new Church Street Terminal, at Church, Cortlandt, Dey and Fulton streets, Borough of Manhattan, New York, deserve to be called unique.

The terminal is being erected on the spot where Henry Hudson saw the waves breaking on the rock strewn shore of old Manhattan. Far under ground and below the old water level is being constructed the five-track terminal of the Hudson & Manhattan Railroad Company for the two "McAdoo" tunnels under the North River to the Pennsylvania Railroad station in Jersey City.

The water at this point rises within 10 ft. of the sidewalks and ebbs and flows with the tides in the rivers. The lower stories of the terminal are in reality a great watertight box of concrete, 185 ft. wide, two blocks long and 8 ft. thick. It extends downward to solid rock 75 ft. below the sidewalks, or 65 ft. beneath the water line —a depth about equal to the hight of a four-story city residence. In this box or cofferdam will be four stories, including train platforms, concourses, stairways, inclined planes, waiting rooms, telegraph and telephone booths and a restaurant.

Pittsburgh's New University Buildings.

After considering the merits of 63 designs submitted to them for new university buildings, the committee of the Western University of Pennsylvania, Pittsburgh, accepted the scheme of Palmer & Hornbostel of New York City, architects of the Carnegie Technical Schools and the million dollar Memorial Hall.

The other nine honor designs in the order of their merit were those of:

Janssen & Abbott, Pittsburgh.
Allison & Allison, Pittsburgh.
Lord & Hewlitt, New York.
Whitfield & King, New York.
Bilquist & Lee, Pittsburgh.
Haight & Githens, New York.
Heacock & Hokanson, Philadelphia.
George B. Post & Sons, New York.
Ripley, Russell & White, Boston.

Five general groups of buildings are included in the plan, making an aggregate of 30 structures. The cost of the completed group would, according to the informal estimates made, range from $8,000,000 to $25,000,000, according to material used and the degree of decoration.

All the buildings face the angle formed by the junction of Bayard and Parkman streets and Grant boulevard, where the lines of drives through the grounds will culminate in a magnificent fore-court. Within this main entrance the four buildings of the engineering and mines group will be arranged. Here the construction of the new university will be begun, the work commencing with the first of the mines buildings. It will be three stories high, cost about $175,000, occupy 5000 sq. ft. of ground area, and be ready for occupancy, it is hoped, by the first of January, 1909. Following the completion of this structure will be the erection of the first of the college buildings proper. Within five years it is expected the great cluster of buildings will take definite shape, and within 10 years the trustees of the university believe the plan for the school itself, aside from the dormitories, libraries and auxiliary buildings, will be completed.

The five groups of buildings will be divided as follows: Engineering and mining to the east of the plan; professional, college and administration in the center; library, museum and college halls to the west; women's and dormitory groups to the north. The great centerpiece will be the administration building, purely Grecian in its style of architecture, and surmounting the very summit of the hill.

COMPETITION IN TWO-FAMILY HOUSES.

FIRST PRIZE DESIGN.

IF evidence was wanted of the interest which is being manifested by the architectural profession in the design and arrangement of dwellings intended for occupancy by two families it could readily be found in the results of the competition which we have just concluded in buildings of this character. The invitation extended to readers of this journal to participate in the contest was widely accepted, and the responses were such as to render the Forty-first Competition the most successful we have ever conducted. While the bulk of the entries were from cities lying east of the Missouri and north of the Ohio rivers, the Pacific Slope, Canada and even British Columbia were not without representation. Naturally the greatest interest, as reflected by the number of entries, was in those sections where more or less building in the way of two-family houses has been going on during the last few years, and where dwellings for two families are a feature of the local architecture. Looking over the returns as furnished by the Committee of Award, which after careful examination and long deliberation has rendered its report, it is found that of the total entries practically 41 per cent. were from the States of New York, New Jersey and Pennsylvania; nearly 22 per cent. were from Massachusetts, Rhode Island and Connecticut, while 14½ per cent. were from the Middle West, embracing in this classification Ohio, Indiana, Illinois, Iowa and Kansas. The northwestern section, as represented by Michigan, Minnesota and Wisconsin, contributed a little more than 7 per cent. Canada, Manitoba and British Columbia furnished practically 5 per cent., as did also the Pacific Slope, while the remainder were scattered.

It may not be without interest right here to point out that there are two types of houses designed for occupancy by two families—one where each family tenants a floor, and if there is an attic the rooms are divided between them; and the other where the house is divided vertically by a party wall, so that each family occupies one-half of the building from cellar to attic, and generally designated as "twin" or "double" houses. The competition under discussion covered houses of the first mentioned type as set forth in the published conditions governing the contest. There it was stated that in order to place all contestants upon the same basis of equality the total floor space of the building, measuring from extreme outside walls as represented by the plans, must not exceed 3100 sq. ft., exclusive of cellar, verandas or porches. This floor area was to be divided into such a number and arrangement of rooms for two families as the taste and preference of the architect designing the structure might suggest, "but the building **was not** to be divided from front to rear by a party wall extending from the ridge of the roof to the cellar, as would be the case in what are known as 'double' or 'twin' houses—that is, those in which each family occupies half of the building divided vertically from cellar to attic."

Section and Front Elevation.—Scale, ⅛ In. to the Foot.

Competition in Two-Family Houses.—First-Prize Design.—Arthur Loos, Architect, Milwaukee, Wis.

Another important condition was that there should be an estimate of cost in detail under the headings of "Excavation," "Mason work," "Carpenter work," including roof; "Plastering," "Painting," "Plumbing" and "Tinsmith's work." The cost of each in the aggregate was also to be stated, including cost of heating, electrical work, &c. The estimate was to be in detail in the sense in which that word is usually employed in the building business. Still another requirement was that each sheet of every design and each specification and estimate submitted should bear upon its face a *nom de plume*, motto or device by which it could be identified, and the same designating motto or *nom de plume* was to be placed upon a sealed envelope containing the real name and address of the competitor.

The first work, therefore, of the committee, into whose hands the drawings submitted were placed for consideration, was to ascertain if all contestants had complied with the conditions and to eliminate such plans as had not. Owing to the large number of entries this work was laborious, requiring much time and care in its execution. The preliminary survey revealed many surprising interpretations of the published conditions, one of the most conspicuous being that relating to the total floor space of the building. Some assumed that it meant each floor should contain 3100 sq. ft., and designed accordingly; others compromised and gave each floor something over 2000 sq. ft. of space, while still others made the first and second floors together aggregate about 3100 sq. ft., and then provided rooms in the attic to be divided between the two families, but which made the total floor space considerably in excess of the amount to which the contest was limited.

Again an appreciable percentage of those contesting furnished designs of "twin" or "double" houses—that is, those divided vertically by a party wall, the type which it was distinctly stated in the published conditions was not to be regarded as included in this contest. Some others failed to furnish certain drawings, such as a roof or attic plan.

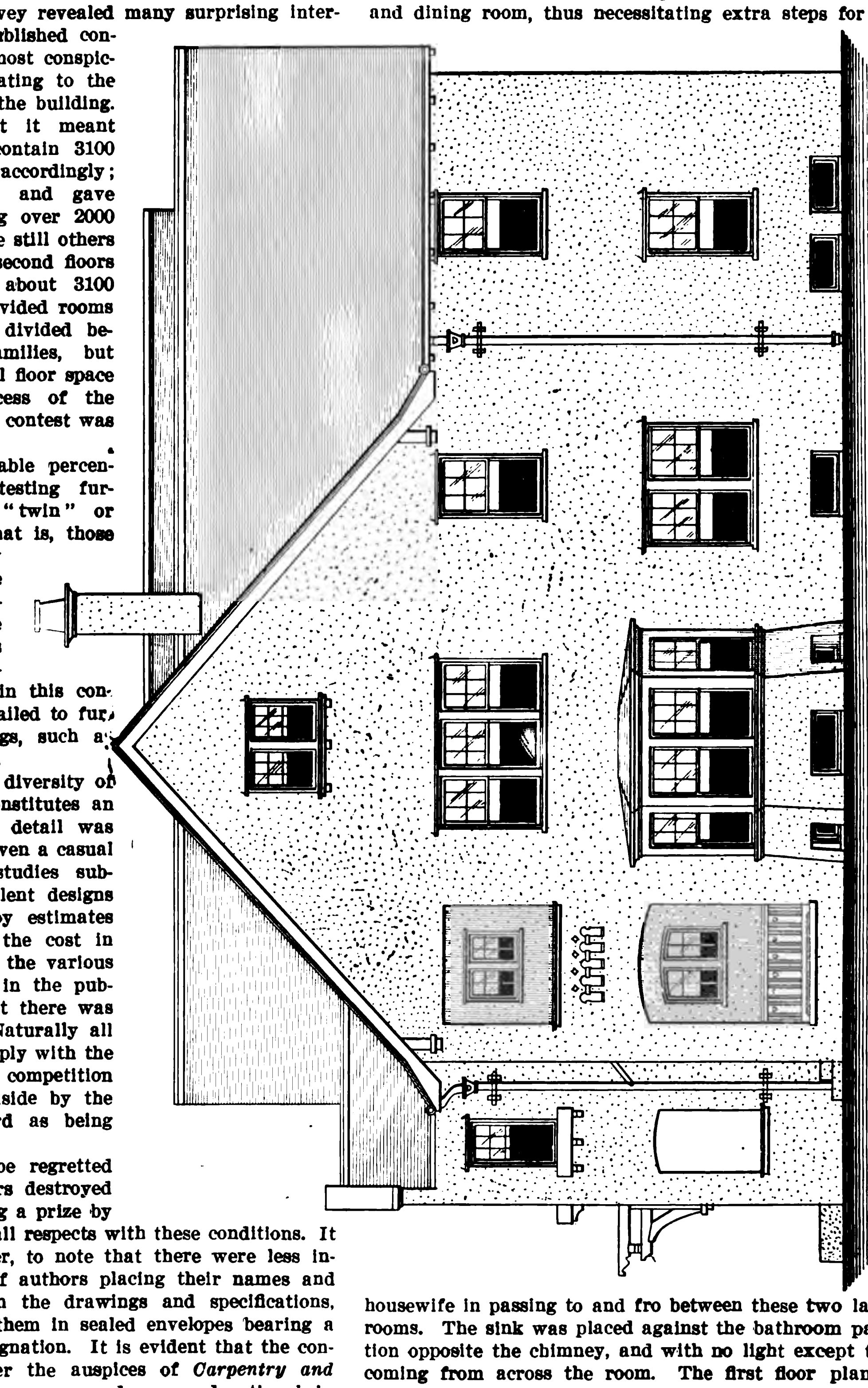
That there was a diversity of ideas as to what constitutes an estimate of cost in detail was also apparent from even a casual inspection of the studies submitted. Many excellent designs were accompanied by estimates which simply gave the cost in the aggregate under the various headings called for in the published conditions, but there was nothing in detail. Naturally all such as failed to comply with the requirements of the competition were at once laid aside by the Committee of Award as being out of the contest.

It is greatly to be regretted that so many authors destroyed all chance of winning a prize by failure to comply in all respects with these conditions. It is gratifying, however, to note that there were less instances than usual of authors placing their names and addresses directly on the drawings and specifications, rather than placing them in sealed envelopes bearing a *nom de plume* or designation. It is evident that the contests conducted under the auspices of *Carpentry and Building* are becoming more and more educational in character, and the interest developed is each year becoming more widespread and productive of highly satisfactory results from the standpoint of the practical reader and prospective house builder.

It may be of suggestive value to those who contemplate entering future competitions to point out a few of the things which the Committee of Award regarded as unfavorable features in some of the drawings submitted in this contest. In the arrangement of the first floor there were several plans showing the stairs to the cellar under the main flight leading to the second story and opening out of the reception hall. It was therefore necessary for those living on the first floor to pass from the kitchen to the front of the house and through the reception hall in order to get to the cellar.

In one case the bathroom was so placed that it was necessary in order to visit it to pass through the dining room into the kitchen and then into the rear entry. In another case the bathroom was placed between the kitchen and dining room, thus necessitating extra steps for the housewife in passing to and fro between these two latter rooms. The sink was placed against the bathroom partition opposite the chimney, and with no light except that coming from across the room. The first floor plan of another design showed a bedroom placed immediately beyond the vestibule, so that the only light for it was that transmitted from the vestibule through a ground glass window.

One arrangement showed the bathroom so placed as to render it necessary to pass from the dining room through a bedroom to reach it or go through the butler's pantry into the kitchen and then into a rear hall.



Competition in Two-Family Houses.—First-Prize Design.—Side (Right) Elevation.—Scale, 1/8 In. to the Foot.

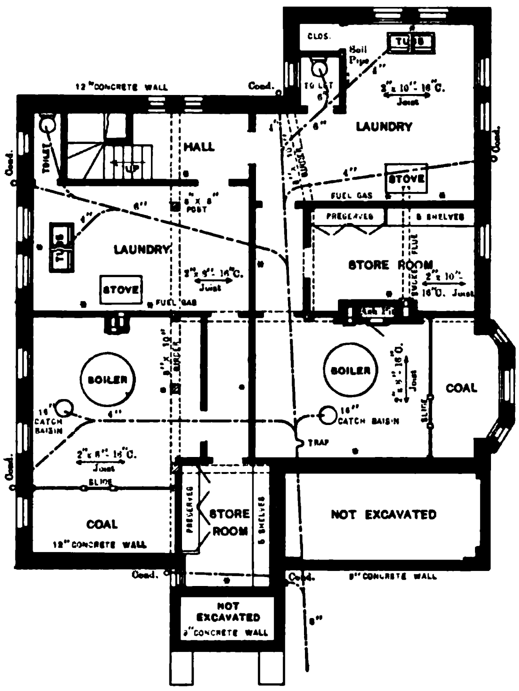
Another design showed what might be termed a two-family arrangement where each occupied one half of the respective stories of the house, and yet there was no party wall to separate the families.

One author presented a study showing the stairs to the second floor extending half way across the front of the house, cutting off the dining room on the first floor from light or view from the front.

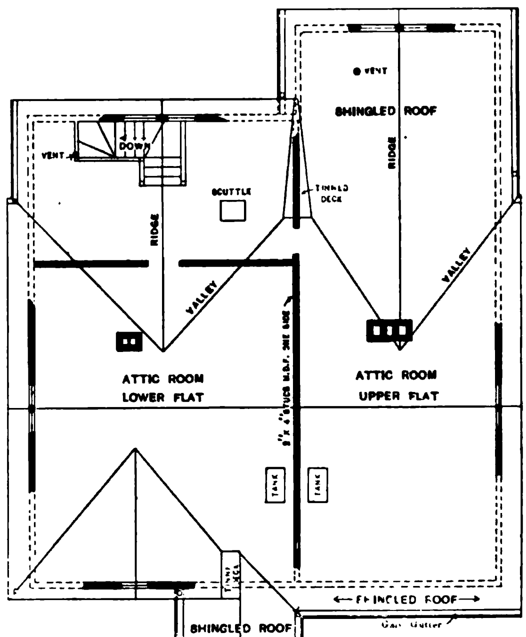
The bathroom in another case was accessible only

The above may not be uncommon forms of floor arrangement in different sections of the country, but it is not regarded as altogether the best practice, and naturally the Committee of Award gave preference in their consideration to designs which did not possess these objectionable features.

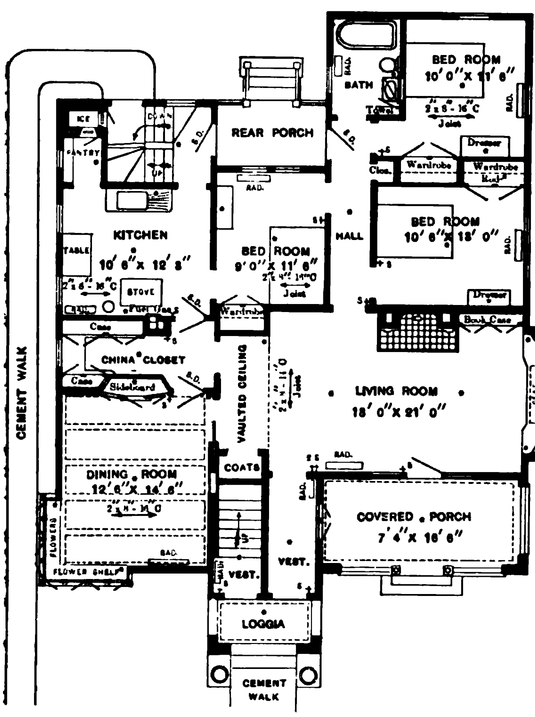
One design showed on each floor a parlor, sitting room, reception room, library, dining room, kitchen, bathroom, pantry and three sleeping rooms with a hall extending



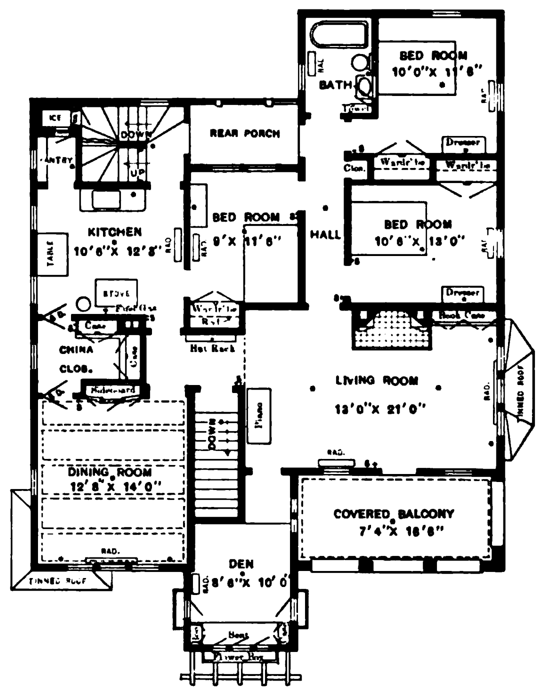
Basement.



Attic and Roof.



First Floor.



Second Floor.

Competition in Two-Family Houses.—First-Prize Design.—Floor Plans.—Scale, 1-16 In. to the Foot.

directly from the dining room, a bedroom or the kitchen. Otherwise the general arrangement was good and the exterior presented an attractive appearance.

The location of the bathroom seemed to be a rather common source of handicap to what in many cases would otherwise have been regarded as good arrangement. One author showed the bathroom accessible only by passing through a bedroom or through the dining room, going through the pantry into the kitchen and then into a passageway from which the bathroom opened.

through the main body of the building. On the third floor or attic were eight sleeping rooms and two baths opening from two halls, each 42½ ft. long and 4½ ft. wide, separated by a party wall. The floor area was more than 6000 sq. ft.

The Committee of Award in its report points out that while deciding in the order that it has, it appreciates the fact that there is enough difference of opinion regarding the arrangement of two-family houses, even by experts in work of this kind, to change the order here named. It, however, has selected the best three sets which in its opinion are entitled to the prizes under the conditions of the contest, realizing, however, that many excellent designs were put aside owing to noncompliance with the conditions, but which otherwise would have received favorable consideration.

The Committee of Award decides that the first prize of $200 be given to the set of drawings submitted by Arthur Loos, 426 Camp Building, Milwaukee, Wis.; that the second prize of $125 be awarded the drawings submitted by John H. Ramberg, with LeRoy Barton, associate architect, 287 Clinton street, Brooklyn, N. Y., and that the third prize of $75 be given to the study furnished by Curtis Walton, 963 Rose Building, Cleveland, Ohio.

While not entitled to a prize there were several sets of drawings submitted which received favorable comment at the hands of the committee, and which are worthy of "Honorable Mention" in this connection. These include the studies contributed by:

William McCluer, 33 Canby Building, Dayton, Ohio.

George H. Wood, 388 Main street, Everett, Mass.

A. E. Nicholson, Queen street, St. Catharines, Ont., Canada.

Laura E. Kingston, 518 Main street, Worcester, Mass.

R. B. McGeckin, Ellis Building, Macon, Ga.

C. S. Wigglesworth, 174 Franklin avenue, Chelsea, Mass.

William H. Harvey, 311 Main street, Worcester, Mass.

Rapp, Zettel & Rapp, Johnston Building, Cincinnati, Ohio.

M. P. Kellogg, 1147 Thirteenth street, San Diego, Cal.

These are of such a nature that we shall hope to publish one of more of them after the prize designs have been presented to the attention of our readers.

We give herewith the design awarded the first prize, together with the specifications and estimate of cost. In commenting upon its selection for first prize the committee says: "Commendable features of the design which we have placed first in order of merit are the separate front entrances for each family, while at the same time those living on the first floor also have an entrance directly into the living room from the covered porch. The layout of the rooms is good, the fireplace in the living room, the bay window, the bookcases and ample light are all features tending to make this abode of the family cheerful and homelike. A coat closet is an excellent feature and utilizes what might otherwise be waste room. The china closet is well arranged and the built-in sideboard of the dining room is conveniently placed. The kitchen has a pot closet which many of the designs do not possess, and the ice box is conveniently placed for outside icing. The three bedrooms with the bath are concentrated at the rear, all being well lighted, while the sleeping rooms are provided with built-in wardrobes. A linen closet opens from the rear hall and is convenient to all the bedrooms.

The second-floor plan shows a slight modification of the first, the covered balcony affording facilities for the family on this floor to sit outside the same as the people on the first floor. The 'den' in the front of the house is an interesting feature of the arrangement. The design and general style of treatment of the exterior is in keeping with the spirit of the times, all of which, of course, has a bearing upon the merits of the study."

Specifications.

The specifications accompanying the design marked "Simplicity" and awarded the first prize read as follows:

Excavation and Concrete Work.

Excavate the grounds for basement according to plans and section, 6 in. clear from face of wall, and to depth required by same. Footings shall be of concrete 6 in. thick and 6 in. wider than the walls or piers they are to carry. Entire basement below first story joist to be of concrete composed of one part Vulcanite or Portland cement, three parts sharp, clean sand and six parts crushed limestone of 1 to 1½ in. cubes.

Porch Floors.—First story front and rear porch floors to be concrete, 5 in. thick and reinforced with ¼-in. round rods and finished off with a smooth and even surface.

Basement Floors.—Floor in laundries and toilets filled between sleepers with cinder concrete. Balance of basement shall be cement floors 4 in. thick, composed of one part cement, two parts sharp sand, five parts crushed stone, with 1-in. thick top finish troweled to a smooth and even finish; pitch all floors to catch basins.

Around entire outside wall lay 4-in. clay surface drain with joints laid open, and in sufficient crushed limestone to secure perfect drainage to catch basin through openings in walls.

Chimneys.—Chimneys are to be built of common brick laid up in mortar composed of best lime, cement and sand. All flue lining to be 8 x 12 terra cotta flue lining, with an iron door at bottom of each flue and cast iron thimbles for boiler, laundry and kitchen stoves. Where chimneys are exposed above roof they are to be plastered same as balance of house. Chimney caps and pots are to be of terra cotta of a dark brown color.

Living room mantel backing to be of brick and face and hearth to be lined with unglazed light green Grueby tile, with copper hood over fire opening.

Outside Plastering.—The outside of building to be plastered throughout with cement mortar three-coat work, the last coat to be applied rough cast with a broom. The plastering to be done on ⅝ x ⅝ in. wood lath nailed on ⅝ x 2 in. wood furring strips, which are nailed directly on sheathing of building.

Inside Plastering.—Entire first and second stories plastered throughout two good coats, finish coat to be a white float or sand finish worked to a true and even surface. Laundry, basement hall, stair partition to attic, as well as entire basement ceiling to have one coat. Laundry and basement hall plastering applied on wood. Lath on 2 x 4 in. furring strips; kitchen and bathroom to have adamant wainscoting 4 ft. 6 in. high.

Wood Lath.—All inside lath to be No. 1 ⅜ x 1¾ in. lath, free from stains, sap or bark. Joints broken every 18 in. and well nailed at bearings.

Outside lath to be ⅝ x ⅝ in. wood lath nailed on ⅝ x 2 in. wood furring strips, nailed 12 in. on centers on sheathing.

Carpenter Work.

All lumber to be used in the construction of this building must be good well seasoned hemlock or pine; finishing lumber must be thoroughly seasoned and dry.

First-floor joists, 2 x 8 in., 16 in. on centers.
Second-floor joists, 2 x 8 in., 16 in. on centers.
Attic floor joists, 2 x 8 in., 16 in. on centers.
Rafters, 2 x 5 in., 16 in. on centers.
Collar beams, 2 x 4 in., 16 in. on centers.
Outside studs, 2 x 4 in., 16 in. on centers.
Valley rafters, 2 x 8 in., double thick.
False rafters, 2 x 6 in., dressed three sides.

Sheathing.—The entire outside frame of building to be lined with seasoned 6-in. planed and matched No. 1 hemlock fencing. Then cover outside of sheathing with heavy building paper doubled around all openings and nailed with tin washer cap nails.

Roof.—The roof constructed of 2 x 5 in. rafters, 16 in. centers, with 2 x 4 in. collar beams; cover entire rafters of roof with 6 in. M. D. No. 1 hemlock fencing, and then covered with best quality Star. A Star cedar shingles laid 4½ in. to weather.

Windows.—All outside wood fencing that show when finished will be of second quality clear pine; pulley stiles ⅞ in. thick, parting stops ½ in. thick, sash 1⅜ in. thick, stool and apron ⅞ in. thick. Sills to be 1¾ in. thick laid 1½ in. bevel per foot. All window stops to be secured every 15 with round headed screws. Mullions of dining room bay; also triple window over entrance to be of solid oak. All other outside finished lumber will be of cypress.

Floors.—The floors of living and dining room to be of white oak well matched, even color, and end matched, remainder of first and second floors to be steel polished perfection No. 2 maple flooring ¾ x 2¼ in. Attic joist to be covered with No. 2 M. D. fencing.

Floor Lining.—Line the joist of first and second stories with well dressed 6-in. common hemlock M. D. fencing, laid diagonally and covered with heavy Eureka deafening felt.

Inside Finish.

Dining rooms, living rooms, vestibule and den to be finished in white oak for staining. Bedrooms, bathrooms and hall to have poplar finish for enamel paint. Kitchen and rear stair hall to have cypress finish for staining. Dining room to have wood wainscoting constructed of 1 x 8 in. boards dressed, tongued and grooved, with base and plate rail cap. False beams in dining room to be constructed of ⅞ x 6 in. lumber. All door and window casing to be ⅞ x 4½ in., with molded cap for three main rooms. Bookcase and china closet shelves to be on movable cleats, with ⅝ x 2½ in. wood ceiling backs. Construct drawers and lockers, as shown, on scale drawing.

Doors.—All outside door frames 1⅜ in. thick; doors, 2¼ in. thick. Doors leading from dining and living rooms, 1¾ in. thick; all others, 1⅜ in. thick. In side door frames, 1⅛ in. thick.

Plumbing and Sewerage.

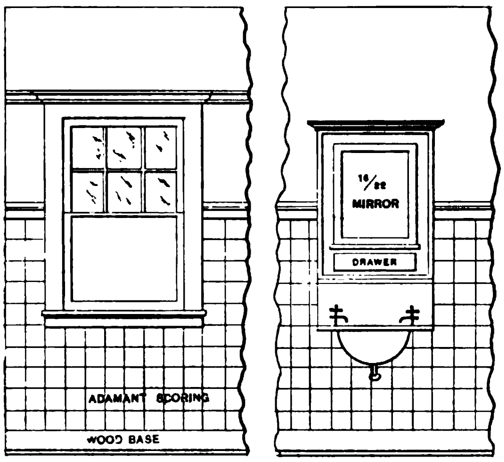
Drains.—All drains inside and outside of building to be of vitrified clay of sizes marked on plans and properly connected with street sewer.

All drains from conductors to 2 ft. above ground to be iron.

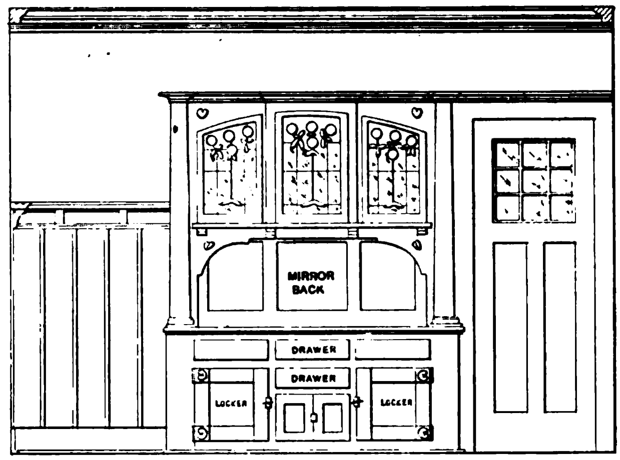
Stacks.—Soil pipes to be extra heavy cast iron, with lead and caulked joints.

Water Supply.—Tap the water main in street and continue water from street curb with 1¼-in. extra strong lead pipe, provided with stop cock box and rod at curb. Supply continued as far as hot water boiler, full size with ⅝-in. branches to washtubs, sinks, water closets and bathtubs and ½-in. branches to washbasins. Hot water supply from boiler to fixtures to be a galvanized iron pipe of same size as for cold water and extended to all sinks, basins, washtubs and bathtubs.

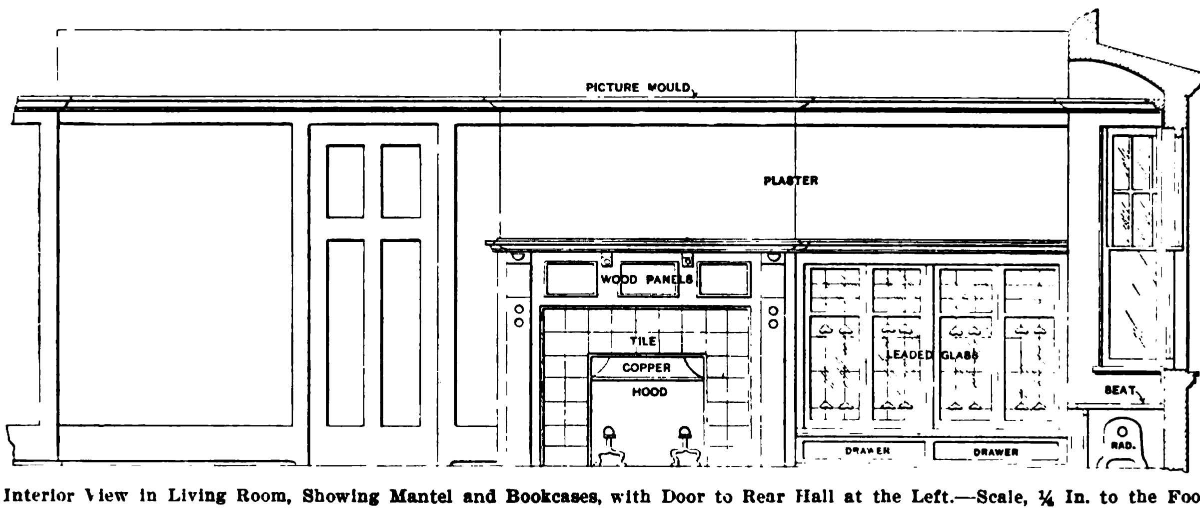
Street Washer.—Iron street washer in front and rear to be brought through window frame with ¾-in. galvanized wrought iron pipe with hose connection.



Elevations Showing Typical Kitchen and Bathroom Finish.—Scale, ¼ In. to the Foot.



Sideboard in Dining Room, Showing China Closet Door at the Right.—Scale, ¼ In. to the Foot.



Interior View in Living Room, Showing Mantel and Bookcases, with Door to Rear Hall at the Left.—Scale, ¼ In. to the Foot.

Competition in Two-Family Houses.—First-Prize Design.—Miscellaneous Constructive Details.

Water Meter.—Furnish and set up in basement, 1-in. approved rotary meter with shutoff on service side.

Wash Tubs.—Provide and place in laundries where shown two two-part Alberene laundry tubs.

Sinks.—The sinks to be 20 x 30 cast iron, white enamel, with 15-in. high roll edge back; sink and back in one piece.

Boilers.—Furnish and set up complete next to kitchen stove one 30-gal. J. B. Clow & Son's Company Star gas water heater with gas and cold water supply and hot water discharge connections, to different fixtures.

Water Closets.—Furnish and set in place in bathrooms a plain syphon jet bowl, vitreous ware, with copper lined birchwood tank seat and cover; flush and supply pipes nickel plated, with stop cock in supply.

Closet in basement to be syphon wash down closet with tank, seat and cover.

Bathtubs.—Bathtubs to be 5 ft. cast iron, white enemel, provided with combination bibbs, rubber tube and sprinkler. Supplies and all trimmings nickel plated on brass.

Catch Basin.—In basement build two 16-in. pipe catch basins, connected with Cudell or Murphy trap, iron thimble and perforated cover.

Gasfitting.—Commence main service at meters in front basement and supply all places where marked on plans, with supply to laundry and kitchen gas ranges and living room mantel, provided with shut-off key in floor.

Painting and Glazing.

Roof shingles to be stained twice in Cabot's creosote shingle stain of a moss-green color. All other exterior woodwork, including window and door frames, to have two coats of stain of a light brown color. Tin and copper roofs to be painted three coats; first coat of best mineral paint.

All dressed woodwork in basement laundries and basement hall to be painted two coats; Adamant wainscoting in kitchen and bathroom to have two coats oil paint and two coats of enameling.

Hardwood Finish.

Oak floors to be well filled and finished in the best manner with one coat of filler and two coats of Chicago Varnish Company's best floor varnish; last coat to be rubbed down with pumicestone and oil to a dead finish.

Maple floors to have two coats of oil. Living room, dining room and den to have woodwork properly filled with one coat of stain filler and then varnished two coats of Chicago Varnish Company's best interior varnish rubbed down to a dead gloss finish. Woodwork in kitchen rear entry and china closet to have one coat of stain and two coats of varnish.

Woodwork in bathroom and bedrooms to have one coat white shellac, two coats white lead and two coats enamel. Glass for entire building, except two front doors, to be best quality double strength sheet glass.

French plate mirror in sideboards and in medicine case in bathrooms.

Bookcases and sideboards to have leaded glass doors.

Front doors to be plate glass.

Electric Work.

The building is to be wired for electric light according to the rules and regulations of the National Board of Fire Underwriters, with all the necessary switches, cut outs, &c., required. Switches to be within easy reach on side walls for ceiling lights. All switches N. P. flush switch.

Wiring.—To be a two-wire system of high grade rubber covered and braided rubber to be soft and pliable, and wire

98 per cent. copper and not show fracture when bent sharply at angle of 180 degrees. All wire must be run in tubes or on porcelain cleats or knobs. Entire building, except basement and attic, to be wired for electric light in combination with gas.

Basement and attic to have gas lighting only.

Bells.—Provide electric bells from front and rear doors to kitchens; also from dining room floor to kitchen.

Tinning.

All tin used to be Taylor's I. X. Old Style redipped plates. First story dining and living room bay window roofs, as well as second story front and rear porch floors, to be tinned, plates 14 x 20 each put on with cleats well nailed and flat seams heavily soldered. Roof to be lined with waterproof paper laid to lap at least 2 in.

Tin ventilating pipes to be taken from bathrooms with register near floor and carried up through roof and capped with draft ventilator.

Gutters are to be double bottom galvanized iron, hung level and graded inside to conductors where shown on plans.

Conductors to be of corrugated galvanized iron fastened with iron straps and connected with sewer system.

Heating.

This building is to be heated by steam, one-pipe systems, with Clow Buena two-column radiators and two Clow Triumph steam heaters, each with a heating capacity of 325 sq. ft., and capable of heating the building to a temperature of 70 degrees when the outside temperature is 10 below zero.

Hardware.

All finishing hardware to be of a dull brass finish; casement windows to have a hold-fast casement window lock and adjuster.

The color scheme is shown on the elevations.

Estimate of Cost.

The estimate of cost furnished by the author of the first prize design is as follows:

EXCAVATING AND CONCRETE WORK.		
400 cu. yd., at 30 cents per yard	$120.00	
Concrete walls, &c.—68 cu. yd., at $6	408.00	
Concrete porch floors, 214 sq. ft., at 30 cents	64.20	
Basement floors, 780 sq. ft., at 9 cents	70.20	
Cement walk, 326 sq. ft., at 12 cents	39.12	
Chimneys and mantel backing	145.00	
Concrete steps, 40 lin. ft., at 55 cents	22.00	
Total concrete and excavating		$868.52
Labor at 25 to 27 cents per hour.		
LATHING AND PLASTERING.		
Outside plaster, 460 yd., at 75 cents	$345.00	
Inside plaster, 1280 yd., at 26 cents	332.80	
Total plastering		677.80
Plasterer, 45 cents per hour; labor, 25 cents.		
Millwork	$1,036.00	
Carpenter and joiner work	1,810.00	
Total carpenter and millwork		2,846.00
Carpenters, 32 to 35 cents per hour.		
Tinners' work		90.00
Tinners at 35 cents per hour.		
Electric wiring and bell work		120.00
Electricians, 37 cents per hour.		
Painting and glazing		360.00
Painters, 35 to 38 cents per hour.		
Steam heating and ventilating		590.00
Steam fitters at 35 cents per hour.		
Plumbing, gas fitting and sewerage		610.00
Rough building hardware, nails, butts, &c		70.00
Finishing hardware		128.00
Art glass		30.00
Total		$6,390.32

NOTE.—Area of building is figured to include first story living room bay, but not dining room bay, as it does not extend down to floor, and excludes front and rear porches, as well as first story loggia, and is figured from outside to outside of sheathing.

Total area of building is 3098 sq. ft.

The builder's certificate was signed by John Debbink, carpenter and contractor, 1621 Pine street, Milwaukee, Wis.

Cost of Building in Different Localities.

Much comment has recently appeared in the trade and daily press concerning the cost of building construction and of the tendency of prices of some forms of building materials toward lower figures. From a survey of the situation it appears that the decline in the cost of materials entering into the construction of buildings is not at all general, but is just now peculiar to different sections of the country. In discussing the matter of cheaper building construction, a writer in *Country Life in America* points out that it costs less to put up buildings in Philadelphia than in any other large city of the country, due, in great measure, to the cheaper cost of material as compared with cities whose distance is greater from the source of supply. In New York, where the union system is strong, the cost of both skilled and unskilled labor is at the maximum. The cost of labor in the building trades also enters largely into the cost of construction.

In other cities, where the union labor sentiment is not so strong, the wage scale is lower, and in places where labor is not well organized, as in small towns, the cost of labor is still less. Labor is a very large item in New York, but a comparatively small item in many country towns, the difference between the two extremes being as high as 50 per cent. The difference in the cost of labor between New York and Philadelphia is from 15 to 20 per cent., but the cheaper cost of living here, especially in the question of rents, makes the wages of building mechanics in the two cities practically the same.

In addition to labor, the next important factor in building construction is lumber. This important commodity is becoming more expensive every year, and where long freight hauls are required the cost is very high. In parts of this State, Maine and Georgia it is comparatively cheap, and where the cities are close to these bases of supply and shipping facilities are good the cost is much cheaper than in sections distant from the lumber regions.

Philadelphia has also a great advantage by reason of the brick industry still being a big factor in this city. The yards are close by and the cost of hauling is reduced to a minimum.

A Comparison of Cities.

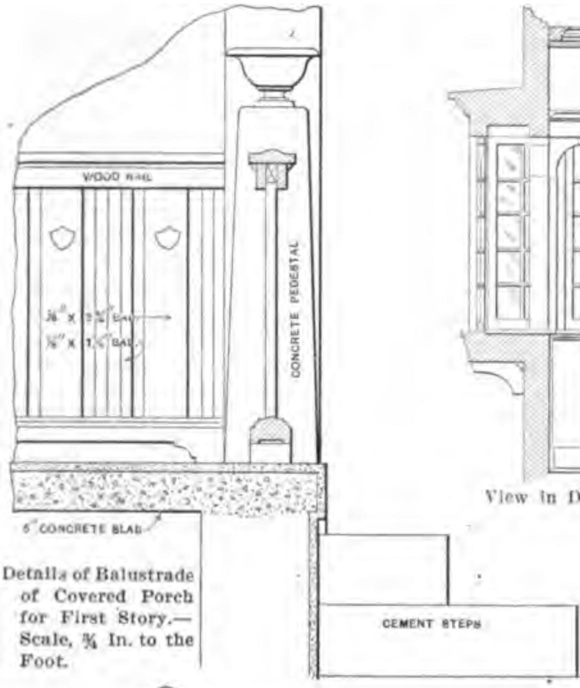
According to the writer in question, Philadelphia contractors and subcontractors are willing to work for a smaller margin of profit than in New York and some of the other larger cities. This is considered to be due to various economic conditions.

The cost of building a country house is affected by its distance from a large city. It costs more to build a house in Morristown, N. J., or Flushing, L. I., than it does at Bryn Mawr or one of the places along the main line of the Pennsylvania Railroad or on the various branches of the Reading Railway. It costs still less in a small town that is not near any large city, other things being equal.

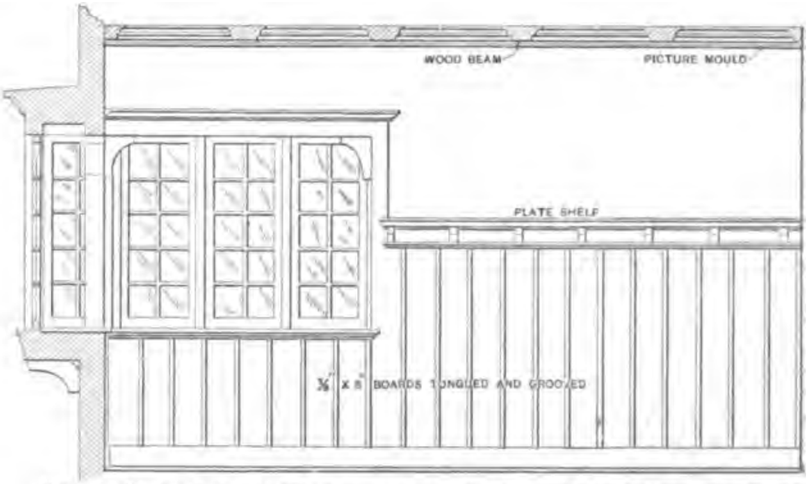
This condition of affairs is well illustrated by an experiment tried by a well-known architect, who erected a country house near Reading at a total cost of $8650. Detailed plans, specifications and photographs were sent to a number of builders in various sections of the country, requesting them to submit estimates on the property, provided it was built in the particular locality where the builder resided. These estimates range all the way from $14,206 in New York, under the most expensive conditions, to $5171 in Bangor, Maine, where lumber is plenty and labor cheap. No attempt was made to cover the entire country, but sections were selected representing the different classes of conditions. The estimates are from large and small cities and country towns, North and South, and are as follows:

New York and vicinity, $11,365 to $14,206.
Boston and vicinity, $12,232.
Philadelphia and vicinity, $9750 to $10,500.
Actual cost near Reading, $8651.
Syracuse, N. Y., $7775.
Anniston, Ala., $6240.
Bangor, Maine, $5171.

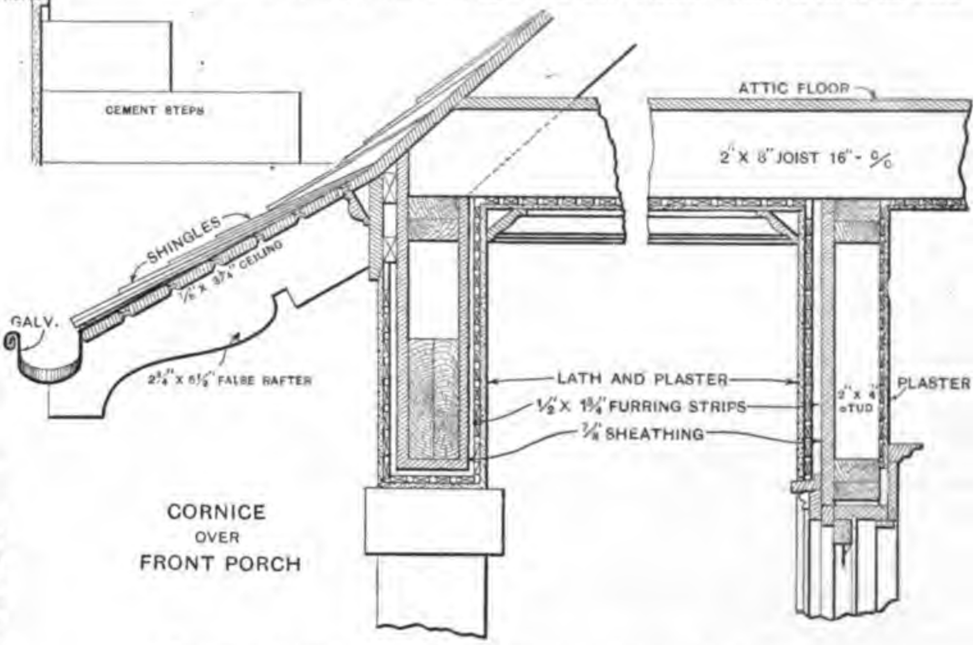
THE National Society for the Promotion of Industrial Education has decided to organize State associations. At the meeting of the Board of Managers recently held in New York City plans were perfected for establishing these branch societies in 38 States. This testifies to the rapid growth of the society, which held its first annual meeting in January of this year at Chicago. The society has established permanent headquarters at 546 Fifth avenue, New York City.



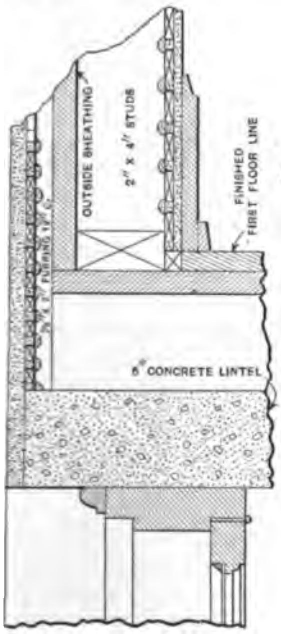
Details of Balustrade of Covered Porch for First Story.—Scale, ¾ In. to the Foot.



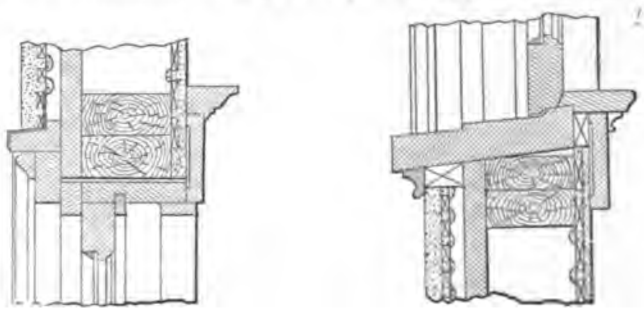
View in Dining Room Showing Flower Bay Window.—Scale, ¼ In. to the Foot.



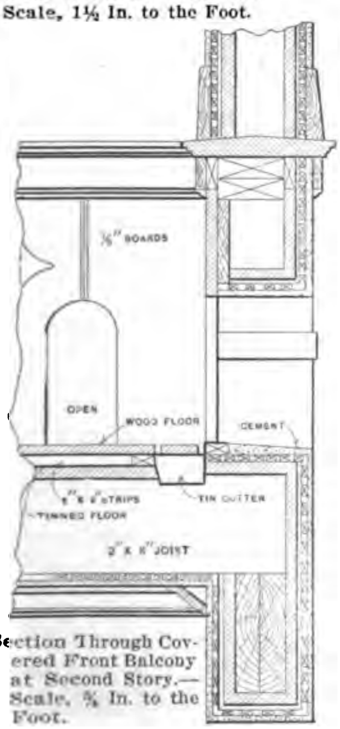
Details of Second-Story Covered Balcony.—Scale, ¾ In. to the Foot.



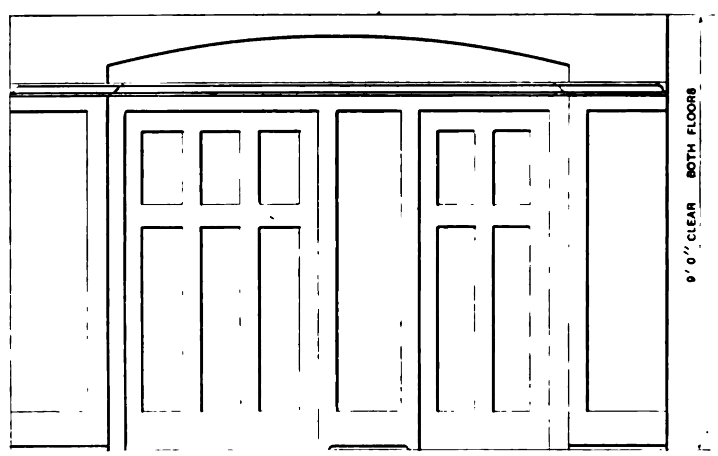
Detail of Basement Window. Scale, 1½ In. to the Foot.



Horizontal Sections Through Window Head and Sill.—Scale, 1½ In. to the Foot.



Section Through Covered Front Balcony at Second Story.—Scale, ¾ In. to the Foot.



Interior View in Living Room, Showing Doors to Dining Room and to China Closet.—Scale, ¼ In. to the Foot.

Competition in Two-Family Houses.—First-Prize Design.—Miscellaneous Constructive Details.

INCREASING THE DURABILITY OF WOODEN POSTS.

IN commenting at some length upon the treatment of wooden posts, with a view to increasing their durability, Hugh P. Baker of the Department of Forestry at the Pennsylvania State College, suggests the following course of procedure:

One of the cheapest and a very effective method of increasing durability is thorough seasoning. With fence posts this may be accomplished in from 8 to 16 months, depending upon the species, size and whether properly peeled and piled. Under no circumstances should posts be stood on the end during seasoning. When so piled the porous condition of the post causes the absorption of water, and brings about a condition which invites the entrance of fungi.

As 0 to 60 per cent. of green timber is due to the sap present in the wood, it will be seen readily that seasoning is an important factor in ease of handling and cost of transportation.

A method formerly much used and of considerable value is that of thoroughly charring the portion of the post which is placed in the ground. This may be done over a slow fire, and as little as possible of the charcoal should be broken from the post during setting.

Water and Smoke Seasoning.

Water and smoke seasoning are methods sometimes used when unusually thorough seasoning is required. There is no doubt that immersion in water dissolves such soluble substances in the wood as starch, sugar and tannin. The leaching out of these materials takes away the substances which often invite the entrance of insects and fungi. The United States Forest Service has been carrying on a series of experiments in Michigan and Wisconsin in which cedar and tamarack telephone and telegraph poles are being submerged in water for varying lengths of time. The time required for seasoning by these methods is the chief drawback.

We often see a combination of linseed oil and charcoal dust advised for increasing life of timber. Linseed oil is good, but not nearly so effective as creosote, and a mixture of linseed oil and charcoal dust is more disagreeable to handle, more expensive and less effective in increasing durability than creosote.

Numerous salts, such as those of zinc, copper, iron and magnesium, are often used, and they have a high antiseptic value; but the fact that they are easily leached out of the wood and not as easily applied as creosote makes them undesirable for use in preserving fence posts. Some of our railroads are using chloride of zinc very extensively in the treatment of ties, but the ties are only used in the dry climate of our Southwest, where there is comparatively little danger of the leaching out of the salt.

Antiseptic salts and oils are applied to timber to increase durability. First by pressure in cylinders; second, by natural pressure; third, boiling in liquids; fourth, in the case of oils, by application with brush or merely soaking the timber in the oil. The preservative may have simply a physical effect on the wood, by encrusting the cell walls, or may have a chemical effect, by combining with the wood fibers or cell contents.

From all standpoints, the best material so far found for increasing the life of fence posts is the oil of tar or some trade compound in which the oil of tar is the active principle. Creosote is the most common form of this oil used in timber preserving plants of the country and by farmers and stockmen in preserving fence posts.

The most usual method of applying oil to posts is by painting the lower half of a seasoned post with the hot oil. Two coats will be more effective than one, and if this process is followed by allowing the lower end of the posts to stand in the oil for several days it will be still more effective. The manufacturers of trade preparations containing tar oil usually advise this method of application, because it is simple and easy, and by test it has been found to be fairly effective in preventing decay.

By experiments carried on in several places in this country, it has been found that the most valuable method of treating posts with creosote or other oils is to boil the lower 36 to 40 in. of the seasoned post in a shallow tank. By giving this treatment for from 4 to 6 hr. the lower one-third of the post will take up from 4 to 8 lb. of the oil. When evenly absorbed it has been found that this amount is sufficient to increase the life of the post by three to four times. Such soft wooded fence posts as those of soft maple, box elder, cottonwood and willow can be treated at a cost of from 6 to 10 cents, and when so treated will last as long as the best grades of white cedar. A tank which would be perfectly satisfactory for this work could be built and set in place upon any farm for from $10 to $15.

Experiments along this same line are being carried out by the United States Forest Service, and in Circular No. 117 just issued the following conclusions are presented:

The resistance of all treated posts to decay is alike, regardless of the kind of wood used; hence only the cheaper woods should be used, and the more valuable kinds should be saved for other purposes. Since sapwood can be impregnated better than heartwood, posts with much sapwood are the best.

Posts cut from woods whose heartwood cannot be treated are best left round. When the heartwood takes treatment readily either round or split posts may be used.

Posts should be air dry before they are treated or set. They should be cut at least a month before treatment. Wood dries fastest in spring or summer, but with those species which check badly, such as the oaks, cutting is best done in autumn or early winter.

Even the inner bark should be removed before the posts are treated or set, especially from that part of the post submerged in the creosote. Bark reduces the penetration of creosote into the wood, besides itself absorbing the creosote without increasing the durability of the post.

The tops of posts should be cut slanting, preferably with an axe, so that rain water will not remain on them. When they are cut with a saw the pitch should be greater, especially in posts in which there is a marked difference in hardness between the spring wood and the summer wood.

Treating the Butts of Posts.

If butt treatments in the open tank cannot be given, and yet some preservative method is desired, plunge the butts of the posts into a vessel of hot creosote or carbolineum, or apply either liquid with a brush.

Use as heavy a grade of creosote as can be obtained.

Aim to get the creosote to soak as far into the posts as possible. With woods having shallow sap wood (about ½ in. deep) treat all the sapwood. With woods having deep sapwood or with heartwood that takes treatment readily, secure a penetration of at least 1 in. The heartwood of very few species can be treated. For this reason round posts are better than split posts, since a penetration is obtained entirely around them. Species with a deep sapwood, like lodge pole pine, will absorb much more creosote than species with shallow sap wood, like chestnut.

A long bath in hot creosote, followed by a shorter one in cold creosote, will probably give best results. Usually, woods with a porous structrue, like the poplars, can be treated more easily than dense woods, like the oaks, and hence need not be left in the creosote for so long a time.

Never heat the creosote above 250 degrees F. In most cases a temperature just above the boiling point of water is best. Heating the creosote above 250 degrees F. weakens the wood and causes a large amount of creosote to vaporize.

Never brush treat posts when the air or the post is so cold that the creosote simply solidifies on the surface of the post.

Keep the posts as dry as possible before treatment, and keep rain and snow out of the tank by roofing it, if necessary.

FRAMING DOMES, PENDENTIVES AND NICHES.—III.

By C. J. McCarthy.

If a hemisphere, or any portion of a sphere, as *a b c* of Fig. 29, be intersected by vertical planes, as *e* and *d*, equidistant from its center, the angular portions *h* and *h*, between the pointers of the planes, are pendentives. In like manner, in a conoid, as *a b c* of Fig. 30, the angular portions *f f f*, between the intersecting planes and *e* and *d*, are pendentives and in an ellipsoid. In these figures the convex surfaces of the hemisphere and conoid are shown, but in vaulting it is of course the concave surfaces which form the pendentives, as in the following figure, where A and B of Fig. 31 are two of the contiguous intersecting planes, C being part of the concave vault and D one of the pendentives.

It is scarcely necessary to remark that the resulting curve of the intersection of a sphere by a plane will be a portion of a circle; that of an ellipsoid will be an ellipse when the plane is parallel to the major axis, and that of

radial lines and draw the parallel lines representing the sides of the ribs. If the ceiling is to be finished in plaster the ribs should be nowhere more than 12 in. apart.

Referring again to Fig. 32, the portion marked No. 2 represents a section of the line H I of the plan.

Bisect the line F G in the point S and describe the semicircle for the resulting line of the intersection of the hemisphere. From S, with the radius E A of the plan, describe the segment *a a a* representing the section of the spherical surface on the line H I of the plan. Draw the curb *c* projected from the plan by the dotted lines as shown, and find the intersection of the other ribs with the side arch and curb by drawing lines from the plan as from *d* to *f* and from *e* to *g*. The projections of all the ribs, except the central one, which is a straight line, and the side ribs *a a*, will be elliptical curves.

The length of each rib is found in the following manner. From the center of the plan E, with the radius E A, describe the arc A *k* B and draw *k n* parallel to the side of the plan A B. With the same radius and with I as a center describe the arc *n t*, which will be the curve of the under side of the rib A *h*. From E describe the arcs *d l*, *r m*, &c., and draw *l o m p* to intersect *n t* in *o p*. Then *o t* and *p t* will be the lengths of the ribs *d e*, *r f*, respectively.

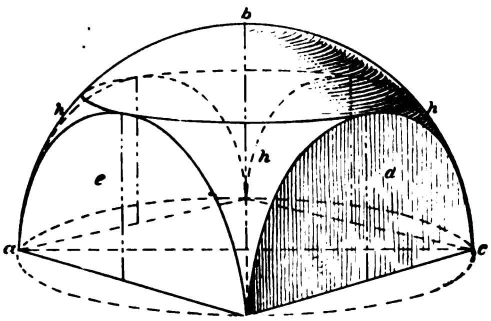


Fig. 29.—A Hemispherical Pendentive.

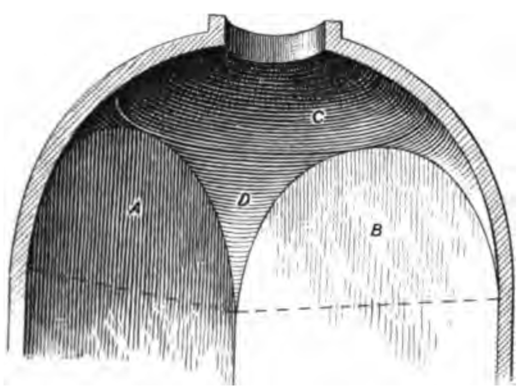


Fig. 31.—Interior View of Pendentive Vault.

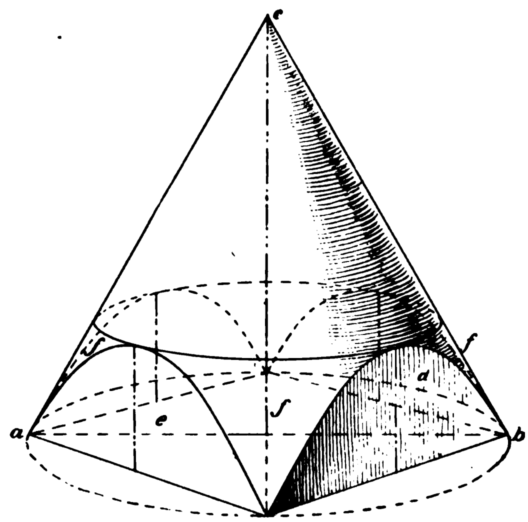


Fig. 30.—A Conical Pendentive.

Framing Domes, Pendentives and Niches.—III.

a conoid a hyperbola. Pendentives are formed in coving the ceiling of a room of rectanguar plan so as to give the four walls the form of four arches surmounted either by a circular or elliptical flat ceiling, or by a circular or elliptical vault. They are also formed in filling in the triangular spaces between the supporting arches and the drum of a dome or cupola.

To cove the ceiling of a square room with spherical pendentives having a circular skylight in the center proceed as follows: Referring to Fig. 32, let A B C D represent the plan of a room. Draw the diagonals of the square, and from their intersection E describe the inscribing circle A B C D, which will be the plan of the hemispherical vault. On any of the sides of A B C D describe a semicircle, which will be the curve resulting from the intersection of the hemisphere by the plane of the sides of the square.

In order to find the seat of the ribs we adopt the following course:

From the center E describe a circle the size required for the skylight; draw also the circle showing the width of the curb. Divide the circle into as many equal parts as there are ribs required, and from the points of division draw radii to represent the center line of the ribs. Set off half the width of the ribs on each side of the

By drawing the lines *o* 4, *p* 5, *t u* and describing arcs with the same radius as *t n* or E A, all the ribs may be drawn separately as indicated by Nos. 4, 5, 6 and 7. The double dotted curves A *k*, *d l* and *r m* show how the bevel of the upper end of the ribs is obtained.

In Fig. 33 is represented a spherical vault less than a semicircle, with a plain facia introduced in the vault above the pendentive. The curve resulting from the intersecting planes is the segment of a circle. In this figure A B C D represents the plan of the room, E being the center of the segmental vault, G H *m l* is the plan of the double curb or plate over the pendentive and *a* the curb or sill of the skylight. From the center E on the line E A make E F′ equal to *r* F, which shows the lowering of the center of the segment below the springing line. From F′ as center and with radius F B describe the arc D *c* B. Then from the plan project the width of the curbs G *c* and *a b*, lay off the hight of the facia as *c d* and describe the arcs *d b*, which give the curve of the ribs D G and G *a*. The length of the other lower ribs is found in the same manner as shown in Fig. 32. The upper ribs are all the same length. The dotted lines drawn from the plan show the manner of obtaining the section of the curbs *c d*, *b*. In the sectional elevation make *r* F equal to *r* F of the plan. Then F is the center of the segment I K, *e l o*. The position of the ribs is found by drawing lines from the plan as *g h*, *m p*.

Referring now to Fig. 34, the lower portion represents the plan and the upper the section of a conical pendentive. Let the square A B C D represent the plan of the room, and the circumscribed circle described from the center E and shown by the dotted lines represent the base of the cone.

In order to find the ribs make E O of the plan equal to the hight of the cone and join A O and C O. From the center E describe the circle representing the sill of the skylight and draw the projecting lines intersecting A O and C O in F and G. From the center E describe the arcs *b l*, *c k*, *d i*, *e h* and *f g* intersecting *e c* in *l*, *k*, *i*, *h*, *g*. Draw *l m*, *k n*, *i o*, *h p* and *g r* perpendicular to E C and cutting the line G C. Then *m* G will be the length of the

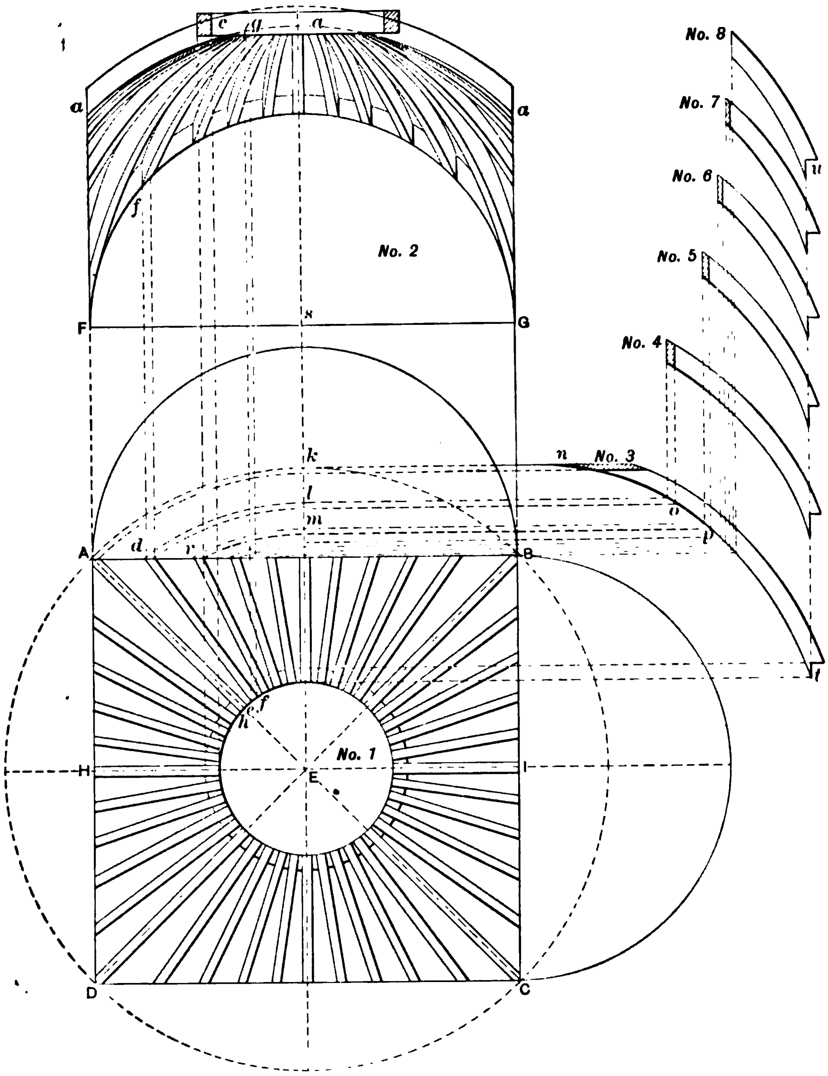


Fig. 32.—Framing of a Spherical Pendentive.

Framing Domes, Pendentives and Niches.—III.

rib *b* and *n* G will be the length of the rib *c*, and so on to the end.

To find the hyperbola resulting from the intersection of the sides we make the perpendicular *b s* equal to *l m*, then *c t* equal to *k n* and *d u* equal to *i o* and *e v* equal to *h p* and *f w* equal to *g r*. After this has been done trace the curves through the points *s*, *t*, *u*, *v*, *w*.

In the sectional elevation extend the line A B to X and Z. Make E D equal to E O of the plan, which is the hight of the cone. Join Z D and X D. Transfer the hyperbola B *s* C of the plan to A C B of the sectional elevation, upon which project the seats of the ribs from the plan by drawing lines as *x y*. Find the intersections of the ribs with the sill of the skylight *b* in the same manner. Then from the intersection of the ribs with the line A C B, as at *y*, draw lines converging toward D for the vertical projection of the ribs.

We shall next take up the pendentive formed by the intersection of an octagonal domical vault by a square. Referring to the portion of Fig. 35 marked No. 1, let A B C D represent the plan of a square apartment, C. E F G H I K D the plan of the octagonal vault and A K I C the curve of one of the longest diagonal ribs, as A.

To find any of the angle ribs, as P D′, produce C D′ to M, and divide the portion M K of the rib A C into any number of equal parts, as 1, 2, 3, &c. Through the points of division draw 1 *l* and 2 *m*, cutting P D′ in *l* and *m*. On P D′ erect the perpendiculars *l* 1, *m* 2 and P *n*, making them equal to the corresponding ordinates *l* 1, *m* 2 and R *n*. Through D′, 1, 2, *n* draw the curve of the rib.

The intermediate parallel ribs are all portions of the same curves and their lengths and bevels are found by drawing lines as *e* 1, *f* 2, *g* 3, &c., from the intersection of the lines of the ribs with the side of the square A C to the points 1, 2, 3, &c., of the rib A K.

In order to find the projection of the ribs in the section No. 2 proceed in the following manner: From the points *e*, *f*, *g*, *c* of the plan draw the perpendiculars *e* 1, *f* 2, *g* 3, and *c o*, and transfer to them the perpendiculars *a* 1, *b* 2, *c* 3 *d m*, as shown by the dotted lines *d*, *i*, &c., which will give the points 1, 2, 3, *o*, through which the curve of the wall rib A O is to be drawn and the same points also give the intersection of the jack ribs with the wall ribs.

The next phase of our subject will have to do with the framing of an elliptical domical pendentive ceiling. Let *h k l m* of Fig. 36 represent the plan of the apartment for which the ceiling is to be developed. Draw the diagonals *h l* and *k m;* through the center C draw the lines E′ F and G H parallel to the sides of the apartment. In order to find the circumscribing elliptical base of the vault proceed as follows: From the center C describe the quadrant *u* 2 3 and bisect it in 2. Through 2 draw 1 2 *t* parallel to the sides of the rectangle *h k*. Join *t* with *u*, and also with *v*, all as shown by the dotted lines. From *h* draw the dotted lines *h* E′ and *h* G parallel to the lines *t v* and *t u*, respectively, cutting the lines E′ F and G H in the points E′ and G. Complete the parallelogram A B C D, which will be the circumscribing rectangle of the ellipse forming the base of the vault. The ellipse of the curb or sill of the skylight is proportioned by drawing the rectangle *a b c d* to meet the diagonals *h l* and *k m*.

On the line B D of No. 3 describe the semicircle B *r* D as a section of the vault on its minor axis. Then as the figure may be considered a solid formed by the revolution of the semiellipse E′ G F of the plan around its axis E′ F, it follows that all sections of it by planes parallel to G H will be circles. Therefore, to find the wall rib *k l* on B D we proceed as follows: From the center F and with radius C *u* of the plan describe the semicircle *n p o*. For the reason ascribed above, all sections made by planes parallel to E′ will be ellipses, hence *n p o*, the wall rib in No. 2, will be an ellipse drawn to the points *v t u* on the plan.

The other ribs may be found by the method of ordinates, but by using a trammel in the manner shown in Fig. 37 they are much more accurately and easily drawn. The points *g*, *h*, *i*, *k* of the trammel are set on the major and minor axes of the ellipse, and *d e* is made equal to the minor, while *d f* is made equal to the major semiaxis. The distance between *d* and *e* will necessarily remain constant in describing all the diagrams indicated by A, B, C, D and E in Figs. 37, 38, 39 and 40, but *f* in Fig. 37 will be moved nearer to *e* for the curve of each rib in every quadrant.

Referring again to Fig. 40, the diagram A shows the manner of finding the rib marked A on the plan, Fig. 36. The line *a c* in diagram A of Fig. 40 is made equal to

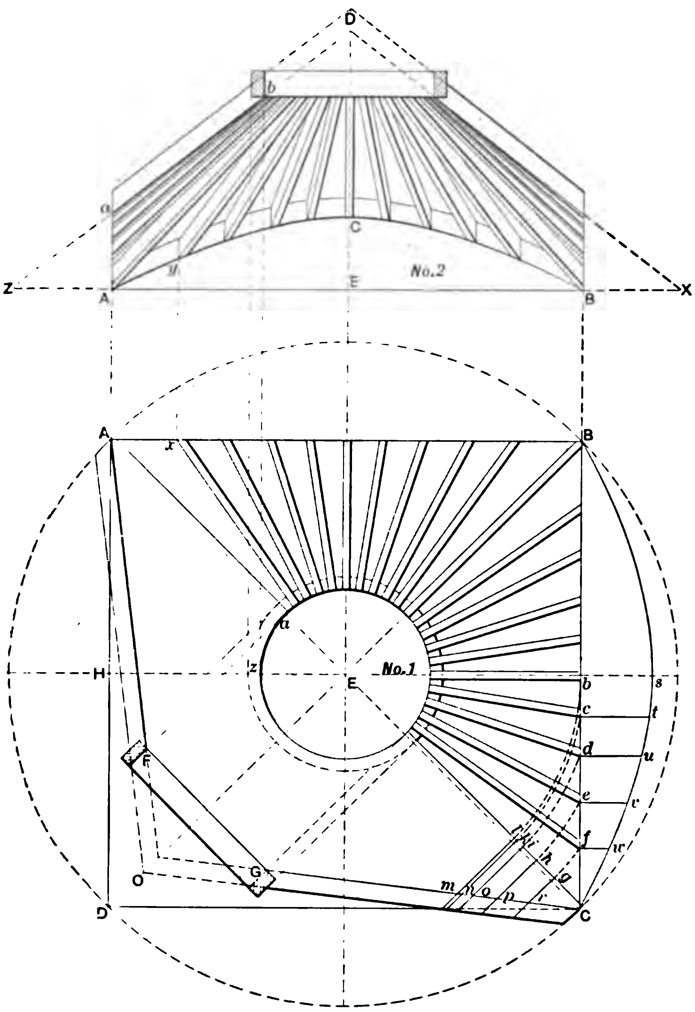


Fig. 34.—Manner of Framing a Conical Pendentive.

a c of the plan, and the lengths *a d* and *g c* in Fig. 40 correspond with the lengths similarly marked on the plan showing the intersections of the ribs with the wall and with the sill of the skylight. Perpendiculars as *d h* and *g f* drawn from *d* and *g* give the proper lengths of the ribs on the curve. The lengths of the ribs B, C, D and E are found in the same manner as indicated by the diagrams B, C, D and E in Figs. 40, 39, 38 and 37.

Monolithic Cored Columns.

The four monolithic granite columns of the First National Bank Building at the corner of Post and Montgomery streets, San Francisco, which were cored out so as to fit over the steel columns at the corner entrance of this building, have attracted much attention. Willis Polk, the architect in charge of the building for D. H. Burnham & Co., regards it as a personal triumph that he was able to induce the Building Committee to decide upon a cored monolith in place of a column built up in sections. Nearly every contractor reported against it, as the plan was opposed to all established precedents. Some of the contractors who were asked to bid on the work demanded as much as $9000 bonus as an insurance against accident in handling the monoliths. A contractor finally agreed to take the work and assume the risk without a bonus. Mr. Burnham insisted that the grain of the monoliths should be the same when standing in the building as in the natural state. In other words, it was made a condition that the columns should be cut from vertical sections in the quarry and not from horizontal sections. There are said to be few granite quarries in the world outside of California where a bed of sufficient thickness could be found to permit of cutting the 21-ft. columns from vertical sections.

There are four columns in all, and they were cut out in two sections, two columns to the section. Before cutting and coreing the columns at the quarries at Raymond, Cal., they weighed 46 tons and afterward 12 tons, which shows the amount of work done upon them. It was necessary to bore more than 300 linear feet of holes in each column in order to take out the cores. This work had to be done with great accuracy, as it was essential that the monoliths should retain a perfectly vertical position after they had been fitted closely over the steel columns. Each column was raised from a horizontal to a vertical position with rope slings. In the bottom of the columns shoulders had been cut, and into these had been set iron bars, to which were attached the clevises. The column was hoisted to a hight of more than 50 ft. and was slipped over the steel column that was standing to

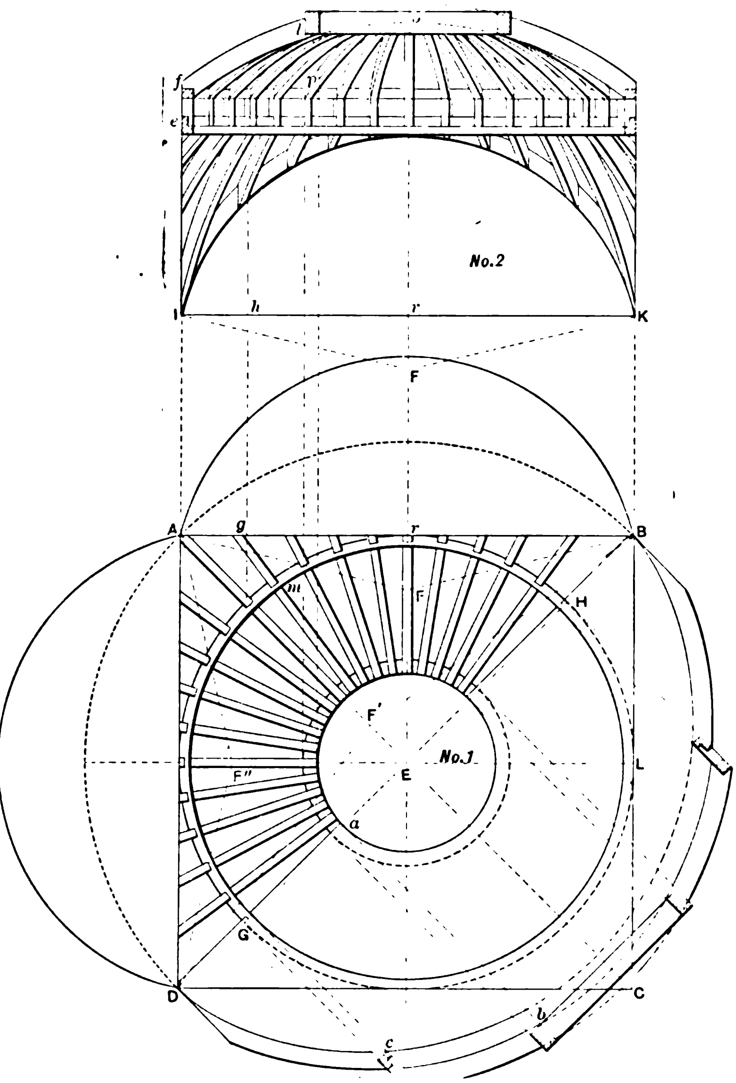


Fig. 33.—A Segmental Pendentive with Vertical Facia.

Framing Domes, Pendentives and Niches.—III.

receive it. After the weight had been released from the cable the clevises detached themselves and the cables were hauled out.

Many larger granite columns have been placed over steel columns in New York and other cities, but they have not been monolithic. They have been sawed on a vertical cross section and cemented with marble worker's wax after being placed in position. The piece of work just done is an innovation in stone construction, but the architects think that the plan will find many imitators now that a successful start has been made.

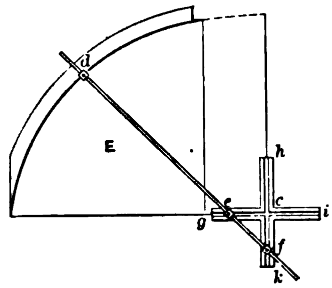


Fig. 37.—Finding Length of Rib E of the Plan, Fig. 36, by Means of the Trammel.

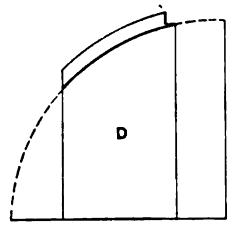


Fig. 38.—Length of Rib D.

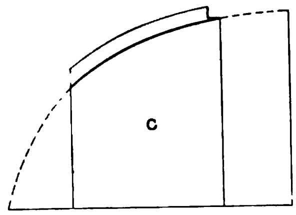


Fig. 39.—Length of Rib C of the Plan, Fig. 36.

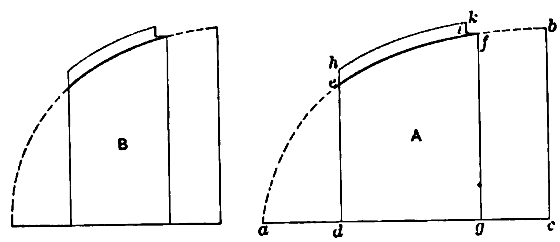


Fig. 40.—Lengths of Ribs A and B of the Plan, Fig. 36.

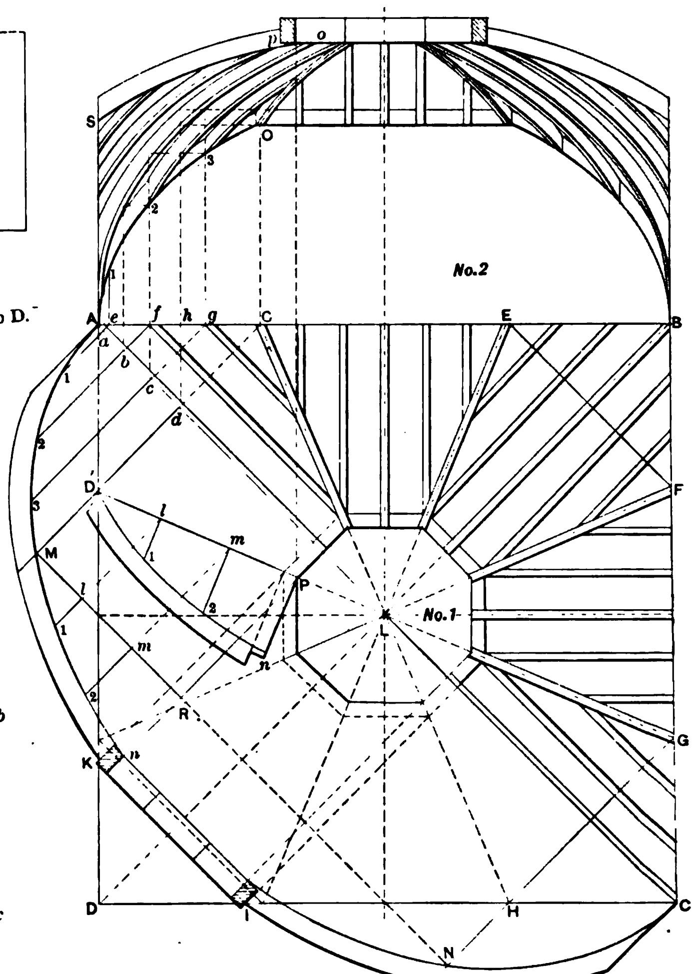


Fig. 35.—Manner of Framing an Octagonal Pendentive.

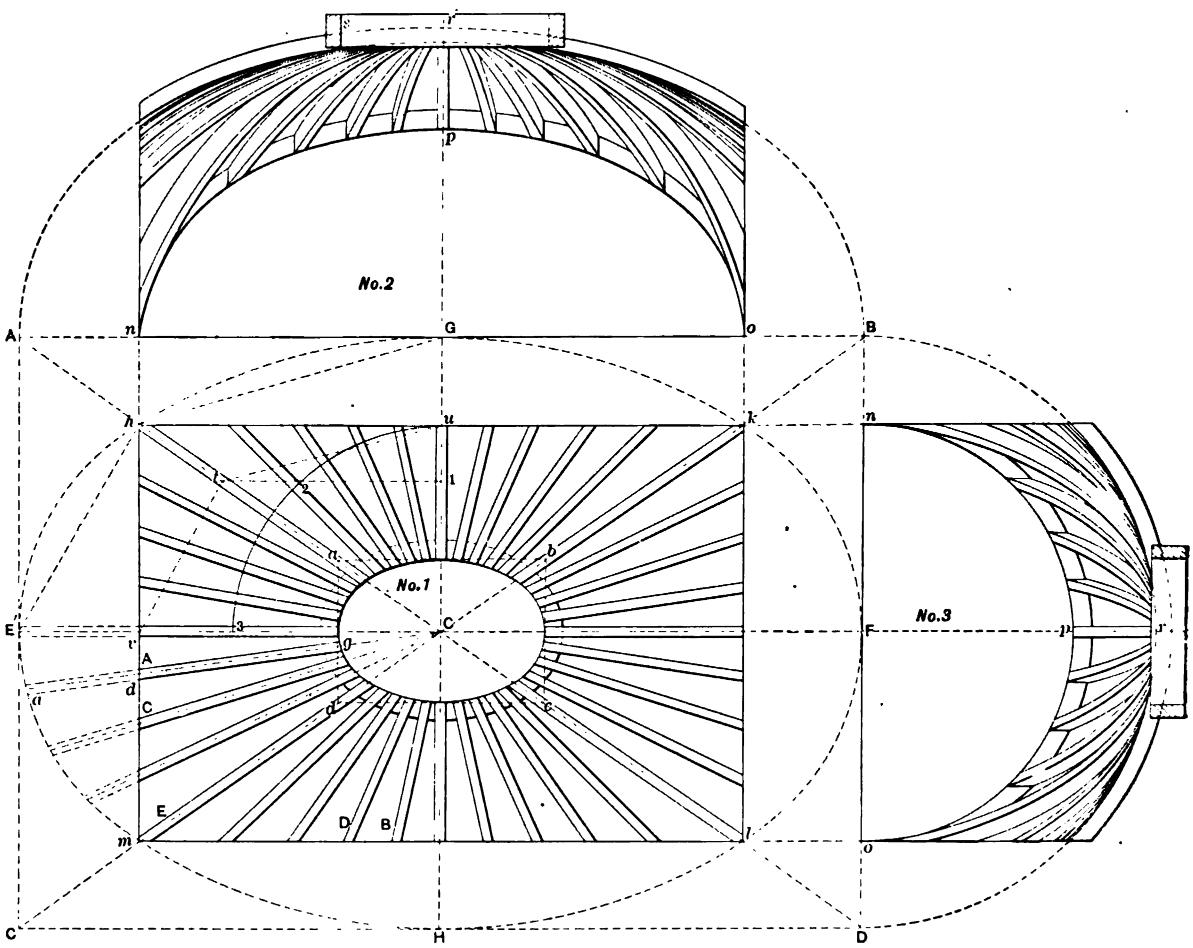


Fig. 36.—Method of Framing an Elliptical Pendentive Ceiling

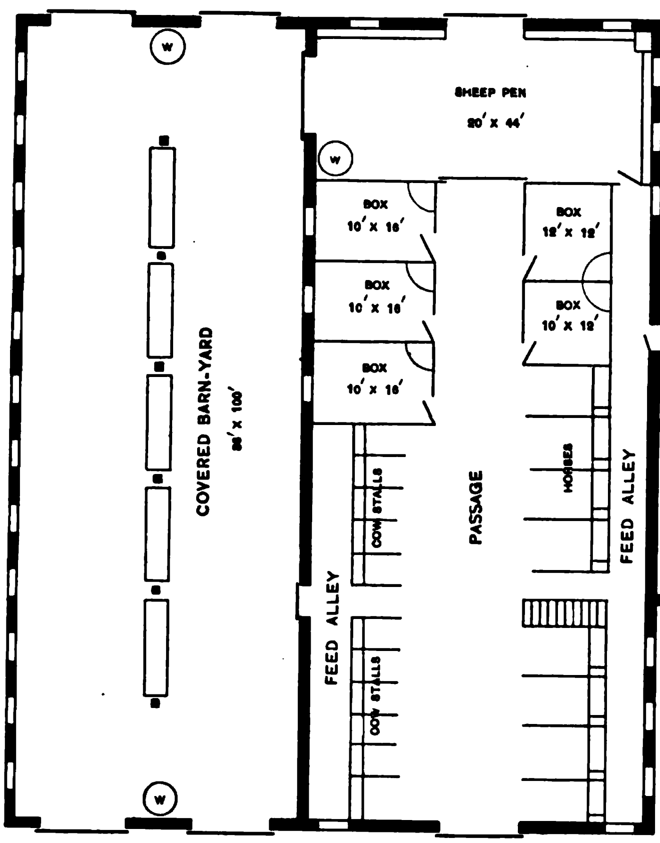
Framing Domes, Pendentives and Niches.—III.

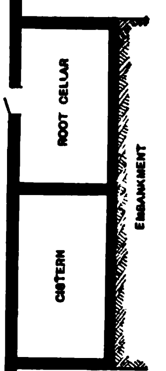
An Ohio Stock Barn of Plank Frame Construction.

(*With Supplemental Plate.*)

We have taken this month as the subject of one of our halftone supplemental plates a stock barn of plank frame construction, the picture showing the building as it appeared just after the carpenters had placed the rafters in position. Some of the farm hands are also included in the picture, which was taken just before the dinner gong had sounded.

We show on this page a plan of the barn, clearly indicating the location of the stalls, sheep pen, &c. From an inspection of the drawing it will be seen that there are 8 horse stalls, 11 cow stalls and 5 box stalls. At the left is a covered shed, the basement being used for the storage of manure. The main floor of the barn is devoted to hay and grain bays, granaries and the storage of straw. A large cistern and a root cellar are located in the embankment at the right that affords the approach to the main floor.





Basement Plan.

An Ohio Stock Barn of Plank Frame Construction.

The barn proper is 44 x 100 ft., while the manure shed is 36 x 100 ft., with 9 ft. basement and 20 ft. superstructure covered with the increasingly popular "curb roof." The barn was framed and raised in five days with the help of six carpenters. It was built for A. R. Morse at Plymouth, Ohio, by Shawver Brothers of Bellefontaine, Ohio.

Views on Industrial Education.

At the recent meeting in Chicago of the National Society for the Promotion of Industrial Education, and referred to in our last issue, a number of speakers discussed various phases of the subject indicated above, and from what they had to say we present the following extracts, as likely to prove of general interest to a large class of readers:

Speaking from the theme, "The True Ideal of the Public School System that Aims to Benefit All," Samuel B. Donnelly, secretary of the General Arbitration Board of the New York Building Trades and member of the Board of Education of New York City, said in part: "The village blacksmith described by Longfellow was certainly a type of cultured man whose example all should emulate—a useful and industrious citizen, who 'owed not any man.' There has been too much one-sided presentation of our great men to the children of the public schools. Washington as the agriculturist and Jefferson as the architect and builder have been neglected. It is the duty of our schools to teach that all labor necessary for man's existence and physical and mental well being is respectable and dignified. We must have less of the literature of individualism in our schools and more thought of the interdependence of society. We ask for a system that not only reveals the genius of music, the genius of art, the genius of literature, the genius of statesmanship, but one that reveals the genius of mechanics and the genius of industry."

Director Chas. F. Perry of the Milwaukee School of Trades had as his theme "The Trade School as a Part of the Public School System." He called attention to the fact that although most of our States provide for a complete system of free education, from kindergarten to university post-graduate work, very few of the youth of the land take full advantage of these opportunities. "Eighty per cent. of those who enter the primary grades fail to complete the eighth grade, 90 per cent. fail to enter the high school, and 96 per cent. fail to graduate from the high school." He charged a lack in the present curriculum of studies which will interest and hold pupils. The inherent unrest of the adolescent period leads to a repulsion for abstract book work. Moreover, the necessity for individual support presents itself early in life to a large per cent. of the world's population. Nearly all must work for a living, but there is always the tendency to turn to unskilled labor because of the lack of training. There is a crying dearth of skilled mechanics. These men do not have sufficiently broad opportunities for training. The United States needs a skilled industrial citizenship like that of Germany and France. There is but one solution to the problem—industrial education. The trade school must be conducted in every way identical with actual commercial conditions, but with one marked exception—there must be no repetition of work. The student should be paid an apprenticeship wage, based on the quality of the work done, the time consumed, and the student's general application to his daily work. Lead the boy to the theoretical side of his work through the practical. Results appeal to him. The trade school student should be at least 16 years of age, and should be an eighth grade graduate. Perhaps a probationary course may be provided for those who drop out of the public schools before the age of 16. The trade school will take a boy whose income represents the interest on $4000, and at the end of a two years' course will increase his earning capacity four-fold. No privately endowed trade schools can do much toward solving the problem of industrial education. They can reach only a small number of individuals. Hence, there must be public provision for industrial schools."

Superintendent of Schools L. D. Harvey of Menominee, Wis., gave an address in part as follows: "I believe it possible with a course in manual training, organized and running through the elementary and into the secondary school, to plan for special training during the last two years of the high school course for the development of skill in the processes essential in a particular trade, and this without taking more time for the work than would be given to the manual training work proper, if the course were extended through these two years instead of substituting the trade instruction for it."

"The Attitude of the Wage Earner Toward Industrial Education" was the theme of Luke Grant, who was of the opinion that the wage earner is not indifferent to the importance of industrial education, but simply cautious. He has learned, in some instances, to treat the product of the trade school with contempt, such a school, for instance, as advertises that it will teach a boy the plumber's trade in a period of six months and guarantee that he will, at the end of that time, be a competent workman.

THE STORY OF MY CEMENT BLOCK HOUSE.*

By W. O. Steele.

THE slabs to fill in the spaces between the columns were 29 3-8 in. long, 11¾ in. wide and 2 in. thick, reinforced with strap iron. They were faced with a mixture of cement 1 and sand 3 parts, and colored to a light slate color and also waterproofed with Medusa compound. The facing was about ¾ in. thick and backed with the regular mixture used for columns, &c.

For these slabs bottom boards 100 in number were sawed just 11¾ in. wide, and strips nailed on the edges, projecting 2 in. above the board. The boards were 3 ft. long, but the strips were just the length of the slabs, leaving a little over 3 in. clear on each end. These slabs were beveled on the ends, the back being ⅝ in. longer than the face, so that when set in the wall they could not be pulled out, but were tightly keyed in place by the mortar. These boards are shown in Fig. 4. The ends of the strips, instead of being sawed square, were cut off to this bevel and two end pieces made, with one edge the reverse of the bevel. These were set up tight against the ends of the side strips and secured with ordinary G clamps. The slab was then rammed up, ends removed and it was allowed to cure on the board. Before the end blocks were removed the sides were smartly rapped several times, loosening the slab from the side strips, so when cured they could be easily removed.

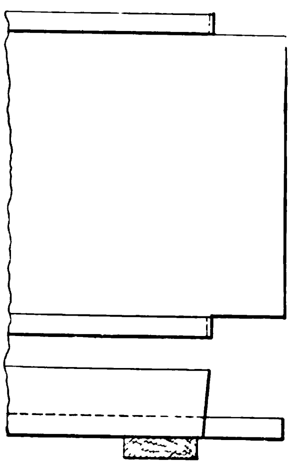


Fig. 4.—Bottom Boards for Slabs.

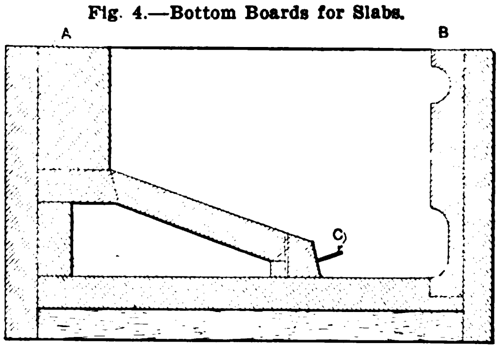


Fig. 5.—Section of Mold for Window Sills.

The sills for the windows were made bottom side up, one mold being used and the green block turned out on a bottom board to cure. Fig. 5 shows a cross section of this mold. The sides, A and B, are ½ in. higher than the finished sill, and a sweep was used that just fitted in between the sides, to remove the surplus material. It is necessary where grooves are employed in molds to produce beads on the blocks to protect them. If the side B had been cut off even with the top of the finished sill it would have left a feather edge on the groove that would have been splintered by the first accidental blow of the rammer, so the ½ in. was added to protect it.

It will be noted that these sills are finished inside and out, so when set, that portion of the window and frame was complete, except for the wooden strip secured to the lead expansions. The top and outside were faced with cement 1 and sand 3 parts, waterproofed with "Medusa." Window and door heads were made in practically the same manner, the bottom of the mould forming the recess for the wooden head of the window frame, and projections on the ends to form recesses for the cast iron brackets that were to support them between the columns. The outside and under face of these heads were faced with waterproof mixtures the same as the sills.

In both these molds slender projections, C, Fig. 5, were placed in proper position to hold the lead expansions that were later to be used to secure the wooden strips forming the window or door frame. These little details must be carefully looked after, and the expansions must all be placed alike, so that the wooden members may all be bored the same and the screws will strike the expansions each time, otherwise a great deal of trouble will be experienced in fitting the woodwork in place, making a botch job of it.

For the inside columns the pieces A were removed from the sides, Fig. 3, and nailed onto the plain bottom boards that had been used in making plain faced columns, then two bottom boards, one with heads for forming flutes, the other with flutes for forming corner beads, were used as sides of the mold, being spaced 4½ in. from face to face for the 4½ in. columns—*i. e.*, those between kitchen and dining room, and parlor and library.

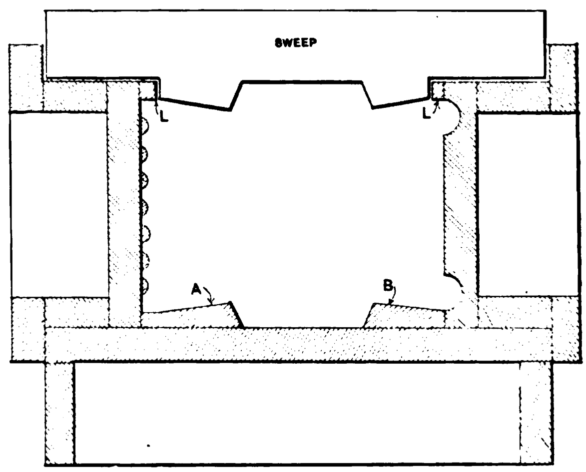


Fig. 6.—Section of Mold for 6 x 8½ In. Inside Column.

The Story of My Cement Block House.

The columns for the partitions through the center of the house were 8½ in. Two bottom boards 14½ in. wide and plain face, were made to mold these on, as the regular bottom boards were not wide enough. It will be seen that this mold would make a column with two finished faces, the bottom board making one side. To form the other side, at the top of the mold, sweeps were used, all as shown in the cross section, Fig. 6, of a mold for a 6 x 8½ in. inside column. Strips L L are required so that the corners of the columns may be square and true. The foundation or bottom slab of panels was in the nature of a "base board," 2½ in. thick, and 9 in. high, with a carved moulding along the top, this latter being formed by working a standard design of stamped metal into the mould, backing with plaster of paris to hold it solid and up to its work, as will be explained later in connection with panel molds. These slabs were made ½ in. shorter than the clear space between columns, thus allowing ¼ in. mortar joint at each end, and were reinforced with ¼ in. rods, and were turned out on the bottom boards and allowed to cure until strong enough to stand careful handling.

The pieces required to complete a parlor panel con-

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* Continued from page 118, April issue.

sist of the slab we have just described, two panels and seven plain strips 2 in. thick by the required width and length to fill the spaces between panels or columns and panels, and were reinforced with ¼-in. round rods, placed 1 in. from the face, the number used depending on the width of strip, but never less than two, always 1 in. from the edge. The strips were made on a flat smooth and perfectly straight board, face down, wooden strips 2 in. deep being tacked on to form the proper sizes. These strips were slightly beveled on the edges next the slab, so the green slab could be turned out without breaking the edges.

For the panels, which are reproductions of Louis XVI style, richly carved, it can readily be understood that wooden molds carved to produce such a face would be very expensive, even though only one face would be required for any number of slabs. To avoid this expense was a problem for two sizes were required of the same pattern—*i. e.*, one 24 in. square and one 24 x 48 in. The solution was found in stamped metal "ceilings," as they are termed, though patterns for side walls are as numerous as for ceilings. Catalogues of the various manufactures were procured and selections made; fortunately just the right size. The back and not the face of these were to be used, the back therefore was thoroughly

devised. This was satisfactorily accomplished as follows: After the slab was completed and "struck" off even with the top of the frame, a sieve 18 in. in diameter and eight meshes to the inch was filled with fine sandy loam and sieved evenly over the entire surface to the depth of ½ in. Then the bottom board, made of rough lumber, but reasonably true and heavily battened so it would not spring under the weight of the slab, was turned face down on the bed of loam and rubbed down until it had a perfect bearing over the entire surface. All was then clamped securely together and carefully rolled over, and the mold removed. Before removing the mold the bottom board was rubbed down to a true and even bearing in a level bed of loam. In this way the slabs remained true, free from cracks and the number that could be made at one time was limited only by the number of bottom boards.

Ceiling panels were made in the same manner. All these panels were faced with a special mixture, sieved onto the face or bottom of the mold through a No. 10 brass sieve, and was of cement 1 part and fine, clean sand 3 parts. This made a smooth dense face, yet with "texture" enough so that the fresco colors with which it was finally finished had that soft color surface so desirable and absolutely impossible to obtain on hard, smooth plastered walls.

Cornices were made with stamped metal backed the same as the panels and turned out on bottom boards in the same way. It may be seen that any one with a little ingenuity can get almost unlimited results this way.

It might be well here to give a little advice on the method of reinforcing or better the principle of it, and the correct method of handling such pieces to prevent cracking. It should be borne in mind that cement or concrete has great compressive and but little tensile strength, and the reinforcing with metal is to supply the required tensile or "pulling" strength. The next step is to thoroughly understand in what portions of the slabs, blocks or beams the stress or tensile strain comes and where the compression. Get this once in mind and there

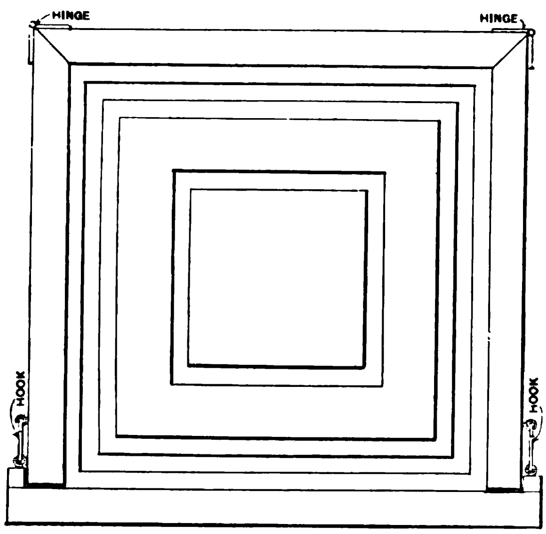

Fig. 7.—Panel Mold.

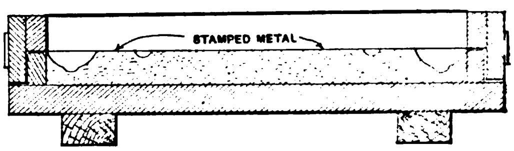

Fig. 8.—Section of Panel Mold.

The Story of My Cement Block House.

cleaned and coated with a solution of bayberry. They were then laid face up on a true, smooth board, and weighted down to hold them securely against the board and a frame 1 in. higher than the highest point of metal fitted carefully around the edge (the edges being first trimmed square and true), then the whole filled with plaster paris, running it very full, and after it was partially set, the surface struck off true and a board made up of 1¼-in. pine plank secured to heavy batten, and the face dressed true and waterproofed so the wet plaster paris would not warp it, was placed face down on the plaster paris and framed, extending 1 in. beyond the outside of frame on all four sides, the whole clamped together and rolled over. It was left in the position a few hours until the plaster paris was perfectly hard, then the original bottom board was removed, and the frame and stamped metal securely fastened with screws and nails to the plank bottom board. The whole was then carefully waterproofed with beyberry, and frame of the proper hights for the thickness of slab carefully fitted around and over the frame inclosing the plaster paris backing all, as shown in Figs. 7 and 8, thus completing the mold—inexpensive but more satisfactory than a carved wooden one would have been.

These panels were reinforced with ¼-in. round rods and expanded metal. As it would cost too much to make more than one mold for each kind of panel and take too long to let the slabs cure in the molds, a means of removing the slabs from the molds as fast as made had to be

will be little danger of misplacing the reinforcing material or in handling the finished material.

For instance in a beam, supported at the ends, the compression is in the upper portion, and the strain in the lower portion. The same is true of slabs supported at the ends, such as those for ceilings. Always handle cements, block or slabs, in the position in which they are to be set, and at the points where they are to be supported. A good understanding of this principle will prevent the spoiling of many pieces.

Take as an example a reinforced beam or girder—if you turn this upside down and lift it by the ends, you are running the risk of cracking it in the center, or if right side up and it is lifted from the center instead of the ends the result will be the same. Therefore slabs that are to be used in a vertical position should be reinforced in the center, if thin, or near each face if thick, and should never be handled except in an upright position. Bottom boards for the curing of such pieces must be heavy enough to support the slab while it is being "up-ended."

Ceiling slabs rest face up on bottom boards, should have the face covered to the depth of ½ in. or more with loam, above the highest point, a board rubbed down to bearing and all clamped together and rolled over, face down as it is to be placed in the ceiling before you attempt to lift it; then lift it, not in the center, but from the points it is to rest on in the ceiling. Of course nearly all pieces are strong enough, when thoroughly cured to stand improper handling without breaking, but do it the right way, and run no risk.

Pieces that are to be used in an upright position need stiffer reinforcing than those to be used horizontally. In horizontal members the reinforcing should be close to the under surface, and preferably of slim proportions, *i. e.*, not so large and stiff, but more of them. For instance, strap iron or wire can be used to advantage in horizontal slabs where ¼ in. to ½ in. round iron would be needed in vertical ones.

The edges of all slabs must be true and clean, for it must be remembered that these joints are to be pointed up smooth and flush, so they will be invisible after they are decorated, and this cannot be accomplished if the edges are broken, warped or rough.

A brick layer does better work than a mason in the setting of columns and outside slabs, but for the setting of the panels inside an ingenius man, who can be taught what constitutes a smooth joint, is better than either. I paid a brick layer 62½ cents per hour to do a part of this work, and had to have the joints all repointed, and he was a better workman than the average, too. Then I took a young man—a farmer, but very intelligent and careful—and taught him the trick, with the result that no trace of a joint could be found in the panels he set, and I paid him 20 cents per hour. He would do hardly more than half as much per day as the bricklayer, but he did it right—had no ideas of his own, in other words.

The bayberry solution referred to is made by dissolving a quantity of "bayberry wax" in gasoline. Put in enough so there is always some wax in the bottom of the can. Apply with a paint brush.

The Present and Future Lumber Supply.

The members of the Builders' Exchange of Cleveland, Ohio, to the number of 250 listened to a most interesting address on the above topic by Gifford Pinchot, head of the Forestry Division of the Department of Agriculture, at a luncheon recently given by the exchange in the Chamber of Commerce Hall, and at which President C. H. Prescott, Jr., of the National Wholesale Lumber Dealers' Association, presided. The subject is one of absorbing interest just at the present time when the forests of the country are being so rapidly depleted, and the figures given by Mr. Pinchot are quite startling. The amount of timber now standing in the United States is less than 2,000,000,000 ft. It is being cut at the rate of 100,000,000 ft. a year. Allowing for the natural growth of timber, this rate of destruction means that there will be no timber left in this country at the end of 30 years. The wastefulness of Americans is shown by the fact that in this country 450 ft. of lumber is cut per inhabitant, while in Europe only 60 ft. per inhabitant is cut. The increase in consumption of wood keeps steadily growing larger, in spite of the recent rapid advance of cement as a building material. A lumber famine is not imminent, but it will surely come if steps are not taken to avert the danger, and many of the present generation will live to regret the wanton waste of the present time.

Mr. Pinchot believes that forest reserves are for the present the greatest need. There are many of these now in the Far Western States, but they are needed in the East and South as well. The center of lumber supply has shifted from New England to the States of the Upper Lakes, and from these States to Georgia and the adjacent States. So much timber has been cut in the South that the central source of supply has again shifted, this time to the Pacific Coast. From the Pacific Coast it can shift no further. This is the last stand of the American forests. Until systematic and scientific replenishing has created new forests there is no hopeful outlook for the future.

At the completion of the address the following resolution, presented by J. J. Wemple, was adopted by the exchange:

Resolved, by the Builders Exchange of Cleveland, That this organization regards with great satisfaction the work of the Division of Forestry of the Department of Agriculture for the preservation of the American forests, and heartily approves the action of President Roosevelt in calling a congress of the Governors of all the States, to be held at Washington in May, for the purpose of considering the subject of husbanding the nation's diminishing timber supply, and concur in the policy outlined as the objects of said congress, as follows:

First—To conserve the national forests for the use of the people.

Second—To furnish homes for the farmer in the desert by reclaiming the soil through irrigation.

Third—To maintain unimpaired the public ranges for the grazing of live stock.

Fourth—To retain control by the Government of the public coal lands, to the end that the people may be insured of their proper use.

Fifth—To place a homesteader on every plot of arable land, whether that plot be in a national forest, a public range or among the mineral lands.

Fireproof Doors and Windows.

The Tenement House Department of the City of New York has just issued Bulletin No. 22 relating to fireproof doors and windows, from which we take the following: Where fireproof doors are called for, it is primarily for the purpose of preventing interference with the use of halls or other egress passageways through the entry of fire therein. To that end the department requires that not only shall the doors proper be satisfactorily fireproofed on both sides, but that the jambs shall also be so protected that they cannot catch fire and allow the door to fall. Where the jambs are blocked out from the wall of hall or passage, care must be taken to see that the space between jamb and wall is completely filled with fireproof material or is covered over with metal, so that there will be no opportunity for fire to reach and weaken the jamb or its supports. The department will not object to the placing of nonfireproof trim over the metal or other protective covering or filling on the apartment or store side of the door jamb, provided that opportunity is given to the inspector to note and report that the construction underneath same is fireproofed as per regulations. The construction on the hall, passage, or court or shaft side must be entirely fireproof. (This includes dumbwaiter doors.) Similar construction is required for all fireproof windows, store fronts forming sides of fire passages, &c., except that windows from entrance halls, stair hall windows entirely on entrance floor, and windows on lot line (Bulletin 8), must be fireproof throughout. Windows of entrance halls may be glazed with cathedral, leaded or other fancy glass, provided the same is covered and protected on the outside with wire glass. On plans filed after April 1, 1908, stair hall windows partly or entirely above the entrance floor will be required to be fireproof throughout, except as to the glass.

The New Concrete Walk at Atlantic City.

A striking illustration of the growing popularity of concrete construction is found in the decision of the authorities to reconstruct a large portion of the famous board walk at Atlantic City, N. J., of the material mentioned, the scheme being to use concrete piles connected by concrete girders. The portion of the walk which is to be reconstructed extends from Connecticut to Pacific avenues, and is located several hundred feet nearer the ocean than the site of the present walk. The new work will consist of 800 ft. of walk 41 ft. wide and 2400 ft. of walk 21 ft. wide. The walk is to be supported on 380 concrete piles 16 in. in diameter and varying from 28 to 32 ft. in length. The piles are arranged in bents of four and two, the distance from center to center of bent being 20 ft. The tops of the piles are to be connected by a reinforced concrete girder 24 in. in depth and 8½ in. wide, these girders forming a support for the 4 x 14 in. joists. The upper surface of the walk is to be faced with 2-in. plank, thus retaining to a certain extent the appearance of the former board walk.

The change of position of the new walk is necessitated by the building up of the land which has taken place during the past four or five years. We understand it is the intention of the city officials to replace the present board walk as occasion demands with a structure of a permanent nature.

ESTIMATING MILL WORK FROM BLUE PRINTS.

VARIOUS methods are followed by those who are called upon to make estimates from blue prints, but they are not always the most economical as regards time and labor, nor do all produce the best results. A study in the practice of price fixing as it affects the planing mill man during his intercourse with contractors and architects is contributed by Charles Cloukey to a recent issue of *Wood Craft*, and what he has to say is of such manifest interest to a large class of readers that we allot space to the following extracts:

Perhaps the most economical plan of making estimates from plans is to make a complete and accurate list at the start, so that in case the order is placed, the copy of the list furnished the buyer can be used by the superintendent or foreman in billing out the work. It may take a little longer in the first place, but it will save much time when it comes to getting out the bills.

Every estimator should have some routine system of taking off quantities from blue prints in order that he will not be liable to overlook some class of items and so that the billing clerk or foreman will be able to start at the first and bill out the whole job about in the order that it should be got out.

It is not necessary that the estimator should be able to make the cutting bills of the work he takes off the plans, for it is supposed that the plans, specifications and details will furnish all the information necessary to make out the preliminary list of items. However, if there is any doubt in regard to sizes or details, or if, as is often the case, the drawings and specifications do not agree, the estimator should submit the matter to either the contractor or architect, as the case may be, *if* he has the time and opportunity. If his time is too limited, he should put down the size he thinks is right and follow it with a (?), which will give him the privilege of a change in price if he is wrong, and at the same time cause the factory to get a decision before the work is actually begun. The old saw, "Be sure you are right before you go ahead," is a very good factory saw.

Listing the Items.

The estimator will find it a great saving of time to make up his list of items before he begins to attach the prices. If he is continually vacillating between his blue prints and his price-lists, he is not only liable to lose sight of some of the items on the plans, but his mind will not be able to do the rapid work possible with a more sustained effort of concentration. If he is taking off frames, let him take off all the frames before turning to something else. If it be doors, make a complete list of the doors and their specifications.

Another practice is a good one. Bill the windows and frames separately, denoting the sizes of each, for this will act as a check, and by comparing the two lists it will appear at once if there is an error. If the frame bill is made first and the window bill copied off of that, any mistake that has been made will be carried forward into the windows instead of being discovered and corrected. This practice is true of other items which might be duplicated in the same way.

Suppose we take a good sized brick building as a sample. We find that the first items needed on the job are the door and window frames for the basement or the first story, as the case may be. Now, to follow out the idea already advanced, we will begin with the outside door frames at the bottom of the wall or basement, and put them down as indicated on the plans, basement first, then first floor, second floor, third floor, and so on to the top. For the convenience of the factory it is well to note at the right of the items the floor to which they belong. For the accommodation of these notations, the estimating sheets should be of a generous width, something like letter size, and in length about 1 ft. Usually the size of a door is given on the floor plan. If an outside door, the style may be seen from one of the elevations. If the door is not shown on the drawings it will be necessary to hunt up the specification referring to it.

We will say that there will be an item of door frames like the following:

3 O S Plank Dr Fra 3-0 x 7-0 T 36 inches for 13-inch wall, rab 1¾—Basement.

If the construction is unusual, the notation, "see detail," will be added, but if it is of the ordinary type for which no detailed drawing is furnished, both the estimator and the superintendent will know how to handle it without further notes. The balance of the outside door frames on the job will follow in their order from the bottom to the top of the building.

However, if there is a composite frame for a front or main entrance, all the openings entering into its make-up should be given in listing the frame, as follows:

2 Front Ent Fras, each to contain
2 Drs 2-8 x 8-6
2 Sd Lts 1-8 x 8-6
1 Tran 5-4 x 24 inches
2 Tran 1-8 x 24 inches (See details.)

If there are no details for above frame, the jambs would be figured according to the thickness of the walls, the mullion jambs about 6 in. and the mullion casings about 4½ or 5 in. wide. The transom bar would be plain, with a molding under the transom sill on the outside, and the distance from the top of the door to the bottom of the transom would be about 4 in. Such a frame would be worth about the same as three door frames with transom bars, although they are usually put in about 50 per cent. higher on account of the fact that the bigger a frame is the more costly it looks, which is one of the advantages of the mill man.

If the large frame has a triple transom in the form of a circle, Gothic, segment or ellipse, it should have the attention of practical experience, for unless the estimator has a wide range of previous estimates to draw from, or is a man accustomed to getting out this kind of work, he will hardly be able to make a reliable guess.

After assembling all the outside door frames on the job, begin with the box window frames and take them off in the same way, listing as follows:

24 Box Wd Fras 36 x 24—2 lt, 1¾ sash (regular) or (see detail).

4 Plank Sash Fras 24 x 36—1 lt. Opg 2-4 x 3-5.

Sashes and Frames.

It will be observed that it is not necessary to give the window opening of a regular check rail window. With a given glass size the opening in the frame is always the same, no matter where made, and so universal has become the use of the check rail window, that unless otherwise specified, an order for a window 1⅜ or 1¾ thick will always be entered up and made as a check rail window. So it is the custom to omit the specification of "chk rl" or "chk" when listing windows from the blue prints.

But with sashes it is different, on account of whether they have bottom rails 2 or 3 in. wide, and if the inside of the frame is to have the regular trim, including stool to lap over the sill, the bottom rail of the sash should be 3 in. wide, the same as that of the windows.

There is a twofold object in making sure that the sash will fit the frames. One being the check of the sash against the frame, and the other the avoidance of uncertainty in making the cutting bills, which consumes valuable time in looking up the true status of the items in question. And it is the same with a hundred little notations which may be jotted down with profit here and there along the estimate list. Perhaps there arises some perplexing question which requires considerable time and mental effort to clear up and which will be soon forgotten unless some little key to the situation is jotted down on the list. Then when the estimator is approached by some inquirer who has not studied it out, he will be able to recall all the points at once and impart the desired information without delay. He should list every job just as though the order had already been given and as though he had but one chance at the set of plans.

(*To be continued.*)

Carpentry and Building

WITH WHICH IS INCORPORATED
THE BUILDERS' EXCHANGE.

DAVID WILLIAMS COMPANY, - - PUBLISHER AND PROPRIETOR
14-16 PARK PLACE, NEW YORK.

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CHARLES KIRCHHOFF,	VICE-PRESIDENT
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(Entered at the New York Post-Office as Second-Class Mail Matter.)

MAY, 1908

The Building Situation.

So many branches of trade are dependent in large measure for their activity upon the amount of new building in progress that it is important to note as the season gets under way what are the salient features of the situation. Since the first of the year the statistics of projected improvements in the building line have not been of an altogether gratifying character, although here and there bright spots are to be observed which have indicated a feeling of confidence in a fair volume of business. The record for the first quarter of the current year shows a rather heavy shrinkage in operations all over the country, January indicating a falling off of 44 per cent., February 41 per cent. and March 40 per cent. A large percentage, however, of the decrease in the valuation of the improvements for which permits were taken out, as compared with the same period in 1907, is chargeable to a few leading cities, the reports from the smaller places being of a rather more favorable nature. Here in Greater New York the season opens with the value of new work projected and under way less than one-half what it was at this time last year, although since the first of April permits have been taken out in the Borough of Manhattan for new construction aggregating nearly $7,000,000. Notwithstanding the comparatively poor showing, the year 1908 is likely to be notable for the beginning of construction work which will be monumental in character and effect some rather radical changes in the way of the demolition of old landmarks in order that far greater ones may take their places. Former residential districts are being rapidly transformed into business centers and the progress of subway transit facilities is such as to encourage the idea of increased activity in suburban sections, where those desirous of avoiding the congested condition of the city must seek for homes.

Important Building Undertakings.

While the total operations in the Borough of Manhattan may not be as large in volume as those of other years when the smaller builders were more active, it is expected that this will be fully compensated for by the magnitude of the undertakings in prospect. Among the work to which one may look forward with reasonable assurance of its being undertaken is the mammoth municipal building opposite the City Hall Park, at the entrance to the Brooklyn Bridge, the site for which is now being cleared by the city, and the cost of which will involve millions of dollars; the new structure which will rest on the present site of the Fifth Avenue Hotel, with its 10,000,000 sq. ft. of floor space and involving an outlay of more than $2,500,000; the tower addition, as it may be called, to the present Whitehall Building, at Battery place and West street, costing in the neighborhood of $4,500,000 and requiring the demolition of 17 old buildings; an office building on the site of the recently closed Sinclair House, at Eighth street and Broadway, involving nearly $500,000 more; a public school building on 111th street, which will require $280,000 to complete; a skyscraper in Beaver street, costing $250,000; the new uptown post office building on Eight avenue and extending from Thirty-first to Thirty-third streets, and costing several millions of dollars, together with a number of large apartment houses on Washington Heights along the new Riverside Drive extension, which will involve outlays ranging from $150,000 to $250,000 each. These with the pushing toward completion of many important undertakings, not the least conspicuous of which is the 48-story tower of the Metropolitan Life Building, will make 1908 memorable in the annals of building history and provide employment for a small army of men.

The Question of Industrial Education.

The question of educating the youth in this country so that it has some fair degree of preparation for the kind of work it plans or is best adapted to take up is receiving so much attention and apparently at almost all parts of the country that the amount of information and argument reaching this office is far greater than the time available for its careful consideration or for its presentation in these columns. There seem to be as many opinions regarding the solution as there are sands to the sea, but that something is lacking is universally accepted. In late issues space has been given in this column for the essence of papers presented by careful and experienced students of the subject before the national society organized to promote industrial education, and besides public educators focussing local thought here and there, the movement is taking such strong root that the National Educational Association will devote itself seriously to the problem at its convention in Cleveland, June 29, and in the Empire State, Dr. Andrew S. Draper, State Commissioner of Education, has had a bill introduced providing for the establishment of general industrial and trade schools in cities and in union free school districts. The fact that happenings in New York State are given prominence in the daily press of the country means that the agitation there will be reflected to advantage. On this score may well be mentioned conferences being held in New York City by a public education society and especially a noteworthy 72-page report of a committee appointed under the chairmanship of Prof. William Kent of Syracuse University, by the Chamber of Commerce of Syracuse, N. Y., to investigate the need of industrial training. In this report, which can probably be had for the asking, are given some specially pertinent suggestions by Dr. Draper. What the relation will be between trade schools and the industrial instruction which it is proposed to graft to the public schools is a leading point of controversy, but altogether much encouragement is to be taken from the status of the public attitude and present efforts will by that fact be further multiplied.

New York's Latest Theater.

A theater which is not in any sense a commercial venture, but is to be maintained for the advancement of art and suitable for the production of classical dramas, modern plays and light opera, is about being erected on Central Park West, between Sixty-second and Sixty-third streets, New York City. The structure will cover a plot 200 ft. on Central Park West, and extend back about 225 ft. on Sixty-second and Sixty-third streets. The exterior will be of Indiana limestone, finished in the Italian Renaissance style of architecture, with a two-story colonnade crowned by a rich cornice and balustrade. According to the plans the auditorium is approached by a circular corridor 18 ft. wide, which will serve as a foyer, and from which ascend two circular staircases to the foyer on the second floor. The auditorium, which will seat 2318 persons, including the boxes and balconies, will be wide and shallow, and every effort has been made to design a building in which everybody shall be able to see and hear the actors with an equal degree of facility. The stage is 68 ft. deep and 100 ft. wide, with a proscenium arch 45 ft. wide and 40 ft. high., and ample dressing rooms will be provided for the actors, which will be reached by elevators from the stage level. The boxes are arranged in two tiers of 24 each, and in the rear of the boxes, besides a small parlor, there is a private hall, which enables all the box occupants on one floor to visit the other boxes on the same floor without passing through the main foyer. The first tier of boxes is only 4 ft. above the orchestra pit, while nine stairs lead through the foyer to the second tier. Before drawing the plans the architects, Carrere & Hastings, made a special visit to Europe for ideas, and their finished work represents the result of painstaking analyses of the leading French, German and Austrian playhouses. The new theater is estimated to cost about $2,000,000, and it is expected to be opened in the autumn of 1909.

Officers of International Association of Master House Painters.

The twenty-fourth annual convention of the International Association of Master House Painters and Decorators of the United States and Canada was most successfully carried out at New Orleans, La., on February 18 to 21, inclusive. The sessions were held in Washington Artillery Hall, which was beautifully decorated for the occasion and which when the meeting was called to order was filled with a representative gathering of prominent master painters from all parts of the United States and Canada.

The officers elected for the ensuing year are as follows:

President, Charles E. Van Syckle of Newark, N. J.

Vice-President, Samuel J. Brown of Milwaukee, Wis.

Secretary-Treasurer, W. E. Wall of Somerville, Mass.

Mr. Wall was also elected chief organizer for the ensuing year.

The Executive Board consists of the following: H. Frank Read, Providence, R. I.; A. D. Wharton, Richmond, Va.; Carl Goeddertz, Rochester, N. Y.; Charles H. Fowler, Philadelphia, Pa.; W. J. Albrecht, Toledo, Ohio; W. A. Houston, Lawrence, Mass.; E. Y. Fitzhugh, Nashville, Tenn.; John E. Wagner, Baltimore, Md.; A. H. McGhan, Washington, D. C.; James Roach, Detroit, Mich.; Jacob Guckenbach, Chicago, Ill.; A. M. McKenzie, Hamilton, Ont., Canada; Thomas Flanagan, Jersey City, N. J.

The place of holding the convention in 1909 was voted to be Baltimore, Md.

Michigan State Association of Builders.

At a meeting held in Detroit on April 1 delegates representing some 250 of the leading building firms of the State organized the Michigan State Association of Builders, with officers for the ensuing year as follows:

President, Edwin Owen of Grand Rapids.

First Vice-President, John M. Feiner of Ann Arbor.

Second Vice-President, John A. Wilde of Detroit.

Treasurer, A. A. Albrecht of Detroit.

Secretary, John J. Whirl of Detroit.

The officers, with George Spindler of Saginaw and Moore McQuigg of Kalamazoo, constitute the Executive Committee.

The following declaration of principles was adopted:

1. No discrimination shall be made against any man because of his membership or nonmembership in any society or organization.

2. Subject to any rights under contracts existing between them, it is the privilege of both the employer and the employee to terminate their relations whenever either sees fit so to do.

3. Since the employer is responsible for the work turned out by his workmen, he must, therefore, have full discretion to designate the men he considers competent to perform the work, and to determine the methods under which that work shall be performed; the question of the competency of the men, and the number of foremen, apprentices, helpers and handy men, &c., to be employed will be determined solely by the employer.

4. Employees will be paid by the hourly rate, by premium system, piece work, contract, or otherwise, as the employer may elect. No limitation by fellow employees or any organization of the quantity or value of the work an employee may accomplish in a given time will be permitted or tolerated.

In the operation of any system of hours or wages now in force or to be extended or established in the future this association will not countenance any conditions which are not just or which will not allow a workman to earn a wage proportionate to his productive capacity.

A Seven-Story Two-Family House.

A rather unique dwelling of the Italian Renaissance type of architecture and designed for occupancy by two families is about being erected on East Fifty-second street, near Madison avenue, Borough of Manhattan, New York. The building will be seven stories in hight, with façade of brick, with limestone trimmings. The first floor will be given over mainly to entrance hall, reception and billiard room. The three floors above this will comprise one apartment, with dining room, library, large and small salons, half a dozen bedrooms and three bathrooms. The three upper floors will provide the second apartment, a duplicate of the other in its main features.

The basement will be fitted up for a garage, which will be reached through a passageway leading through the building from the street to an elevator capable of handling the largest motor cars. The roof of the dwelling will be laid out as a summer garden. According to the architects, Warren & Wetmore, the structure will cost in the neighborhood of $150,000, and will be erected for William K. Vanderbilt. The neighborhood is one of many fine residences, and is only a block from Mr. Vanderbilt's own palace in Fifth avenue.

Church Built from One Tree.

A large Baptist church that stands in the city of Santa Rosa, Cal., enjoys the distinction of having been constructed entirely from a single tree. Of course, that includes the woodwork of the structure. The tree from which the timbers, lumber and shingles were cut was a giant California redwood. A considerable quantity of the lumber was left over after the church building was completed. This building has a spire 70 ft. high; an audience room capable of seating 300. The building is 35 x 80 ft. There are not many buildings in the country all the timber of which came from a single tree.

THE fire loss of the United States and Canada shows an appreciable falling off from the previous month, as well as from the corresponding month of last year, the figures, according to the *Journal of Commerce*, being $16,723,300. For the first quarter of this year the total fire loss was $64,795,600, while in the first three months of last year it amounted to $64,501,200. In the corresponding months of 1906, $54,700,900. Although the fire loss for February and March of the current year was considerably under the corresponding months of the two previous years, the aggregate for the quarter just closed is in excess of that of last year by reason of the heavy loss in January, 1908, the figures being $29,582,600.

CORRESPONDENCE.

Finding Bevels in Truss Construction.

From C. G., Ithaca, N. Y.—Responding to the inquiry of "J. A. K." relative to finding bevels in truss construction with the steel square, I take pleasure in sending the following comments with explanatory diagram, Fig. 1. What he wants to know is how to bisect the angle $m\ c'\ b$. To do this lay off from b equal distances as a and a'' upon the sides of the angle $a\ b\ c'$ and square over intersecting at c'. Draw a straight line indefinitely from b through the intersection at c, thus bisecting the angle $a\ b\ c'$. The angle $a\ c\ b$ equals $a\ c'\ b$, which equals half of $m\ c'\ b$, or the required angle. Therefore, by taking $a\ c$ on the tongue and $a\ b$ on the blade the tongue gives the cut for the upper end of brace and for the straining beam.

The following equations will serve to show some of the geometrical principles connected with the proposition, and may not be without interest to the studious readers. Referring to the diagram

$m\ c'\ n = m\ c'\ a + a\ c'\ n =$ two right angles.

$n\ c'\ b = a\ b\ c'$.

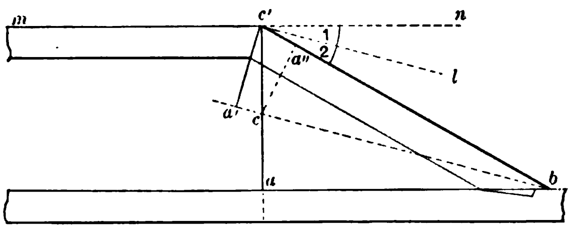


Fig. 1.—Plan Recommended by "C. G."

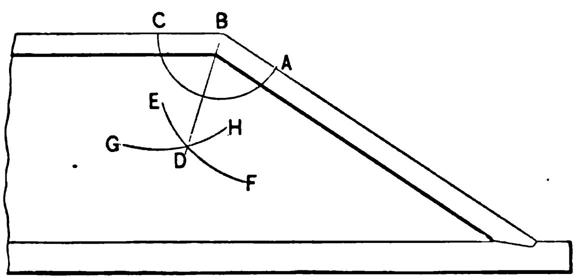


Fig. 2.—Method Suggested by "C. E. B."

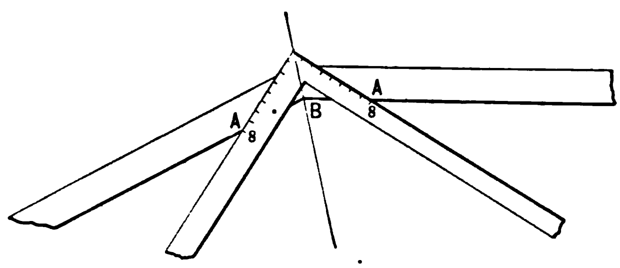


Fig. 3.—Plan Proposed by "G. A. W."

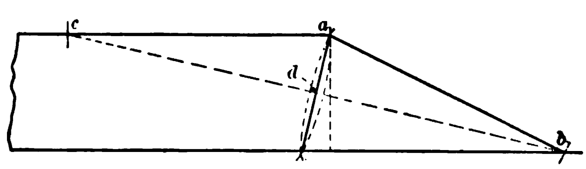


Fig. 4.—Solution of "T. J. P."

Finding the Bevel in Truss Construction.—Methods Suggested by Various Correspondents.

$a''\ b = a\ b$.

$a''\ c = a\ c$.

$a''\ b\ c = a\ b\ c$.

$a\ c\ b = a''\ c\ b = a'\ c'\ b = a'\ c\ c'$.

$a\ b\ c = a''\ b\ c =$ right angle No. 1 = right angle No. 2 $= a'\ c'\ c$.

$m\ c'\ b =$ two right angles $= a\ b\ c'$.

$\frac{1}{2}\ m\ c'\ b =$ a right angle $- \frac{1}{2}\ a\ b\ c' = a\ c\ b = a''\ c\ b = a\ c\ c' = b\ c'\ a' = m\ c'\ a'$.

Therefore one right angle $- \frac{1}{2}\ a\ b\ c' = \frac{1}{2}\ m\ c'\ b$.

Or $a\ c\ b = \frac{1}{2}\ m\ c'\ b = a\ c'\ b'$.

The trouble with Mr. Hodgson's method is in assuming that if we take one-half the rise of the brace on the tongue and the run on the blade we thus bisect $a\ b\ c'$ with the blade and $m\ c'\ b$ with the tongue, which the diagram will show to be in error. I will gladly explain anything that is obscure to "M. A. K." in this connection.

From C. E. B., Rockville, Ind.—Allow me space to give "J. A. K.," Detroit, Mich., my method of finding the bevel for all similar work. The sketch, Fig. 2, sent herewith will show at a glance that the method will work on any cut on equal sized timber. Referring to the sketch, take B as a center and with any radius strike the arc A C, or just lay down the points from which to strike the two arcs. Now, with A and C as centers and with a radius greater than the distance A B, strike the two arcs E F and G H, cutting each other in the point D. Connect D with B and the line thus produced will be the bevel for the cut of both members of the bridge timber.

From G. A. W., Pottsville, Pa.—Replying to the inquiry of "J. A. K.," I send a sketch, Fig. 3, showing my method of finding the cut of principal and straining beam in a truss. The line extending up and down represents the line of joint, while A A shows how the square is applied. The points are equidistant from B, through which point the joint line is drawn, having the point of the heel of the square in line.

From T. J. P., Greenview, Ill.—In the April issue of *Carpentry and Building* I notice the inquiry of "J. A. K.," Detroit, Mich., asking how to obtain with the steel square the bevel in a truss between the straining beam and the brace at their intersection. As an answer to this query I submit the following method, which is very simple and, I believe, absolutely correct. On paper or board draw the elevation of the truss, as shown in the accompanying sketch, Fig. 4, making $a\ c$ equal to $a\ b$. Connect $b\ c$, as shown, then bisect the angle formed by the lines $a\ b$ and $a\ c$, when $a\ d$ is then the proper bevel desired.

Now to get the bevel with the steel square take the length of $b\ d$ or $c\ d$ on the blade of the square and the length $a\ d$ on the tongue of the square; mark along the tongue and you will have the proper bevel.

Sharpening a Hardwood Scraper.

From J. J., Philadelphia, Pa.—Will some of the experienced readers of the paper instruct a beginner how to sharpen and keep sharp a hardened scraper?

Trouble with a Refrigerator "Sweating."

From Frank M. Hamlin, Lake Villa, Ill.—I note the trouble with his refrigerator of which "E. A. W.," complains in a recent issue, and will offer my suggestion for a remedy. In the first place I would make sure that the water which collects from the melting ice is drained off, as it should not be allowed to collect in the ice box or tray. The trouble is probably caused by the ice coming in direct contact with the metal sides of the box, which would cause the same action as in the case of a vessel of ice cold drinking water which, it is commonly noticed, will sweat in the same way.

In order to overcome the trouble complained of by the correspondent, I would suggest that he make a wooden crate to fit the four sides and bottom of the ice box, which will keep the ice from touching the metal. Owing to the small size of the box it will probably be necessary to make the crates of thin material, say, ½ x 2 in. oak strips, making them so that there will be a space between the strips of about 2 in., which will allow a circulation of air all around the ice.

Details of Steel Plate Girder Construction.

From M. D. H., Mt. Vernon, Ill.—I come to the practical readers of the Correspondence Department for information relative to certain details of steel plate girder construction. In the case I have in mind a 36-in. steel plate girder of 60 ft. span is loaded with a uniform load of 2000 lb. per lineal foot, and has three concentrated loads of 5000 lb. per lineal foot. It also has three concentrated loads of 5000 lb. each of distances of 20, 30 and 40 ft. from the left hand end. The end stiffeners are each riveted with 10 ¾-in. rivets.

What I want to know is what flange area is necessary at the middle and what thickness of web must be used? Assume 15,000 lb. per square inch as the allowable fiber stress and 11,000 lb. per square inch for shearing.

Answer.—In reply to the above inquiry, the 36-in. steel plate girder works out as follows:

Reactions at points of support are:

2000 lb. x 60 ft. x 30	= 3,600,000	uniformly distributed load.
5000 lb. x 20 ft.	= 100,000	concentrated load.
5000 lb. x 30 ft.	= 150,000	concentrated load.
5000 lb. x 40 ft.	= 200,000	concentrated load.

4,050,000, divided by 60, equals 67,500 lb. reaction at each point of support. Take the center of moments at the center load we find:

Positive moment equals	67,500 x 30 equals	2,025,000 ft. lb.
Negative moment equals	60,000 x 15 equals	900,000 ft. lb.
Negative moment equals	5,000 x 10 equals	50,000 ft. lb.
Total negative moments		950,000 ft. lb.

Total maximum bending moment at center 1,075,000 ft. lbs. By laying off the maximum bending moment of the uniformly distributed load as a parabola, and the maximum bending moments of each concentrated load as shown in the diagram of bending moments, using the ordinate of each construction as shown in the figure, the maximum bending moment is found to be at the center of the girder and agrees fully with the calculated bending moment; the scales are marked on the diagram.

Flange area required equals $\frac{1,075,000}{3 \times 15,000}$ nearly 24 in.

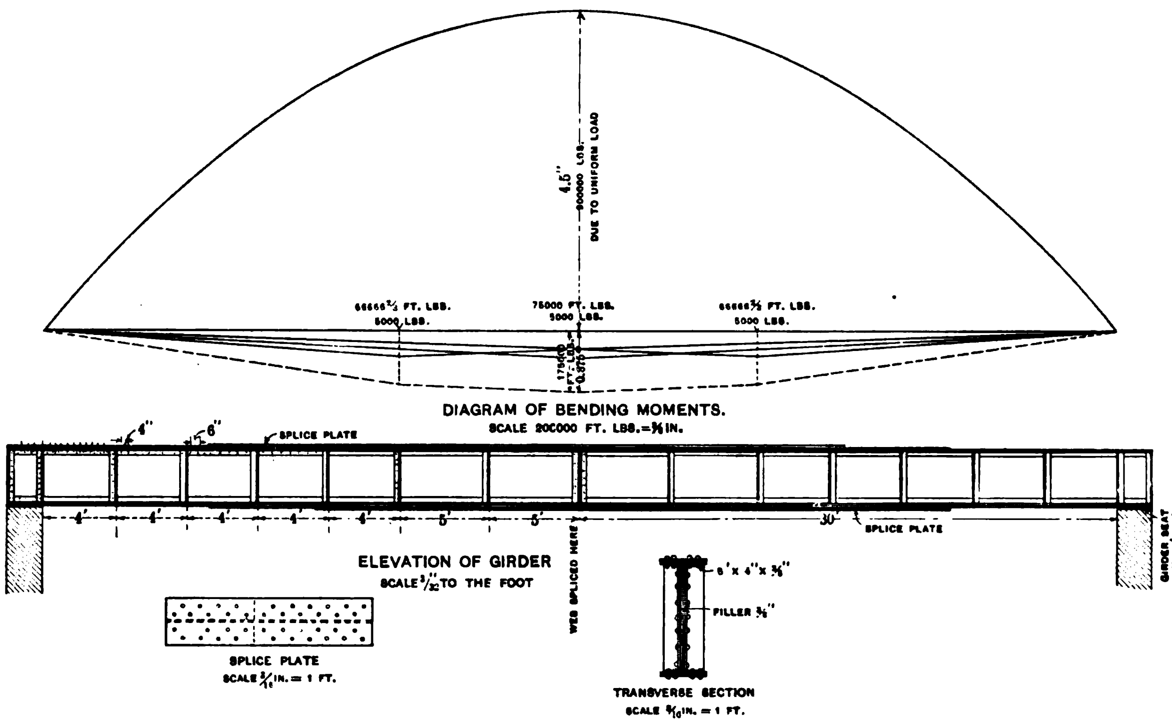
Bottom flange = 2 angles 6 in. x 4 in. x ½ in. =	9.50 sq. in.
Three plates 16 x ⅝ in. =	18.00 sq. in.
Total gross area =	27.50 sq. in.
Deduct four ⅞ in. holes through ⅝ in. plate,	1.32 sq. in.
Deduct four ⅞ in. holes through ⅝ in. angle,	1.32 sq. in.
	2.64 net, 24.86 sq. in.

Reaction at point of support was found to be 67,500 lb. Then the theoretical thickness of the web plate is equal to $\frac{67,500}{29 \times 11,000} = 0.21$ in., but such a plate would be too thin to afford a proper bearing area for the ¾-in. rivets, and the least section practicable would be ⅜-in. To arrive at the units of this calculation it was assumed that eight rivets would be deducted, thus: 8 x ⅞ in. equals 7 in., subtracted from 36 in., equals 29 in. To make it 10 rivets would increase the second figure in the decimal by two points only, and that would not materially alter the result. The bearing value for a ¾-in. rivet in a ⅜-in. plate for a shear of 11,000 lb. is equal to ⅜ x ¾ x 11,000 = 3094 lb. per square inch; maximum shear at end of girder equals 67,500 lb. Number of rivets required at point of support equals $\frac{67,500}{3094} = 22$ rivets.

It will be noticed by the correspondent that we have used the bearing value of one rivet instead of the shearing value in this case, because the bearing value is less than the shearing value, which is equal to its sectional area multiplied by its shearing stress, or 0.4418 x 11,000 = 4860. As there are to be two stiffeners at each support, there would be 11 rivets in each stiffener, and the pitch of the rivets would be $\frac{36}{11}$ or 3.27 in., which would be in accord with good practice. We should advise using two 5 x 4 x ⅜ in. stiffeners, with the longer or 5-in. leg set at right angles to the web axis on account of affording a better support to the wide flange plates.

The net area of a flange plate is ⅜ in. x 16 in. — 0.65 equals 5.35 sq. in. A fiber stress of 15,000 lb. per square inch gives a safe strength of the cover plate of 80,250 lb. The safe bearing value of a ¾-in. rivet in a ⅜-in. plate is 3094 lb., and $\frac{80,250}{3094}$ equals 26, which means that there should be 28 rivets at the end of each cover plate, and as they are in pairs, it would require seven in each row at the end on each side. For the intermediate distances the rivets may be spaced 16 x ⅜ in., or 6 in.; near the points of support up to the second set of stiffeners they should be spaced about 4 in. on centers.

The theoretical length of the first outside flange plate, or the inner plate, as it is called by some writers, is



Details of a 36-In. Steel Plate Girder of 60-Ft. Span.

equal to the length of the girder in feet times the square root of the net sectional area of all the plates, divided by the total net flange area, and to the result add 2 ft. to allow for end riveting; or, expressed by a formula, L equals $2 + 1\sqrt{\frac{a}{A}}$.

The first or inner cover plate is equal to $60\sqrt{\frac{16.05}{24.86}} + 2' = 50$ ft.

The second cover plate is equal to $60\sqrt{\frac{10.70}{24.86}} + 2' = 41.4$ ft.

The third cover plate is equal to $60\sqrt{\frac{5.35}{24.86}} + 2' = 29.6$ ft.

While the theoretical requirements of the first cover plate do not call for the plate to extend the full length of the girder, yet it is good practice to do so to stiffen the girder laterally, especially so in a girder of this description whose depth should be 5 ft. instead of 3 ft. in order to obtain the most economic section.

The unit stress allowed by the following formula: $\frac{11.000}{1 + \frac{d^2}{3000\, t^2}} = 2700$ lb., but this amount is exceeded by the unit shear of 11,000 lb. per square inch, and it will be necessary to use stiffeners throughout to insure the girder against buckling. It will be necessary to put stiffeners at every point where there is a concentrated load. A steel web plate ⅜ x 36 in. has a gross shearing value of 94,500 lb.; deduct for 11 rivets or 11 x 2240, which equals 24,640 lb., which gives a safe resistance of 69.860 lb.; as will be seen this but slightly exceeds our maximum shearing stress.

The allowable web bearing load on a ¾-in. rivet in a ⅜-in. plate is 3094 lb. The number of rivets at points of support is 22, as has been shown. Now in the web stiffener at first concentrated load it is equal to the total shear at that point divided by the bearing value of one rivet, or $\frac{22,500}{3094}$, which is equal to about seven rivets. The vertical shear at the first concentrated load is equal to 67,500 — (5000 + 40,000), or 22,500 lb. In the same way the shear at the center load is found to be 37,500 lb., and by the same method would require 12 rivets; but as can be seen from above the twelfth hole would weaken the web plate too much, and it will therefore be necessary to use two stiffeners at this point.

At this point it will also be necessary to splice the web plate. The angles can be obtained in one length. For splicing the web plate it would be advisable to use a ⅜-in. plate each side of the web plate of an area equal to the shearing stress at the center—viz., 37,500 lb., which equals the resistance of $\frac{37,500}{3094}$, or 13 rivets, say 14 rivets, placing seven each side of the joint, use a plate 8 in. wide, which will fit snugly between the flange angles and act as a filler between the two middle stiffeners.

The first cover plate will also have to be spliced; use a plate 16 in. wide by ½ in. thick. The net area of the inner plate is 5.35 sq. in. and its safe strength at 15,000 lb. per square inch equals $\frac{80,250}{4860}$ which is equal to 19, say 20, rivets through the splice plate on each side of the joint. These rivets will be spaced with a pitch of about 4 in. The splice plate should be placed close to the lower end of the lower plate, and the joint in the upper flange being placed at the other end in a similar manner.

In the illustrations provided to explain the answer to this problem there is shown a diagram of the bending moments, in which the bending moment for the uniformly distributed load is worked out by means of the parabola above the girder and the other moments due to the concentrated loads below, so that a vertical line measured at any point between the extreme lines top and bottom, by the designated scale, will give the bending moment at that point. The vertical elevation will show the distribution of the stiffeners and the location of the splice plates. The plan of the splice plate for the first cover plate is shown in detail, also a detail section of the girder. C. P. K.

Building on the Percentage Basis.

From J. J., Philadelphia, Pa.—In the March issue of *Carpentry and Building* for this year a correspondent tells about erecting buildings on the percentage plan. Will he kindly tell me what per cent. is generally charged for doing work in that manner?

Note.—We trust our friends among the contracting builders will express their views freely on this subject as it is one which is at present attracting a great deal of attention.

As regards the percentage charged for doing work on this plan, it may be stated that practice differs in various sections of the country, the rate being governed by conditions, but not necessarily by the amount of the contract. Some builders state that on a job of $10,000 or more the percentage may vary from 5 to 20 per cent., depending altogether upon circumstances under which the work is to be done.

The field for discussion opened by the inquiry of our correspondent above is one affording excellent opportunity for an expression of opinion, and we trust our practical readers will freely avail themselves of it.

More Power for a Carpenter's Shop.

From G. C., Malden, Mass.—If "J. E. D.," Milton, Iowa, whose communication appears on page 99 of the March issue of the paper, will belt direct to shaft under the floor and do away altogether with his flywheel and shaft overhead he will get the power for which he is looking. I would state, however, that in my opinion 2 h.p. is too small to run so much unnecessary shafting.

From T. G. P., Oil City, Pa.—I would say to "J. E. D." of Milton, Iowa, whose inquiry appears in the March issue, that he take out his overhead line shaft and put it in the place of the short shaft under the floor, then place the engine so that there is from 12 to 16 ft. distance between the main shaft of the engine and the line shaft, making sure that there be not less distance than this. He should then run his main drive belt horizontally; place tight and loose pulleys on the level shaft; put the flywheel on the line shaft between the two machines, or else place a small flywheel on each arbor of the machines and get the belts good and tight. They should not, however, be too tight, as in that case there will be too much friction and strain on the boxes. By this arrangement the correspondent will get more power from his engine, although, in my opinion, the latter is too small for his machines. It should be at least 3½ to 4 hp.

The way he has his belting and shafting arranged at present develops too much friction and is too much of a drag on the engine. The flywheel as now placed is no help at all, but instead is a drag. The more horizontal the belts the better the machines will run. Counterbelts from line shaft to machines should be not less than 8 ft. long. Perpendicular belts have little power. Belt slipping can be overcome either by increasing the size of the drive wheel or else by drilling several ¼ or ⅜ in. holes in the rim of the drive wheel, these giving additional grip. Use good oil and good babbitt.

From H. M. S., Winsted, Conn.—I have a shop 24 x 40 ft., similar to that of "J. E. D.," which I operate with a gasoline engine. I run a saw and dado machine, molding machine, a jointer, a turning lathe and two boring machines. My shaft is under the floor, and I belt from the engine to the shaft and belt my machines from the shaft under the floor. If "J. E. D." will do away with his overhead shaft he will save a lot of power that is now wasted, and will have no trouble with his engine. If he lacks speed he can use a larger pulley on the shaft to run his machines. If he knows how fast his engine runs and how fast he wants his saw to run he can figure how large his pulley must be in order to give the required speed. As he wants to know where to put the flywheel I would say "put it on the dump heap," as that is the best place I know.

Cutting Louvre Boards for a Circular Window.

From A. S. M., Loocootee, Ind.—I inclose herewith a drawing showing a circular louvre frame. The boards are dadoed into the jambs at an angle of 45 degrees, as shown. What I want to know is, how to obtain the shapes of the boards at their intersection with the jamb, and also how the jamb would be developed. Is there any formula by which this problem can be worked out?

Answer.—There is a department of geometrical science known as "descriptive geometry" whose principles can be employed to solve this, and in fact any other problems involving the finding of shapes and angles, with which the carpenter and joiner is likely to be confronted. An understanding of its principles will place within his grasp the solution of all problems of a geometrical nature connected with the construction of roofs, stair rails, &c.

Figs. 1 and 2 of the accompanying illustration are reproduced from our correspondent's drawing, and are self-explanatory. In Fig. 3 we show how the methods of descriptive geometry are employed in obtaining the shape of one of the boards. The operation here explained will have to be performed separately for each board and should be done upon the full size drawing, of which Fig. 1 is a reduction, in order that the proper relation of the profile or section of each board with the curve of the jamb may be maintained. In Fig. 3 the width of the louvre board is much increased relatively to the radius of the jamb, so as to make the operation appear more clear. First divide the line representing the upper surface of the board in the section into any convenient number of equal spaces, as shown by the small figures, 1 to 7, and from each point project lines horizontally to intersect the curve line A B, which represents the bottom of the gains in the jamb corresponding with the line A of Fig. 2. In any convenient position above or below the

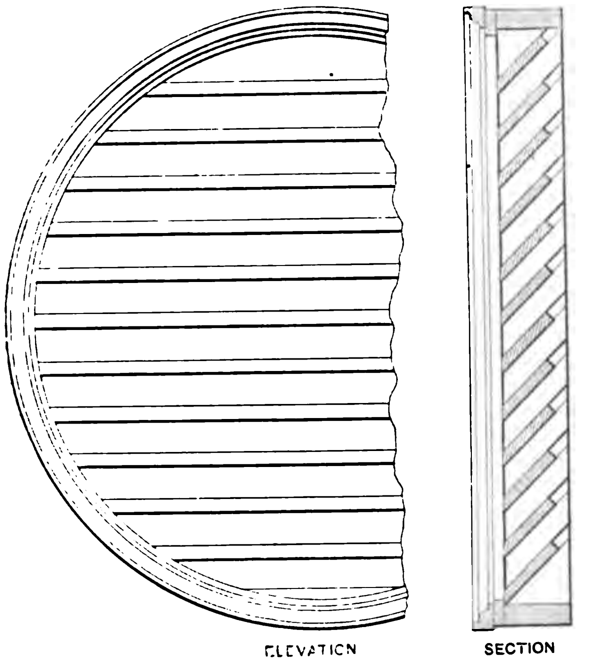


Fig. 1.—Half Elevation and Section of Circular Louvre Window Sent in by Our Correspondent.

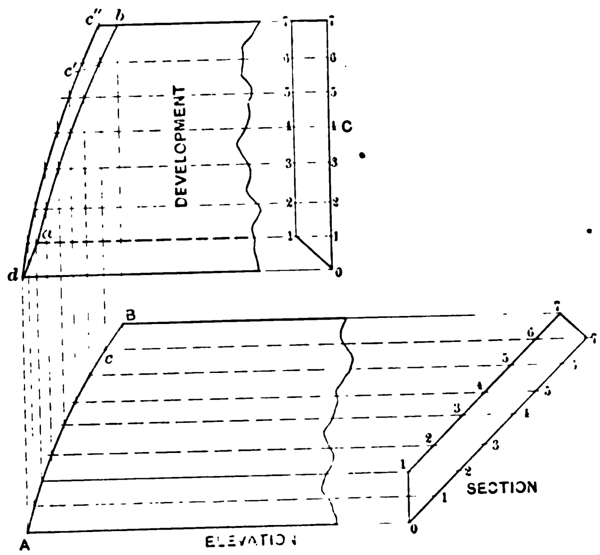


Fig. 3.—Method of Obtaining Shape and Bevel of Louvre Board in Upper Half of Circular Window.

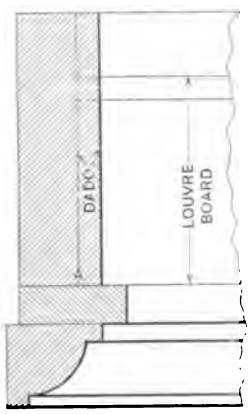


Fig. 2.—Section Through Jamb of Window. —Scale, 3 In. to the Foot.

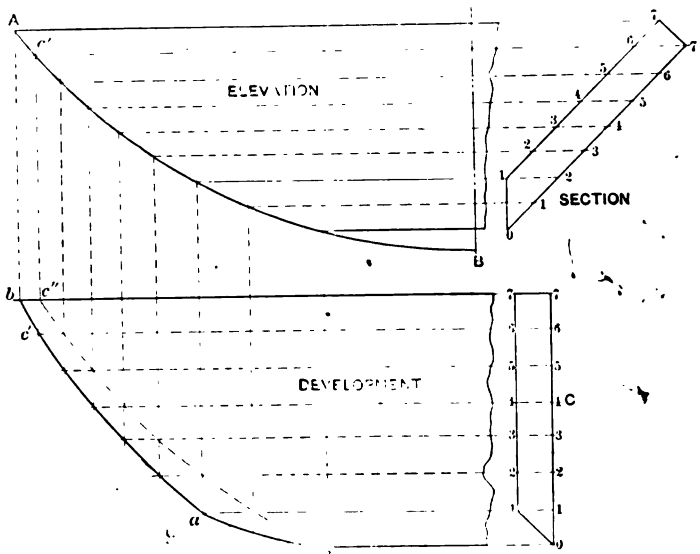


Fig. 4.—Diagram Showing Development of Lowermost Board in Window.

Cutting Louvre Boards in a Circular Window.

sectional view construct a duplicate of the section as at C, placing it so that the face of the board shall be in a vertical position, and divide its surface into spaces corresponding with those of the first section. From each of the last named points of division draw lines, extending them indefinitely into the space above A B, and from each of the points on A B erect a line vertically to intersect with line of corresponding number coming from section C. A line traced through the several points of intersection as shown from *a* to *b* will give the required shape of the end of the board on its upper surface.

Since, of course, the lower face of the board will strike a different part of the curve of the jamb, this operation will have to be repeated to obtain the shape of the board on its lower surface, all of which is shown in the drawing. Any set of spaces will answer the purpose, but it will be found very convenient and less confusing to use a space in dividing both surfaces of the board in the section, which is equal to the thickness of the board. Then, since the board stands at an angle of 45 degrees, each point on its lower face will fall upon the same line as the point of next higher number on its upper face, thus avoiding a multiplicity of lines. Thus the line from point 6 on the upper face and point 7 on the lower face intersects A B at *c*, whence a line is carried upward to cut the line drawn from 6 on the upper face of section C at *c'*, and to cut the line from 7 on the lower face at *c''* of the development. A line traced through the intersections obtained from the points on the lower face of the boards is shown by *c'' d*, and the space between it and *a b* shows the amount of bevel which the board must have to make it fit perfectly against the bottom of the gain or dado.

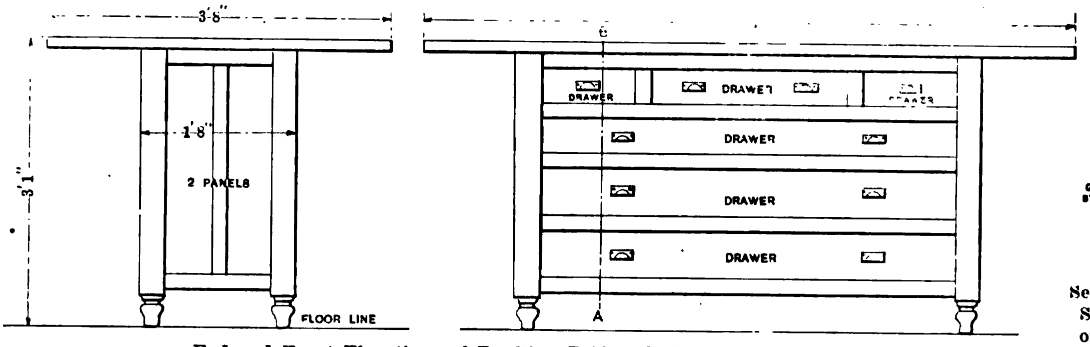
An inspection of these lines shows that the amount of bevel on the ends of the boards increases toward the top, and that therefore these lines must come together in the board which crosses the window at its widest part, and further that while the boards above the center of the window are longest on their lower faces, the boards below the center will be longest on their upper faces. Fig. 4 shows the development of the lowermost board of the window, in which the same reference letters and figures have been used as in Fig. 3, so that the description above given of Fig. 3 is equally applicable to Fig. 4, except that in Fig. 4 the development has been for convenience placed below the elevation instead of above it as in Fig. 3.

With reference to the development of the lines upon the jambs for cutting the gains, a development of them could, if necessary, be made upon paper or a piece of cardboard, so that the paper could be bent around against the curved surface of the jamb and the lines scribed thereon; but the lines on the jamb could more easily be obtained by holding each louvre board after its ends have been cut to shape, as shown in Figs. 3 and 4, in its proper position against the jamb, and then scribing around it.

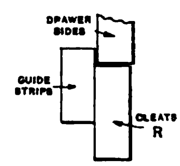
Details of a Draftsman Table and Cabinet.

From W. F. Gernandt, Fairbury, Neb.—The drawing table which is shown somewhat in detail on the accompanying blue print is the style used in this office, and it has been found very satisfactory in every way. It is of such a nature as to meet the requirements of the case and it is possible that other readers of the paper may be interested in the table, and I, therefore, send the sketches for publication if the editor so desires.

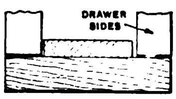
Note.—We are always gratified to receive from our interested readers matters of this kind, as they are of practical value to many in that they afford the basis of suggestions of value to those desirous of making something similar for their own use. We trust the correspondent above will see fit to contribute other suggestions of a practical nature which may come under his observation.



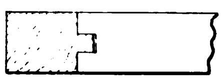
End and Front Elevations of Drafting Table.—Scale, ½ In. to the Foot.



Section of Drawer Slides on Line O-O of Plan.—Scale, 3 In. to the Foot

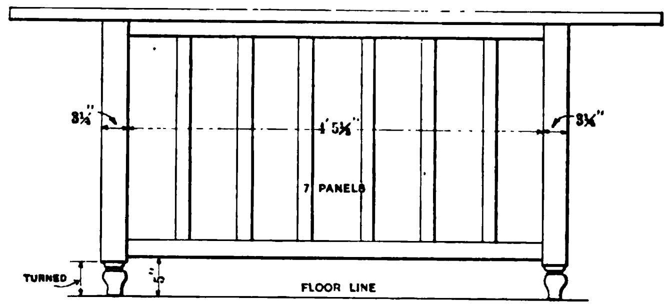


Section of Drawer Slides of Line P-P of Plan.

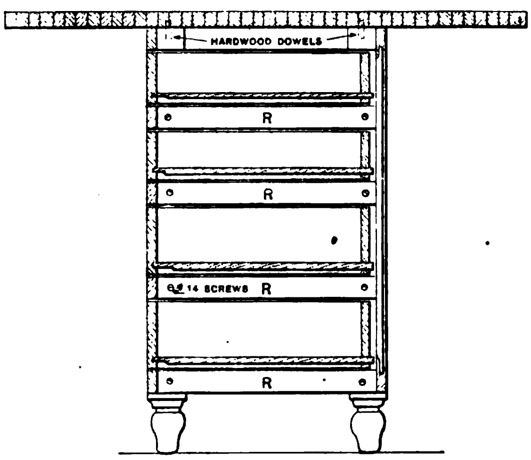


Section on Line X-X.

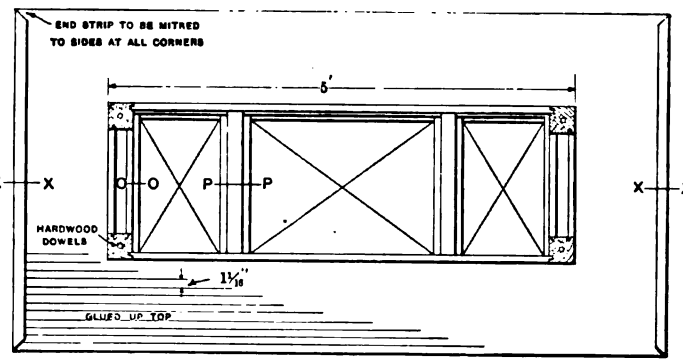
Scale, 3 In. to the Foot.



Rear Elevation of Table.



Vertical Section Through Table Taken on Line A-B of the Front Elevation.—Scale, ½ In. to the Foot.



Plan of Table Top and Horizontal Section at Top of Cabinet.—Scale, ½ In. to the Foot.

Details of a Drawing Table and Cabinet.

THE ART OF WOOD PATTERN MAKING.—V.

By L. H. Hand.

WE shall next consider the pattern which was worked out on my own bench for a gooseneck throttle, shown in Fig. 65, and which was made to take the place of a slide valve throttle discovered to be defective after the engine was sold and promised for shipment. Being pressed for time I avoided glue joints as much as possible and produced a pattern by cutting it from solid plank doweled together as indicated in Fig. 66. On the ends of the patterns, as *a b c*, I laid out the working lines with the dividers, taking off all measurements from the working drawing, Fig. 67. In order to insure accuracy over the curve at the elbow I cut a reverse pattern of the outside radius of the pipe, shown in Fig. 68, and using this as a guide carefully pared away all surplus wood. In this work perfect accuracy is indispensable in order along the center A and C and at the corner of B, as indicated at *d*. Under certain conditions it might be desirable to make this pattern entirely in the lathe, as in case where ample time could be allowed for glue joints to dry or in making new work where it was desirable to have absolute accuracy in every part, as it will readily be admitted by any practical woodworker that it is difficult for the hand alone to compete with the lathe in accuracy. Owing to the fact that the art of wood turning has been very ably treated in the columns of *Carpentry and Building* recently, I have not thought it advisable to consider this subject in detail. However, the very nature of his work makes it imperative that the patternmaker be an expert wood turner. Nevertheless he will not come into competition with the cabinet turner, who, by the use of

Fig. 65.—A Gooseneck Throttle.

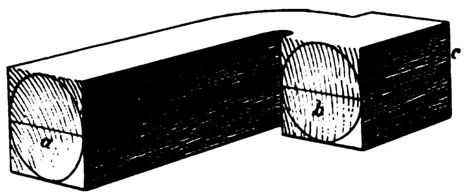


Fig. 66.—Block from Which Pattern Is Made.

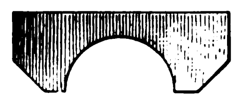


Fig. 68.—Reverse Pattern of Outside Radius of the Pipe.

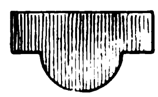


Fig. 70. — Thin Wood Pattern of Inside Radius of Pipe.

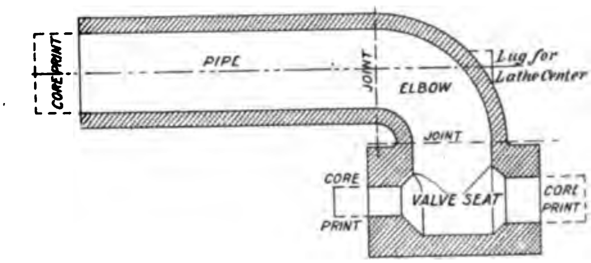


Fig. 67.—The Working Drawing.

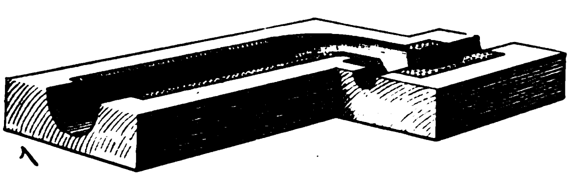


Fig. 69.—Half of the Core Box.

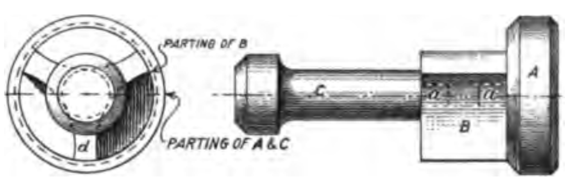


Fig. 71.—Details of Throttle Valve.

The Art of Wood Pattern Making.—V.

to avoid thin places in the pipe, which is subjected to a high steam pressure.

Having satisfactorily finished the elbow, the core prints were turned up and glued on, making the prints correspond in size to the projecting portions of the core, as indicated in the working drawing or sectional view, Fig. 67.

The next step is to produce a suitable core box, which must be an exact reproduction of the hollow portion of the casting, together with the core prints, as shown in Fig. 67, which core box, not being reversible, as is the case with straight cores, must be made in the shape of two half boxes doweled together. My way of making this box is to cut a cardboard pattern of the core and prints as shown in Fig. 67, which is then easily laid out on the face of either half of the core box, Fig. 69. In cutting out this core box it is necessary to provide a thin wood pattern of the inside radius of the pipe, Fig. 70, to insure accuracy in cutting out the surplus wood around the elbow.

The throttle valve was made in three pieces, which will be understood after an examination of Fig. 71, where A and C were turned, while B from its peculiar cross section, which is shown at *d*, was cut out with the band saw. The parts were fastened together with tenons and glue, as indicated at *a a* of the illustration. It will be seen that in molding this piece a trowel parting is made marks on the lathe rest, gauges, &c., and a certain skill of eye and hand acquired by long practice, is enabled to turn out a prodigious number of spindles, balusters, table legs, &c., which to the eye present enough similarity to appear exactly alike. In many cases cabinet work is done by the piece, while the patternmaker is always paid by the hour. The cabinet turner's work is probably inspected by the foreman and passed from the general appearance of such pieces as are in sight when the day's or week's work is done, while the work of the patternmaker is subject to the closest scrutiny in every part, determined by the callipers and rule of the inspector, or, what is of far greater moment, the casting itself, or a number of castings, may be found deficient in stock in a certain place by the machinist, who attempts to plane or turn them up. In this case the pattern and casting become simply scrap and a dead loss to the concern and possibly the loss of his job by the patternmaker.

To make this pattern entirely in the lathe it is necessary to construct it in three sections, the latter being joined together, as indicated by the dotted lines in Fig. 67. In order to make it more easily understood I have marked each section by a different name as, for example, pipe, elbow, valve seat, &c. The first operation is to prepare a block of suitable size and length to turn up the pipe and valve seat, the dowels being so arranged that each part will have one or more dowel pins in it. Then with the working drawing as a guide turn up the required portions with their core prints, as shown. Next, fit two blocks to the side of the piece for the valve seat for joining the elbow to it, making the joint in the block correspond with the joint in the valve seat, as in Fig. 72. Procure a plank of sufficient thickness to turn up the elbow which may require to be glued up of two or more thicknesses of thinner stuff, in which case it will improve the job to cross the grain in gluing up provided always that the lumber is "bone dry."

From the plank so prepared turn up the ring, Fig. 73, using a thin wood pattern of the radius shown in Fig. 68 to insure perfect accuracy in the work. Two quarters of this ring form the elbow, which is then secured to the pipe and valve seat with glue and long dowel pins. When thoroughly dry fit a small projecting lug to the pattern, as indicated at *a*, Fig. 67, for holding the lathe center when the casting comes to the machine shop. In turning out the elbow for the core box a groove of the diameter and radius of the required core is turned into a square block of sufficient thickness, using the pattern, Fig. 70, to test the accuracy of the work. Two quarters of this block make the core box and the other quarters are wasted, but the greater accuracy and less time required by the lathe

hand and a handle for the right hand of the workman. Probably the best way to make this pattern is to part the mold along the bottom of the plane, making almost the entire casting in the drag. However, it can be parted through the center of the knob and handle and cast half in the drag and half in the cope.

We will consider the first method only. The first thing in order is the working drawing, Fig. 74, which informs us that we must prepare a square block exactly the size and shape marked "core print." This block must have draft toward the top, which can be made by applying a try square to the bottom and dressing away just enough material from the side and end so that daylight will show at the farther side between the blade and the wood. Next glue thin pieces to the sides of the prepared block to represent the metal required in the sides of the plane and to the bottom the thickness required for metal on the bottom. In the center of the bottom dowel a strip to make the tongue, which engages the groove in the wood bottom, which should be left loose for the convenience of the molder. This strip does not need to be cut at the throat of the plane, but must be painted light at *a*, Fig. 74, thus making a print to receive the projection of the core.

It will be noted that the molder will have to dig out the sand at *b b*, Fig. 74, so that the pattern can be withdrawn from the drag, which could be avoided by cutting off the core print at either end of the metal. However, the tendency of the core to vary from its proper position

Fig. 72. — Joint in Block Corresponds with Joint in Valve Seat.

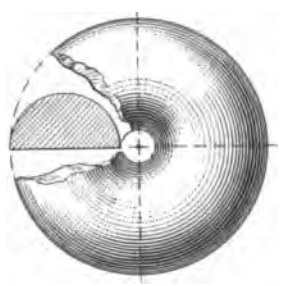


Fig. 73.—Detail of the Ring.

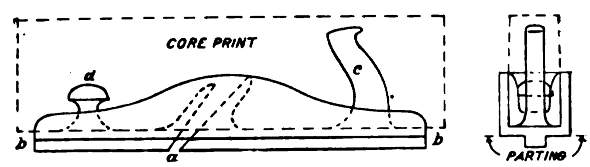


Fig. 74.—Making Pattern for Hollow and Round Plane.

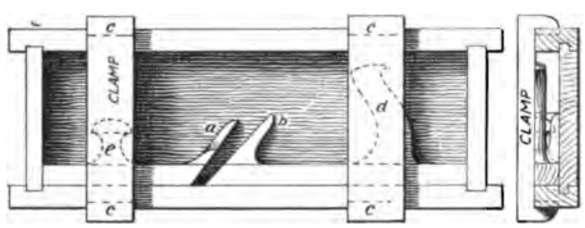
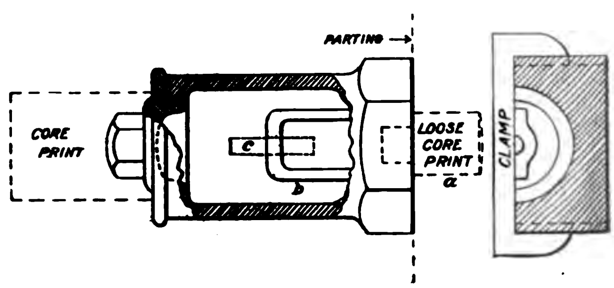


Fig. 75.—Top View and Cross Section of Core Box.



Figs. 76 and 77.—Pattern for Ordinary Oil Cup.

The Art of Wood Pattern Making.—V.

method well repays the loss of lumber. As a matter of fact, gleaned from actual experience in shops where every size of pattern is made ranging from oil cups up to engine saddles, drivers, &c., there need be almost no waste of material from scrap if care is used to look the scraps over for all small and medium sized patterns. However, as a rule in this day of exorbitant prices for strictly clear cork pine there is entirely too much good stuff hauled to the boilers by the laborer who cleans up the shop. If I were a young man I would study this matter carefully as a means of rising in the estimation of my employer, being an old man I both study and practice rigid economy of material "to hold my job."

By referring to page 58 of the February issue of *Carpentry and Building* for the current volume the reader will find the patternmaker's hollow and round plane, Figs. 17 and 18, which constitute a good illustration of the subject in hand and will be well worth the time and trouble of producing to any one who expects to make a specialty of pattern making. It will be noticed that the excellence of the casting produced by this pattern will depend entirely upon the skillful manner in which the core box is made. The outside of the casting presents little more than three plain surfaces, while inside must be provided with a seat for the bit, projections for holding the wedge, and may also embody a knob for the left

in the mold with the shorter core print will hardly justify the latter method. In considering the best method of construction for the core box, we decided to make a box, as shown, by the top view and cross section in Fig. 75. This box was of the exact length of the core, the exact depth of one-half of the core, and the exact width of the space between the top of the core and the point *a* of Fig. 74. Into this box we fitted loose pieces, making a joint at the front of the throat of the plane and cutting away enough wood from the back piece to form the core, which divides the metal at the point *a* in Fig. 74. To the bottom of the box we secured the projecting parts representing metal indicated at *a b* of Fig. 75, and into the outside we cut gains *c c c* to hold the clamps exactly in their proper position. We next cut out the handle *c* of Fig. 74, so that it would divide in the center and secured it in its proper position on the under side of the clamp *d* in Fig. 75. We then turn up the knob *d* in Fig. 74, which was split in two with an extremely thin back saw with no set, which we keep for such work. This also was secured to the under side of the clamp, as shown, at *e* in Fig. 75.

I have only described the making of half the core box. There will necessarily be two, one right and one left, the core parting being exactly at right angles to the parting in the sand. The advantage of making the core box in this way is that a perfectly square core can be produced. The box readily comes apart, and the clamps being of different widths cannot be exchanged and a mistake or misunderstanding arise. Of course, in work of this description great care must be taken in painting the parts. Natural wood represents sand (core), and black represents iron.

There may be different or even better ways of making this pattern, but the one here described renders it plain for the molder, who is a very important personage to be conciliated when it comes to holding a job in a pattern shop, and while perfectly plain patterns are sometimes carelessly painted and no fault found with them, it is a safe rule to paint the exact shape of the metal on the face of core boxes and the exact shape of the core in the parting of hollow castings. Patterns for brass are always painted the reverse of those for iron. When work is designed so that it is hard to understand or difficult to draw out of the sand there is liable to be a noise in the foundry. As molders and coremakers do a great deal of piece work it is safe to "pat them on the back" once in a while and make everything plain and easy for them.

The ordinary oil cup shown in Fig. 76 presents some features worthy of consideration aside from the fact that its diminutive size requires considerable skill and care in construction. It embodies the peculiarity of having a core completely incased in another core, and while in practice the hole in the valve support could easily be drilled, it is real handy to know how to do it in case of an emergency. I have a kind of back attic in my cranium where I store away many little "kinks" that have appeared in *Carpentry and Building* since the first volume was published, and I remember a little item that came out about a quarter of a century ago regarding kerfing and bending without a form. I never think of this until I want to bend the bottom rise of a stairway around the newel post, and then it "bobs up serenely," serves my purpose and retires to its den. The little imp just spaces off my kerfs for me, and I pull the plank until the kerfs close. It never misses enough for the eye to detect.

Another long forgotten correspondent illustrated the whole science of stair railing by folding three little scraps of paper in a peculiar way. I theoretically folded up these little scraps and can produce them on short notice. They have earned me many a good dollar and I would not trade them now for the best book on hand railing ever published—and I have read a few of the books, too.

But to proceed: Consulting Fig. 76, which for convenience I have drawn in part sectional, it will readily be seen that this pattern can be parted through the center and cast half in the cope and half in the drag by extending the core print to a length so that the print is heavier than the core. I part it at the base line and cast all but the lug *a* in the drag.

We will not devote any space to the pattern or cap which it will be seen is only a simple job of lathe work, except the hexagonal knot and base, which are shaped with a firmer chisel using a bevel set at 30 degrees angle. Make the core box as indicated by the dotted lines and the inside of the casting, Fig. 76. To the top of it fit a clamp. Fig. 77, and to the under side of this clamp secure a half pattern of the valve support *b* of Fig. 76 with the core print *c* of the same figure. Make a little core box for the part marked *c*, which is the core entirely concealed within another core, all of which will be readily understood from an inspection of Fig. 77, which represents a cross section.

Unique Design of Tenement House.

AN unusual design of tenement house for the utilization of an irregular shaped 25-ft. lot has just been filed with the Bureau of Building in the Borough of Manhattan, New York. The plans call for a six-story structure to meet the requirements of the tenement house law on the matter of light and ventilation, the design as shown being in reality two separate buildings about 21 and 31 ft. deep, respectively, divided above the first story by an open court 13 ft. deep. The ground floor will be occupied as a store, while at the second story will be a combination window that may be turned into a door 7 ft. high and 4 ft. wide, giving access to the roof of the store where it crosses the open court, thus establishing ready communication between the two sections of the building. This novel combination of window and door was adopted to meet the directions of Tenement House Commissioner Butler to "improve means of escape in case of fire."

The "Buyers" Club Building.

A rather interesting type of business structure at present under way in St. Louis, Mo., embodies a number of practical features never before carried out on such an extensive scale. The building will cover an area 234 x 324 ft., and will be 18 stories in hight, with a tower extending 10 stories above the building. It will be known as the Buyers' Club Building, and according to the estimates of Architects Eames & Young of St. Louis, will cost in the neighborhood of $4,000,000. It will occupy the entire block bounded by Seventeenth, Eighteenth, Chestnut and Pine streets, and will be within one block of the St. Louis Union Station.

The building will be given up entirely to the display of merchandise with the exception of the top floor, which is to be furnished for club purposes exclusively for visiting buyers, convention delegates, &c., while the tower will contain offices. The club floor will comprise a convention hall with committee rooms, &c., the use of which will be given over, together with all the club privileges, to visiting buyers and to conventions where the delegates are in a position to buy goods or influence their purchase. The structure will be thoroughly fireproof, with floors of the corridors and public places paved in marble, tile and mosaic. All interior doors and trim will be of steel and copper, and elevators and stairs will be protected by inclosures of metal and wire glass.

The main floor of the building will be devoted to exhibiting, demonstrating, advertising and retailing departments; the first floor to building supplies, including brick, terra cotta, concrete, sash, doors, mill work, cabinet work, roofing, architectural ironwork, bathroom equipment, fireproof doors and casings, concrete reinforcing systems, heating apparatus, &c. The second floor will be devoted to hardware and sporting goods; the third floor to house and hotel furnishings; the fourth to foodstuffs, groceries and confectioners' supplies, and other floors to various classifications of goods covering a wide range.

Rules for Those Who Live in Flats.

A rather remarkable clause is contained in the will of a wealthy landlord, who died in Berlin a few weeks ago, and which, if applied to some of the flats in this country, would prove a blessing to people who desire quiet in the building during the day, and especially at night when rest and sleep are imperative. The testator in question bequeaths a large number of flats to his heirs on the condition that they do not let them to persons keeping servants, or having children, dogs, cats or birds. Tenants may not be engaged in night work which will cause them to return home while the other occupants are sleeping.

One musical instrument is permitted in each flat, but no flowers may be placed on the window sills, and the tenants must sign an agreement to wear slippers indoors.

THE interior illumination of the household is still being given a great deal of study, as occasion was had to remark some months ago in these pages. The public is not educated sufficiently in respect to the proper protection of the eyes against faulty artificial lighting, but it is very tender with regard to the amount of the lighting bill. The adaptation of the different kinds of lights, so that at the one time the eyes are safeguarded, desired decorative effects are obtained, and light is not wasted, should be a profitable line of study for those identified with house lighting.

WHAT BUILDERS ARE DOING.

WHILE a survey of the country's building situation reveals a continued shrinkage in the value of improvements for which permits were issued in the principal cities in March, yet a source of gratification is found in the fact that the percentage of decrease as the season advances is steadily, though very slowly, growing less. From the smaller places and especially the interior come reports of prospects of growing activity the present season, more particularly in the way of dwelling houses and unpretentious structures for business purposes. In the larger cities almost without exception the falling off in the valuation of the projected improvements as compared with last year is very heavy, especially in Greater New York, Cleveland, Detroit, Pittsburgh, Buffalo, Cincinnati, Minneapolis and St. Paul. It will be noted that the decreases are found largely in those cities where building has heretofore been active for a considerable period, so that the figures for the past month compare with previous large totals. One notable feature of the statistics covering the month of March is that, notwithstanding the heavy shrinkage in the value of the projected improvements, the number of permits issued in that month this year and last are practically the same, showing that the activity is made up largely of smaller work.

Atlanta, Ga.

In view of the fact that building materials have fallen off in cost something like 15 to 20 per cent., as compared with a year ago, there exists quite a general feeling that activity will soon increase, and that by July 1 the volume of operations will compare favorably with 1907 of the same date. The showing for the first three months of the current year does not compare favorably with the first quarter of last year, due, no doubt, in large measure, to the uneasiness which has been general all over the country. According to Inspector of Buildings Ed. R. Hays there were 403 permits issued by the Department in March for improvements, estimated to cost $284,737, which in value is just about double what it was for February, and practically the same as that for January. Compared, however, with March last year the showing is about 50 per cent. less. Then there were 331 permits taken out for building improvements, costing $560,876, and for February last year there were 310 permits issued for improvements, costing $610,411.

For the first quarter of the current year there were 944 permits issued for new buildings and improvements, estimated to cost $683,139, while in the corresponding period of last year 1025 permits were taken out for buildings, estimated to cost $1,656,184. From this it will be seen that the shrinkage the first quarter of this year is about 60 per cent., as compared with the corresponding quarter a year ago.

Boston, Mass.

At the second annual meeting of the Master Carpenters' and Woodworkers' Association of Greater Boston officers were chosen for the ensuing year as follows:

President, Thomas T. Tracy.
Vice-President, William I. Brown.
Treasurer, George W. Macaulay.
Secretary, Arthur W. Joslin.

The Executive Committee consists of Charles H. Belledue, Angus Macdonald, Benjamin Pearson, Henry Howard and M. Frank Lucas.

The association at the present time has a membership of something over 150, and employing in the aggregate approximately 2500 carpenters in normal times.

The wage scale and working conditions as adopted by the association for the ensuing year are that wages after May 1 will be on the sliding scale system, with a maximum of 44 cents per hour, the men being paid according to their worth. All overtime, except for Sundays and legal holidays, for which the association will pay double time, will be paid for as time and a half, and Saturday half holiday will be granted from June 1 to October 3, with loss of pay. The association has declared for and intend to maintain the "open shop" system.

While there is considerable agitation in the carpenters' unions looking for 50 cents per hour as the standard wage, it is regarded as very doubtful if any demand will be made to enforce an increase to this figure just now, on account of the very adverse conditions existing in the building industry.

Buffalo, N. Y.

The month of March has shown some signs of improvement in the building line, but prices of all materials entering into construction remain about the same as heretofore. The value of the new work projected was just about one-half in March what it was in the same month last year, although there is not the same difference as regards permits issued.

According to the figures of Deputy Building Commissioner Henry Rumrill, Jr., there were 216 permits issued in March for building improvements, costing $440,000, whereas in March, last year, 246 permits were taken out for improvements, costing $850,000.

For the three months of the current year there were 453 permits issued by the Department, involving an estimated outlay of $986,000. These figures compare with 531 permits issued in the first quarter of 1907, calling for an estimated outlay of $1,649,700.

Chicago, Ill.

The local building outlook for the year 1908 appears to rest upon a very substantial and satisfactory basis. When allowance has been made for the unsettled financial condition that has existed since the panic of last fall, the number of permits issued by the Department of Buildings compares favorably with other years. In comparing these figures, however, one must not lose sight of the fact that the present is a presidential year. Although the disposition of those interested in the building industry appears to be of a conservative nature, yet there is considerable confidence manifested as to the future and the general feeling of builders seems to be much more of an optimistic than of a pessimistic nature.

Estimates taken a year ago and again recently upon the same buildings show a saving in the contract price of 10 per cent. or even more. All materials are lower than a year ago, especially brick and lumber. Labor is ostensibly receiving the same wage as obtained a year ago, and employers claim that for the same amount of money expended a greater amount of work is produced.

According to Commissioner of Buildings Joseph Downey, permits were issued in March to the number of 1104, covering building improvements having a frontage of 27,062 ft., and estimated to cost $4,829,300, while in March, last year, permits were issued for 1083 buildings, having a frontage of 28,158 ft. and costing $5,906,400. The increase noted in the number of buildings shows considerable activity in smaller operations, such as dweling houses, apartment buildings, factories and other structures of moderate size. For the first three months of the current year, there were 2100 permits issued for buildings having a frontage of 54,250 ft., and an estimated valuation of $11,033,950, while in the corresponding quarter of last year, 2119 permits were taken out for buildings having a frontage of 57,344 ft., and involving an estimated outlay of $12,530,950.

There is an impression that as soon as the season is fairly under way there will be considerable more buying of real estate, and building operations will be carried on among investors of moderate means. Architects declare that there are very few speculative deals upon the boards, the great majority of business now going out being of a character that promises to go forward to completion. The proposition of a new county infirmatory building for Cook County having carried at the recent municipal election, work on this project will go forward without delay. The construction will involve a large expenditure.

The first week in April the Chicago Architectural Club held its annual exhibition at the Art Institute, the showing being the best yet made by the club. One of the exhibits which attracted much attention was a plaster model of the main facade of the Supreme Court Building at Springfield, Ill., of which structure W. Carbys Zimmerman is the architect.

Cincinnati, Ohio.

While the number of permits for building improvements thus far the current year are about the same as last year, the amount involved is smaller, which shows that most of the improvements are of the nature of dwellings and small business structures. The larger improvements appear to be held back by reason of general business conditions. Building materials show little, if any, change, although there has been a decline of about 10 per cent. in the prices on lumber. Labor conditions are somewhat better, and there is a feeling of hopefulness, although the statistics issued from the office of the Building Inspector cannot be said to afford the basis for it.

In March 599 permits were issued for building improvements, costing $428,340, while in the same month last year 476 permits were taken out for improvements, involving an estimated outlay of $659,463, a falling off of more than 30 per cent. For the first quarter of the current year there were 952 permits taken out, as against 1062 in the same time last year, while the value of the building improvements were $926,050, as compared with $1,492,971 in the first quarter of 1907.

Cleveland, Ohio.

The building outlook in Cleveland for the coming season is far from satisfactory, and contractors and architects are looking for a quiet year. Although the weather was more favorable than usual during the early spring months for starting building operations, only a small amount of work was commenced. The only line of building that is starting out with any activity is medium priced residences, although operations in this line are expected to show considerable falling off as compared with a year ago. Some contracts have been closed for the erection of small store buildings, but there are very few commercial or factory buildings planned. As far as can be learned there is not a project under consideration for the erection of a single large office building. In the erection of apartment houses, large numbers of which have been built here during the past few years, there is a very limited amount of work in sight.

The only change in the prices of building materials so far made is a slight reduction in lumber and some reduction in the cost of plumbers' supplies. The slight decrease in the cost of these materials, however, have not been sufficent to stimulate building activity. The high wage scale that prevailed in the building trades last year has not been changed, and as yet there is no talk of a general cut of wages, although in some of the trades workmen in their anxiety to secure employment are seeking work at wages lower than the adopted scales. The condition of the local money market gives no encouragement to those who have the erection of new buildings under consideration. Money is still tight, loans hard to get, and banks are asking high rates of interest.

During the first quarter of 1908, building operations in Cleveland, as shown by the permits issued by the building inspector's office, fell off over one-half as compared with the first three months of 1907, as here shown:

	1907.	1908.
January	$707,773	$291,771
February	385,184	239,024
March	1,898,702	745,985

During the first quarter of 1907, the total permits issued for new buildings in the city aggregated $2,991,659, and during the same period this year the total amount of the permits was only $1,276,780.

Denver, Colo.

There has been a decided impetus given to building operations in the city, and the showing made by Building Inspector Robert Willison for the month of March is of a most gratifying nature. There were 312 permits issued for buildings estimated to cost $901,850, while in March last year 288 permits were taken out, calling for an estimated outlay of $668,640. Among the March permits were 175 brick residences, to cost $441,000; an orphange, to cost $190,000; 4 apartment buildings, 1 school building, a church, 8 frame residences and 13 terraces, the latter costing $60,200.

It is stated that in the first three months of 1908 the gain over 1907 in the value of the improvements for which permits were issued was 24 per cent.

Hartford, Conn.

There has been a material drop in prices of building materials in this section this spring, but it appears to have had no appreciable effect in stimulating building operations, as the depression in the opinion of those competent to judge of the situation is due more to the unsettled conditions of the money market than to high prices of materials. The banks have been unable to meet all the demands for mortgage loans, and until this condition improves no great change is expected in the building industry, which at present is very dull, as compared with the corresponding period of the past two years.

According to the statistics compiled in the office of Building Inspector Fred J. Bliss, there were 111 permits issued during the first three months of this year, calling for an estimated outlay of $203,570, while in the first quarter of last year 106 permits were taken out for building improvements, costing $477,080. From this it will be seen that the shrinkage for the first quarter is more than 50 per cent., as compared with a year ago.

Indianapolis, Ind

Building materials are somewhat lower than last year and if no appreciable advance is made this season it is felt that many people will build as an investment, owing to the fact that there seems to be an abundance of idle money. All things considered, the outlook for the year is encouraging. This feeling has substantial basis in fact, in that the permits issued from the office of Inspector of Buildings Thomas A. Winterrowd were 460 for March, calling for an estimated outlay of $927,389, while in March last year, 431 permits were issued for improvements costing $605,718. An idea of the impetus given to building operations in March as compared with the first two months of the year may be gained from the statement that in January the permits were 172 in number and the value of the improvements $134,697, and in February 130 permits were taken out for improvements costing $192,046.

For the three months of the current year the number of permits issued was somewhat in access of that for the corresponding period last year, although the value of the contemplated improvements was somewhat less. According to the authority in question there were 762 permits taken out in the first three months of this year for improvements valued at $1,254,132, while in the first quarter of last year 740 permits were taken out for buildings estimated to cost $1,353,937.55.

Louisville, Ky.

Building operations are holding up remarkably well and the volume of business makes a very favorable comparison with this period last year. In March there is a gain both in the number of permits issued from the office of Building Inspector John Chambers and in the value of the projected improvements. The permits number 344, as against 275 in March, 1907, and the value of the improvements was $406,167, as against $363,857 last year.

For the three months of the current year there were 639 permits issued calling for an outlay of $604,946, while in the first quarter of 1907 there were 560 permits taken out, calling for an estimated outlay of $698,710. This shows that there is more smaller work under way than was the case a year ago. There is very little change in the situation and prices of materials are about as heretofore, with perhaps a slightly downward tendency in some lines.

The Master Builders' Association of the city adopted resolutions on March 26 binding each member to pay carpenters the same scale of wages as the one which was in effect last year. Another provision of the resolution provides that 8 hr. shall constitute a full day's work and that time and a half shall be paid for overtime.

Los Angeles, Cal.

The building conditions in the metropolis of southern California show some improvement, but there is not as much work going on as is usual at this time of the year. The financial stringency has prevented heavy investments in buildings, which would otherwise have been started before this time. The building permits for the month of March showed an increase over any preceding month of the current year. The total valuation of the permits was close to $1,000,000.

During the first 23 days of March 669 permits were issued, having a total valuation of $917,185. On March 25 75 building permits were issued. The Pacific Mutual Life Insurance Company took out a permit for a $200,000 Class A steel frame and concrete office building, which is now under construction on the northwest corner of Sixth and Olive streets. The site cost $300,000. The building will have six stories, and is being constructed of steel brick, terra cotta and concrete after the most approved plans.

The Burck-Gwynn Company took out 43 permits in one week to build as many five-room frame cottages, each of which will cost $450 and occupy an ordinary sized lot. The location is near the intersection of Fifty-sixth street and Western avenue. The demand for such cheap homes is very large.

Memphis, Tenn.

The outlook for an active building season is fairly encouraging, and when one considers the amount of new work projected in March it is found that there is a slight falling off as regards the number of permits issued, but an increase in the estimated value of the improvements. According to the figures compiled in the office of Commissioner Dan C. Newton there were 241 permits issued by the Department in March for new work, involving an estimated outlay of $575,584, while in the same month last year 284 permits were taken out for improvements, valued at $331,331.

The showing for the first quarter of the current year, however, is not as gratifying when compared with the first quarter last year, owing to the heavy shrinkage. According to the same authority the total value of the improvements for which permits were issued in the first quarter was $742,022, while in the first quarter of last year the value of the improvements was $1,693,343.

The feeling among building contractors and those identified with allied industries is that the present season will be at least an average one, although account must be taken of the fact that in every Presidential year there is more or less of a let up in practically all lines of business.

Milwaukee, Wis.

The building outlook at the present time is very encouraging and the slight gain in operations over last year indicates a healthy condition, which is extremely gratifying to those interested in the development of the city. Prices of building materials have not declined to any appreciable extent, so that any stimulus given to building must be regarded as due to the growing needs of a prosperous and expansive city.

According to Inspector of Buildings Edward V. Koch there were 459 permits issued in March for building improvements, estimated to cost $743,586, whereas in the same month last year 360 permits were issued for improvements to cost $697,223. An examination of the figures for the first quarter of this year shows 603 permits to have been issued for improvements, estimated to cost $1,158,236, while in the first quarter of last year 552 permits were taken out for building improvements involving an outlay of $1,152,532.

Minneapolis, Minn.

Presidential election year seems to be having the usual effect on the heavier building propositions, and there is something of a lull in the volume of business, as compared with a year ago, although it is somewhat better for March than in January and February. This is naturally to be expected, as the building season cannot be said to be under way much before March, and in April and May the increased activity should continue. Prices of building materials are somewhat lower this year, apparently causing an increase in the number of small permits issued.

According to Thomas Bue, acting inspector of buildings, there were 435 permits issued in March for building improvements, estimated to cost $413,200, while in the same month last year 363 permits were taken out for buildings costing $684,735. This shows that the work under way is of a less expensive character, as the average per building is considerably less than was the case last year.

For the first three months of 1908 there were 893 permits issued calling for an estimated outlay of $994,525, whereas in the first quarter of 1907 there were 702 permits taken out for buildings costing $1,283,995.

New Haven, Conn.

The builders of the city have been somewhat favored during the past month, in that the amount of new building projected has been somewhat in excess of that for the correspondent period last year. The report of Building Inspector Austin for March shows that the value of the improvements for which permits were issued was $255,018, while in March last year the value was $163,516.

For the first quarter of the current year the total value of the improvements for which permits were issued was $482,891, while in the first quarter last year the total valuation was $417,426.50.

New York City.

The striking feature of the local building situation has been the plans for new work filed the first 10 days of April, when permits were issued by the Bureau of Buildings in the Borough of Manhattan, calling for an estimated outlay of practically $7,000,000. Reference to these new improvements is made on our editorial page this month. During March there was nothing especially notable in the way of building operations, the shrinkage which set in several months ago continuing upon about the same scale as previously mentioned. In other words, the valuation of the improvements for which permits were issued in the Boroughs of Manhattan, the Bronx and Brooklyn was 64 per cent. less than the same month last year, and considerably less in the aggregate than the amount of new work projected the first 10 days of April of the current year.

In regard to the outlook for the immediate future, Otto M. Eidlitz, ex-president of the Building Trades Employers' Association, and now a member of its Board of Governors, stated in an interview a few days ago that in his opinion the depression in business was wearing away. He said, "The building trade shows a marked improvement already. While there will be no conspicuous building boom this year, it will be a much better year for building than was predicted six months ago. A month or so ago one out of six contractors had work on hand, now five contractors out of six are fairly busy."

Oakland, Cal.

The building activity in Oakland, which has been very marked during the past 12 months, continues. The building permits for March showed a total valuation of $469,514. This is somewhat less than February, which was an unusually large month. The reinforced concrete foundations for the Bankers' Hotel, at Thirteenth and Harrison streets, are nearly completed, and the erection of the superstructure will proceed without any serious delay. It will have five stories and a basement, the entire investment amounting to $2,000,000.

The large Scottish Rite Hall, erected by the Masonic Order, is approaching completion in a sightly location, west of Lake Merritt. It has reinforced concrete foundations, and the superstructure has a very ornamental exterior.

Omaha, Neb.

Owing to the conditions generally existing throughout the country at this time, and especially in view of the political uncertainty, not very many large buildings are contemplated just now. The bulk of the new work is made up of smaller building operations which in the aggregate is somewhat in excess of this period last year, and it is generally estimated that the number of homes to be erected in 1908 will exceed that of any previous year for some time back. There are a few large building projects being discussed, but nothing definite has been decided as to when active operations will commence. Prices for building materials are only a trifle less than at this time last year, but the change is not sufficient to stimulate operations.

According to the figures of Building Inspector C. H. Withnell there were 120 permits issued in March for building operations estimated to cost $221,620, while in March, last year, 140 permits were taken out for improvements valued at $344,720. For the three months of the current year the number of permits issued from the office of the Building Inspector was 267, calling for an estimated outlay of $593,820, while in the corresponding quarter of last year 267 permits were issued for improvements valued at $687,865.

Philadelphia, Pa.

The first quarter of the year, according to statistics compiled by the Bureau of Building Inspection, shows permits were issued for 2344 operations at an estimated cost of $4,662,430, while during the same period last year the number of operations started was 2849, the estimated cost of the work being $7,011,445. The month of January showed the greatest decline in value; February showed a slight increase over the same month last year, while March also showed a falling off when compared with the same month last year. This decline for the quarter is largely attributed to unfavorable financial conditions, although inclement weather interferred with early spring work to some extent.

The month of March this year is the smallest for any third month of the year since 1900, when the value of work begun was but $1,640,595. During the past month, the bureau issued 839 permits for 1259 operations at a cost of $2,489,940. The principal individual items being $120,000 for school houses, and $300,000 for a library building. While the work in two-story dwelling operations showed a very large gain over the month of February, the comparative figures being 91 operations at a cost of $183,050 in that month, and 423 operations at an estimated cost of $771,620 in March, the decline as compared with March, 1907, when work in two-story dwellings to the value of $1,266,450 was started, is quite pronounced.

Dwelling operations on the whole have been rather small during the first quarter, owing particularly to inability of builders to make satisfactory financial arrangements to carry out their plans. This condition, however, has not only affected this class of work, but its influence has been felt in that pertaining to office buildings, manufacturing and general industrial plant extensions, which feel the effect of the decline in business generally; therefore, deferring proposed expenditures for additions and improvements. Municipal improvements have helped the building trades to a considerable extent recently, and while contracts for school houses and minor improvements have already been placed, propositions for a considerable amount of new work in school houses and other public buildings are being considered and will be started in the near future. Propositions for further erection of flat houses are also being considered by some builders, while several pretty good sized dwelling operations will likely be started during the coming month.

The trade on the whole is only moderately active, and while a fair amount of new business is expected to develop, it is not thought that the volume will compare favorably with 1907, at least during the first half of the year.

Pittsburgh, Pa.

The amount of work projected in March was very much in excess of that for February or January, but it was very appreciably less than for March last year. According to the figures compiled in the office of Superintendent S. A. Dies of the Bureau of Building Inspection 369 permits were issued last month for building improvements, estimated to cost $567,830, while in March a year ago 417 permits were issued for improvements, calling for an outlay of $1,123,892.

For the first quarter of the current year 596 permits were issued for improvements, costing $1,142,012, while for the first quarter of last year 709 permits were taken out for building improvements, costing $1,848,950.

One of the leading builders of the city has made a careful investigation with a view to determining the cost of building houses at the present rates for material and wages and comparing the results with a year ago. He states that a house may now be erected at 12 per cent. less than a similar building would have cost six months ago. A large number of contractors are figuring on taking advantage of the lower costs of building materials, and expect to have a very active season. It is felt that prices of building materials will continue to decline for some time, and that as a result something of a stimulus will be given to operations during the coming summer.

Portland, Ore.

The building season is opening up well in Portland, and although a number of large new buildings have been occupied during the past few months there is still much additional work in plan in the architects' offices. A large proportion of the permits granted during the past two months has been for East Side dwellings. A Mills tenement structure, costing $100,000, is projected on the East Side. Walter Thomas Mills has plans for erecting a novel tenement apartment house or houses, on a nine-acre tract near Kenilworth, which has been secured for that purpose. It is intended to have the streets follow the contour of the land. There will be a series of buildings, the first one to be for 12 families and to be built so that others can be added to the original one, and so on, until the entire ground has been occupied with a series of family tenements. There will be a big store on the ground, where all articles of family use may be purchased at a low cost. On the ground also there will be a steam laundry, water plant, ice plant, library, club rooms and everything that can contribute to the comfort and happiness of the family at the lowest possible cost. The estimated cost of the buildings is $100,000. It is contemplated to arrange to house 150 families so they can live at the smallest possible cost and yet have all the conveniences and comforts of life.

Philip Buchner is having plans prepared for a $30,000 residence on the East Side. It is to be of the Colonial style of architecture.

San Francisco, Cal.

The local building situation is better than might have been expected, considering the difficulty in securing large loans for construction purposes. A number of buildings are being started, the plans for which were adopted long ago, but the work was temporarily held up. Steel frame and brick structures have been the rule in the buildings commenced during the past six months, but a number of reinforced concrete structures are now planned and others are under way in the city. There may be an increase in the popularity of this type of construction with cheaper materials and labor, although the great increase in cost of many of the earlier reinforced concrete buildings over the original estimates had a discouraging effect.

Cement is now very low priced. Lumber prices are still at low ebb, with no immediate prospect of an advance. Brick is very reasonable in price, and all conditions seem favorable for construction.

The building permits issued during March had a total valuation of $2,676,000, and the total valuation of building permits issued since the fire in April, 1906, is about $100,000,000. The construction of residences, which was greatly neglected during the first year and a half after the fire, is again becoming an important feature of the building situation, and many dwellings of all classes are being erected. Better progress has been made during the past four weeks on the construction of the new custom house, covering half of the block bounded by Washington, Jackson, Sansome and Battery streets. The total cost will be about $1,500,000.

The Adams Estate Company will at once erect a 10-story and basement Class A building on the northeast corner of Sutter and Kearny streets. The structure will cover a lot 60 x 70 ft., and the street façades will have an extremely large glass area, without loss of architectural effect or dignity. The first two stories of the new building will be of ornamental cast iron, with the upper stories finished in glazed brick and terra cotta, while the floors, roof and party line exterior walls will be of reinforced concrete. The commission to design the building was given Washington J. Miller, architect, after a thorough competition. It will cost $250,000, and the building is to be completed within nine months after actual operations have been commenced. By an ingenious handling of the method of erection the first floor tenants will be enabled to occupy the stores within five months after the work has been completed to the street level.

The California Market Company has applied for a permit to erect a $100,000 market building, extending through from California to Pine streets, 136½ ft. west of Montgomery. It is to be of Class B construction, one story high, and will be built of reinforced concrete.

On the Post-Street property, where the Mechanics' Institute Library stood before the fire, will be erected a modern 10-story building of steel and granite, to be used as a library and office building.

Seattle, Wash.

A great deal of building work is projected in the Puget Sound metropolis, although some of it is temporarily held up pending easier financial conditions and dry weather. The fact that the Alaska-Yukon Pacific Exposition is to be held at Seattle next year will cause a great deal of building construction both at the exposition grounds in the suburbs and in the city proper. There is a demand for greatly increased hotel accommodations and a number of modern hotels and apartment houses are in plan. Carpenters are in great demand and other building mechanics are also very busy.

The building permit records show that on one day in March the total valuation of the improvements reached $488,980, although on this day only 45 permits were issued. The permit issued on this date which accounted for the large total was for the construction of the 11-story steel frame office building at Fourth avenue and Union street by the Metropolitan Building Company. Up to this time the work has been going on under a permit to build a foundation. The building is of class B, 120 x 120 ft. and is to cost $450,000.

St. Louis, Mo.

One effect of the general financial depression recently existing throughout the country is a falling off in building operations, as compared with a year ago and just at the season when there ought to be signs of growing activity in this important branch of industry. The shrinkage as against a year ago is quite marked, for, according to the figures compiled in the office of the Building Commissioner, the value of the improvements for which permits were issued in March was $1,964,490, while in the same month last year the value of the improvements was placed at $2,959,659.

St. Paul, Minn.

In common with other centers St. Paul is suffering from the effects of the financial depression which developed in such a marked degree last fall, and building operations while as great in number as last March do not represent the same amount of invested capital by fully 45 per cent. In other words, permits were taken out last month for 209 buildings estimated to cost $370,890, whereas in March last year permits were issued for 198 buildings involving an estimated outlay of $711,364.

The Builders' Exchange has just issued a very comprehensive reference guide book for builders covering the city of St. Paul. It contains among other things a directory of the Builders' Exchange, giving a list of officers, committees and members, together with their telephone calls and addresses. The benefits to be derived from membership in the exchange are set forth in convincing style by President William Rhodes, and there is in addition a list of architects of Northwestern, Western and North Pacific Coast States. Scattered through the pages are advertising cards of many concerns identified with the building and allied industries. Not the least valuable feature of the directory is a number of blank pages ruled for purposes of memoranda. The binding is in leather covers, with a gilt side title, making a very attractive little volume.

Tacoma, Wash.

This city has made an enviable record in the building line, although the rainy season has not ended, and there are prospects for a great deal of construction work this season. There is much inquiry for dwellings of all classes and also for flats. The total valuation of buildings in plan and on which work is to be commenced within a few weeks exceeds $1,000,000.

Tacoma and the Puget Sound region generally is said to be confronted with a scarcity of good building brick. It is likely that clay deposits near Tacoma will be developed with the use of modern machinery in order to furnish brick for a number of new structures that are projected.

A recent shipment of 4,600,000 brick from Seattle to Victoria, B. C., depleted the supply available for use at other points on Puget Sound.

Toledo, Ohio.

In consequence of prices of building material having declined on the average something like 10 per cent., as compared with a year ago, the outlook for the building industry here is very encouraging, and contractors are looking for an increase in building operations. While this feeling is quite general the new work projected is not up to that of this season a year ago, for, according to the figures compiled in the office of Chief Building Inspector John W. Lee, 73 permits were taken out in March for improvements, valued at $131,490, while in March last year 122 permits were issued for buildings valued at $376,325.

The showing for the first quarter of this year is proportionately about the same, when compared with 1907, as the month of March in the two years. The figures show that in the first quarter of this year 163 permits were issued for buildings, valued at $295,734, while in the first quarter of last year 243 permits were issued for improvements valued at $659,225.

Washington, D. C.

There has been an appreciable increase in building activity the last month as compared with February, and the increase is striking when compared with January. The Building Department issued in March 531 permits for improvements valued at $1,190,694, while in March, last year, 486 permits were taken out for improvements estimated to cost $1,179,778.

For the first quarter of the current year there is a marked shrinkage in the value of the building improvements as compared with the first three months of last year, due in large measure to the fact that in January, 1907, the value of the new work was placed at nearly $1,200,000, while in January, the current year, it was only $263,000. The first quarter of the current year shows 1044 permits to have been issued calling for an outlay of $2,180,064, while in the first quarter of last year 999 permits were issued for improvements estimated to cost $3,188,269.

The prices of building materials are approximately the same as have obtained for the past year, and if there is any difference in any particular line it is not sufficient to influence operations. The feeling is optimistic and it is expected that a good year's business will result.

Worcester, Mass.

There has been comparatively little improvement in the building situation, although the talk is hopeful as regards the immediate future. The amount of new work for which permits have been issued, however, is not much more than 25 to 33 1-3 per cent. of what it was at this season last year, but as time goes on activity may develop to an extent which will bring the total business of the year more nearly up to that of 1907. The figures of the Building Department, as issued by Deputy Lester B. Edwards, show 64 permits to have been issued in March for improvements estimated to cost $66,885, whereas in March, last year, 81 permits were taken out for new work costing $185,874.

For the first three months of this year the total number of permits issued was 119, calling for an estimated outlay of $126,650. These figures compare with 159 permits for the first three months of last year for building improvements estimated to cost $478,616.

ELEMENTARY PERSPECTIVE DRAWING.—VII.

By George W. Kittredge.

In introducing the subject of interior, or what is sometimes termed "parallel perspective," the student should understand that its methods involve no principles not already explained or which cannot be readily deduced from what has been told in connection with exterior representation. In proof of this let the reader turn back to Fig. 6, in which it was shown that as the building or subject to be represented is turned from a position in which its two sides make equal angles with the picture plane, the vanishing point of the side which is steadily approaching the picture plane moves away with increasing rapidity. If this operation be continued until one side becomes parallel to, or coincident with, the picture plane, then will there be but one vanishing point (if the subject be rectangular in plan) for the following reason: If, in accordance with the method of finding the vanishing points, explained in connection with Figs. 2 and 4, the observer, standing at the station point, turns so as to look in a direction parallel to the side of the object which has just been turned into coincidence with the picture plane, his line of vision can never penetrate the picture plane because it will be parallel thereto; while, on the other hand, if he turns so as to look in the direction parallel to the other or receding side of the subject, he will be looking at right angles to the picture plane, and a line drawn from the point of sight on the plan in this direction becomes one and the same with the axial ray of vision. When the intersection of this line with the picture plane has been dropped or projected into the horizon line of the picture it will thus be centrally located in the field of view, and all horizontal receding lines of the subject will then vanish to this point, which can properly be designated by the letter V. Since the first named side, or what may now be termed the front of the subject, has become coincident with the picture plane, the hights of all horizontal lines within the same, as measured from the ground up, will be the same at all points from one extreme to the other, or in other words, such lines will be and appear horizontal instead of appearing to vanish as when the side is oblique to the picture plane.

In the plan view, Fig. 14, the subject is shown in three positions. The distance away of the two vanishing points for each position, as determined by the intersection of the visual rays with the picture plane, is indicated for the three positions, respectively, by the addition of the index figures 1, 2 and 3 to the usual reference letters. In the first position the subject is so placed that its sides make equal angles with the picture plane; in the second position it has been turned to the left far enough to exactly divide the angle between the picture plane and the side in the first position, showing that the distance from A to P^{R2} is now less than half the distance to P^{R1}, while the distance from A to P^{L2} is more than twice the distance to P^{L1}. In position three the point P^R has reached and become one with the point A, while the point P^{L3} has reached infinity.

Continued from page 69, February issue.

Having thus shown that the method of locating the vanishing point in parallel (or what for this reason is sometimes termed one point) perspective is exactly in accordance with that employed in angular (or what is termed two point) perspective, we come now to the location of the measuring point, for since one vanishing point has been eliminated there can, of course, be but one measuring point, except in the case of an oblique wall or surface, for which it would be necessary to first find a special vanishing point. It was explained in connection with Fig. 5 that the position of the measuring points were most easily found by drawing arcs through the station point S, using the points P^R and P^L as centers, extending them to cut the picture plane. Applying this rule to the present case, we describe an arc from A —that is, P^{R3} as center, with A S as radius—cutting the picture plane either to the right or left of A, as is most convenient, as shown by the arc S *p* in Fig. 14. From this operation we discover that the distance of the measuring point from A is exactly the same as the distance of the station point from the picture plane. This fact then makes it possible in the operations of parallel perspective to set the measuring point as far to the right or left as is necessary to gain the desired effect, just on the principle that one would approach or recede from the real object for the same purpose in making a sketch.

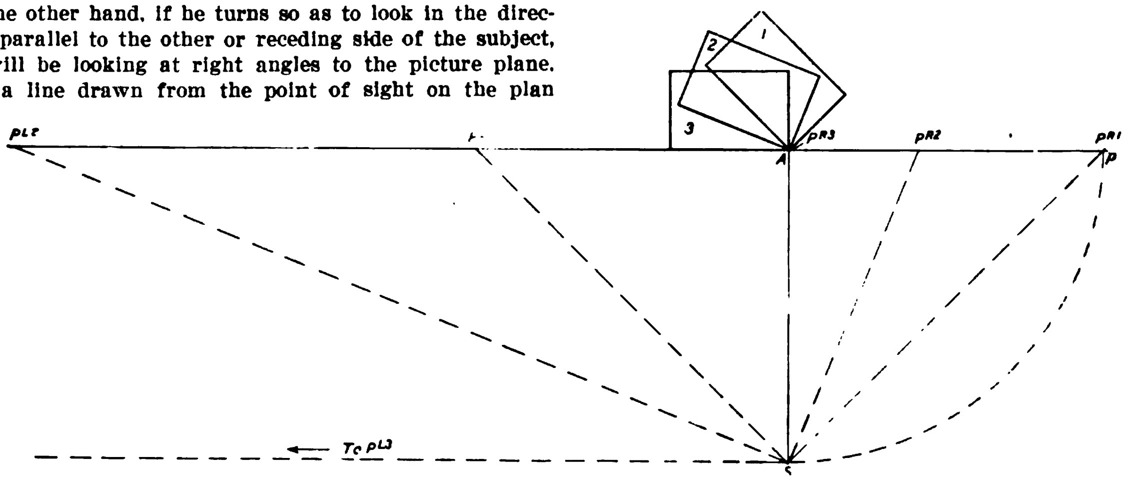


Fig. 14.—Diagram Showing Change in the Distance of Vanishing Points with Relation to the Angle of Subject.

Elementary Perspective Drawing.—VII.

While discussing "interior" perspective, we have thus far considered only the exterior aspect of the object. If we suppose the view to include two buildings with a space between, as when placed upon opposite sides of a street, and the point of sight chosen opposite the space—that is, so as to permit a view down the street—we shall have the essential features of an interior. Under these conditions, then, the side walls of a room will be at right angles to the picture plane, while its farther wall will, under ordinary circumstances, be parallel thereto, and the picture plane will be the plane of an orthographic section across the room at the immediate foreground. As a subject for the illustration of the methods of parallel perspective we have chosen what may be considered as an interior view of a church, similar to that shown in Figs. 4 and 5.

The work may be begun, therefore, by first constructing the outlines of a sectional view, as though a sectional elevation were intended, as shown by A B C D E of Fig. 15. The hight of the horizon may be established at will and the vanishing point located, either centrally or somewhat nearer to one side, as desired. The horizontal line A E, representing the level of the floor, becomes the ground line, corresponding with G C^2 of Fig. 5, upon which spaces representing receding distances are to be set off. The measuring point may be located upon the horizon line, either to the right or the left, according to whether E V or A V is chosen as the receding line to which the spaces on the ground line are to be transferred. Should the line E V, representing the intersection of the right wall surface with the floor, be chosen for this purpose, then the point M must be located to the right of V at a distance equal to the desired distance of the point of sight from the picture plane. Proceeding now with the work, set off on the ground line, from E to the left, all of the spaces or points representing the positions of windows or other details in the side walls, as obtained from the plan of the building and as shown by the figures between E and F. As a point from which to measure these distances, a line should first be drawn across the plan representing thereon the position of the picture plane—that is, to show how much of the interior is to be represented in the view. Having made the several distances from E equal to those of the plan from the line just drawn, lines may now be drawn from each point between E and F toward M, cutting the line E V. From these several points of intersection on E V, lines

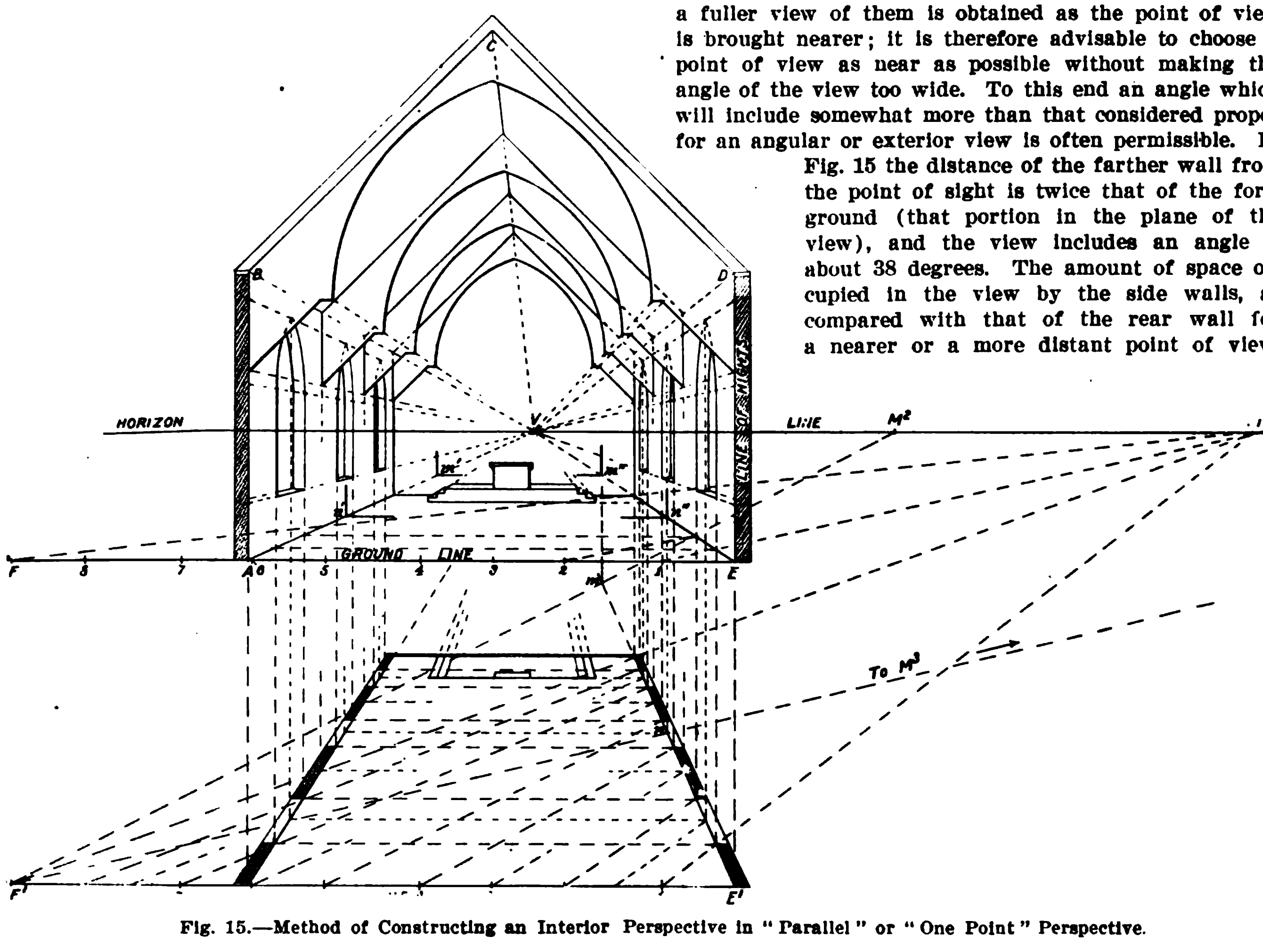


Fig. 15.—Method of Constructing an Interior Perspective in "Parallel" or "One Point" Perspective.

Elementary Perspective Drawing.—VII.

can be erected into the view, and the hights set off on E D and carried toward V to cut the proper lines, in a manner exactly similar to that shown upon the side wall of the building in Figs. 4 and 5.

Should the left wall of the interior contain the same details as the right, it will be necessary to simply carry all points on E V horizontally across to cut A V and repeat the operation of obtaining hights by first transferring the hights obtained on E D to A B. Should the left wall, however, differ in details from the right, the spaces for the same can be set off on the ground line from A to the right, and lines carried from the points thus obtained to another measuring point placed exactly as far to the left of V as M is to the right.

The operations of interior perspective admit of the use of the plan in perspective, as shown in the lower part of Fig. 15, where said operations are so clearly indicated as to require no explanation beyond what has been said concerning this method in connection with exterior perspective and demonstrated in Fig. 5. The results in Fig. 15 have been obtained from the plan, using E^1 F^1 as the ground line, only a few projections having been made from points on E F just to show that the results are the same in both cases. The use of the plan in perspective is to be recommended because the intersections can be made with greater accuracy, especially in case of a low horizon, and because that part of the paper devoted to the view can be kept more free of lines. In fact, a separate sheet of paper can, if desired, be temporarily tacked over the lower part of the drawing, upon which the plan in perspective can be drawn and which can be removed when the work is finished, leaving the paper clean.

An interior can also be constructed by the viewing process, by first placing as much of the plan as is to be shown in the view against the picture plane in a plan view, and then locating the point of sight and proceeding all as explained in connection with Fig. 4.

In assuming the point of view for an interior, it is apparent that the farther away it is fixed the more obliquely or edgewise the side walls will appear, while a fuller view of them is obtained as the point of view is brought nearer; it is therefore advisable to choose a point of view as near as possible without making the angle of the view too wide. To this end an angle which will include somewhat more than that considered proper for an angular or exterior view is often permissible. In Fig. 15 the distance of the farther wall from the point of sight is twice that of the foreground (that portion in the plane of the view), and the view includes an angle is about 38 degrees. The amount of space occupied in the view by the side walls, as compared with that of the rear wall for a nearer or a more distant point of view, can be quite easily determined. If, for instance, the distance away of the station point were decreased by half, the measuring point would then be placed midway between M and V, as shown at M^2, and the point F^1 of the ground line would then fall at *m* on the line E^1 V, with the result that the width of the rear wall would be that shown by *m' m"* in the view. If, on the contrary, the distance of the view point were doubled, the distance of M from V would be doubled, the point so located being marked M^3, and the point F^1 would then fall at *n*, and the comparative width of the rear wall would be that shown at *n' n"* in the view. Of course the details of the side walls would then be correspondingly extended or contracted.

Interior views are not always such as can be designated as being in one point perspective. The view may be such as to include only two walls of a room, both, of course, being oblique to the plane of the view. Such a subject can be treated exactly the same as an exterior view, there being, of course, two vanishing points and two measuring points. In such a case all horizontal measurements are set off on the ground line in one direction from a point representing the intersection of one of the walls with the picture plane, at which point a line of hights is also erected. Should the said intersecting wall be that at the left, then the horizontal measurements will be set off to the right from the point referred to. Those measurements intended for use along the left wall will be carried toward M^L to cut the base line of that wall, while those intended for use on the right wall will be first brought forward from M^R to cut a line drawn from V^L, through the point from which the measurements were set off, thence toward V^R to cut the base of the right hand wall. This is illustrated in Fig. 5, in which the front of the building corresponds with what has been termed the left wall of an interior, while the side of the tower and steps corresponds with the right wall. Referring to the plan, G^1 represents the intersection of the left wall with the picture plane, from which point all measurements are set off to the right. Those points intended for the left wall, indicated by *a*, *b*, *d* and *f*, are carried toward M^L to cut the line G^1 *f'*, while those intended for use on the right wall, 1, 2, 3 and 4, are first brought forward to cut V^L G^1, extended as shown at 1', 2', 3' and 4', and are thence carried toward V^R to cut the right wall, beginning at *b'*.

Commencement Exercises at the New York Trade School.

The twenty-seventh annual commencement exercises of the New York Trade School were held in the auditorium of the institute, Sixty-seventh street and First avenue, New York City, on the evening of Wednesday, April 1, in the presence of a very large gathering of pupils and their friends. Before and after the formal exercises the departments of the school were thrown open to the public in order to enable them to inspect the work of the pupils in the various trades taught. There were several guests of honor present, together with members of the various Trade School Committees and prominent tradesmen. The exercises were opened by the treasurer of the school, F. Augustus Schermerhorn, as President R. Fulton Cutting was absent for the first time since he has been president of the school. Mr. Schermerhorn expressed his pleasure in having the opportunity of congratulating the young men on the completion of their courses at the school and the beginning of the important work of life. He pointed out that the close of the school term on the anniversary of an important battle of the Civil War might be taken as symbolic of that battle, as it led to the surrender of Lee and marked the beginning of the epoch of peace, just as the completion of the preliminary work at the school was the beginning of the far greater life work of each individual.

Mr. Schermerhorn then introduced Dr. James H. Canfield, librarian of Columbia University, who spoke in a very interesting strain to the pupils, suggesting how they should apply the valuable information they had gleaned from the courses of study pursued during the time they had attended the New York Trade School. Among other things, he said:

I doubt if any of you will work for as low a wage as I did after I possessed the college diploma. You want to live, not merely exist. To live is something infinitely greater and means to have a fair share in the things which make your day and age what it is. You want a home and whether it be a palace or a flat you want the better half to make it a home, for I know that that also is occupying your minds. You want to count in this world so as to be a man doing your share, standing shoulder to shoulder with any other man. You want to feel that your advice and counsel is sought and that other men wait to take action until you have had your say. Another thing you want is to endure, that is, have your work and life so important that you will not be forgotten. You want to be remembered. How are you going to do it? You can't do it by being slow, and you must step lively as the band wagon is now an electric car. You can't sit down and criticize, but must know things and use them promptly and intelligently to succeed. Neither can you be fast. It seems all right at night, but, oh! the next morning. You can't succeed on that plan. Others are keeping their heads free from the steam and stew of beer. A man never floated into a good job on beer. You must be a man who can be trusted. An old business man told me that he started by managing his entire business himself and furnished all the intellect and morals needed; he is now operating four factories, two of which are abroad. He needs men of intelligence and sound morals.

The intelligent man is one who knows how to find the place he could fill and then fill it with continued vigilance to avoid mistake. You cannot be a smart Alec. The country is suffering from these smart men. The smart man is superficial, only single plate, and you can't engrave anything on him without getting through the plating. You have got to make a good first impression, then live up to it. You can't be tricky and succeed. You may know some tricky men, but don't follow them. This world would not be worth living in if the vast majority of people were not straightforward and honest. Do you know that this country is full of people who are the most uncommon common people in the world? You read of tricky men who have left the country and dare not come back, who have broken hearts and families. You cannot be selfish, and yet you must look after No. 1 in the right way. Consider your duties before you consider your rights and throw your whole interest into what you are doing. Powers, the great Philadelphia chemist, said he would not give a snap for the $3 a week office boy who did not say we when he spoke of the firm by the end of his first week. It is the gratuitous work that counts. Who pays the trustees of this institution? Who pays Sunday school teachers? Who pays for the immense amount of good work that is done in all lines? You must be generous and help others. Be honest, industrious, clean and upright and in our country there is no power that can keep you from being successful.

The presentation of medals followed, and was a most interesting feature of the occasion. Superintendent H. V. Brill of the school, in presenting a library of technical literature for the most proficient student in the carpentry class, pointed out that it had been a custom of Charles Peeker, one of the graduates of the school, to give a similar library to every graduate who showed the highest proficiency for a number of years back or since his own graduation. This prize was awarded to Frank Douglass of Orient, N. Y. He, with William A. Cotton, Southampton, Long Island, N. Y., and Edwin Johnson, Highland Falls, N. Y., received honor rolls as members of the carpentry department. In the bricklaying class the honor roll student was Charles E. Marvin, Islip, Long Island, N. Y. The gold medal given by the Master Steam Fitters' Association was given to John A. Corboy, who had a percentage of 97. The gold medal given by the Master Plumbers' Association to the most proficient student in the plumbing class was awarded William J. Reilly, Youngstown, Ohio. In presenting the medal given by the *Painters' Magazine* to the most proficient student in the painters' class, John Beattie, of the Master Painters' and Decorators' Association, pointed out the great importance of carefully reading trade papers in order to keep fully abreast of the times, and gave the medal to Henry G. Sinn of Philadelphia, expressing the hope that his future might be as bright as the medal. A set of tools given by the Master Patternmakers was presented by Superintendent H. V. Brill of the school to Edgar G. Higgs of New York City.

The number of graduates from each department of the school who received certificates was as follows: Plumbin,: 111; electrical, 34; steam fitting, 23; carpentry, 15; cornice and pattern drafting, 13; bricklaying, 13; fresco painting, 7; sign and house painting, 6 each; blacksmithing and printing, 2 each; patternmaking, 1, giving a total of 233 graduates.

IT IS PROPOSED to erect at East Walpole, Mass., in connection with the F. W. Bird & Son's paper mills, a group of low cost one-family cottages, similar in construction to experiments which the Bird concern has already made with its products, as an exterior covering. A competition will be conducted for the purpose of selecting designs for such structures, the cost of which is not to exceed $3000. The competition will be conducted under rules of the American Institute of Architects.

THE plans have been completed for an opera house to be located in the Back Bay, Boston, near Symphony Hall, and to cost in the neighborhood of $700,000. Leading capitalists and musical people of the city are backing the project.

DOMESTIC SEPTIC TANKS.

THE above subject is one which has been attracting no little attention for some time past on the part of those interested in sanitation, and at the recent meeting of the American Society of Plumbing Inspectors and Sanitary Engineers, held in Chicago, a paper was read by H. F. Shade, plumbing inspector, Victoria, B. C., which covered many points of note in this connection. The paper, with the accompanying illustrations, is given herewith.

The question of the disposal of sewage from our homes and buildings that are isolated from the service of a sewer system without creating a nuisance dangerous to health, may be to the nontechnical mind simple enough, but to those entrusted with its design and construction it has been and is an exceedingly complex matter. In view of the ever-increasing attention which is being paid to this department of sanitary science within the past few years the following may be of some interest.

Cases of Septic Cesspools.

A few years ago the writer, knowing of several instances where cesspools had been in use for periods covering from five to seven years, without the necessity of their contents being removed, and having heard of the septic tank experiments at Exeter, England, started out to investigate with a view of improving the cesspool. It was found that in every case where these pools did not require the removal of sewage at regular intervals a heavy crust or scum had formed on the top, and the inlet pipe discharged either below the water level of the pool or was so placed that it did not disturb this scum; it was evident from this that the scum allowed for a septic action turb the septic scum nor become blocked at this point as before, and that by raising the outlet to about the center of the depth of the tank the effluent would not be polluted by this black sediment at the bottom, and at this depth there was no danger of the scum being removed through the outlet leg. This information was derived from tanks approximately 6 ft. square, intended for the capacity of from six to eight persons. Later it was found that, by building the tank in proportion to the amount of sewage to be treated and by elongating it so as to eliminate any current or movement in the tank, the scum could be kept absolutely undisturbed, this being of vital importance, for, in order to maintain the septic action, this scum must under no circumstances be disturbed. These tanks were calculated on the basis of 40 gal. per capita per diem, allowing 2 ft. of floating or superficial area for each person.

Previous to this time data on the bacterial treatment of sewage for small works of this kind were unobtainable,

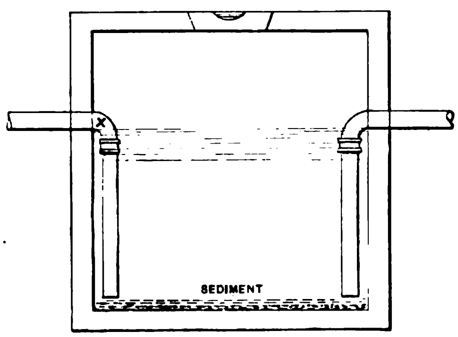


Fig. 1.—Section of Simple Septic Tank.

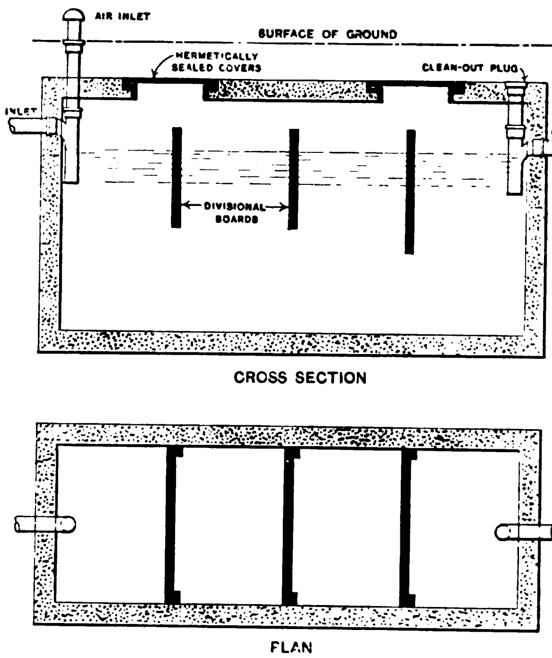


Fig. 2.—Septic Tank with Baffle Boards.

Domestic Septic Tanks.

sufficient to disorganize a large portion of the organic matter in the sewage, and all that was required to complete the work was to encourage sufficient septic action to cope with and disorganize all the incoming sewage matter. It will be better understood that a septic action is a bacterial conflict where myriads of micro-organisms, peculiar to themselves, attack and disorganize the organic matter, and through their action revert it back to the elemental state.

Submergence of Inflow and Outflow Pipes.

The first improvements were to enlarge the tank and to submerge the outlet in the same manner as the inlet at a depth of about 2 ft. below the water level. The result of this was closely watched and the effluent at first was fairly clear, but finally it gradually darkened with considerable odor. With the inlet pipe submerged as above mentioned it would often become blocked at a point as indicated on X, Fig. 1. It was conclusive from this that the inlet pipe was submerged too far below the water line, as the sewage did not have sufficient force to pass down through 2 ft. of submerged pipe into the tank. By sounding the bottom of the tank it was found that a heavy black sediment had precipitated. From these facts it was evident that the inlet and outlet pipes were carried too far below the water line.

Subsequently it was found that if the inlet pipe was brought about 12 in. below the level it would neither dis- but latterly the writer has collected considerable information on septic tank treatment on a larger scale, and even at this date very few data can be obtained for requirements similar to those treated in this paper.

All that has been touched upon so far is the question of tanks for ordinary residences with from four to eight persons, where the effluent is discharged into the sea or other uncontaminable outlet, or into some surface or other drain leading thereto. The necessity of having it for larger private uses where the flow of sewage fluctuates, for instance, summer boarding houses, schools, &c., and where the effluent discharges into rivers or streams that are used for water supply purposes, will, however, be dealt with here.

Septic Tank for Fluctuating Charges.

It will be readily seen that tanks designed for the maximum capacity of summer boarding houses would be far too large for the minimum or winter capacity, as we are told by bacteriologists that if the tank is too large the incoming sewage will not be sufficient to maintain the septic action, and, in consequence, a clear effluent will not be produced. To overcome this difficulty, divisional boards are arranged in the tank, so spaced that for minimum uses only a small portion of the tank is used for purposes of disintegration, while the others are being used for filtering—this is better explained by Fig. 2. These boards are three in number, dividing the tank into four compartments. Assuming that we allow 40 gal. per capita per diem (where houses have water supply *ad lib.*), and the dimensions of the tank are 12 ft. x 4 ft. x 6 ft., it will be seen that the first compartment is capable of treating the sewage of 10 persons. When the incoming sewage exceeds that amount, it would pass under the first divisional board to the next compartment, and so on. It is highly essential that the maximum capacity should not exceed that of the first three compartments, in order that it be possible that the fourth or last one be used for filtration purposes.

Final Disposition of Effluent.

In localities where there are no facilities for draining off the effluent, and where the soil is of a sandy or porous nature, it is taken care of and distributed by a system of tile drainage; this is sometimes called "subsoil irrigation." In this case as well as in all others, the location of the tank is a most important feature, and should only be arrived at after a careful study of the local conditions and other details. Ordinarily, it is better to have it situated on the highest ground possible, and as far from the house as convenient (although the latter condition is not

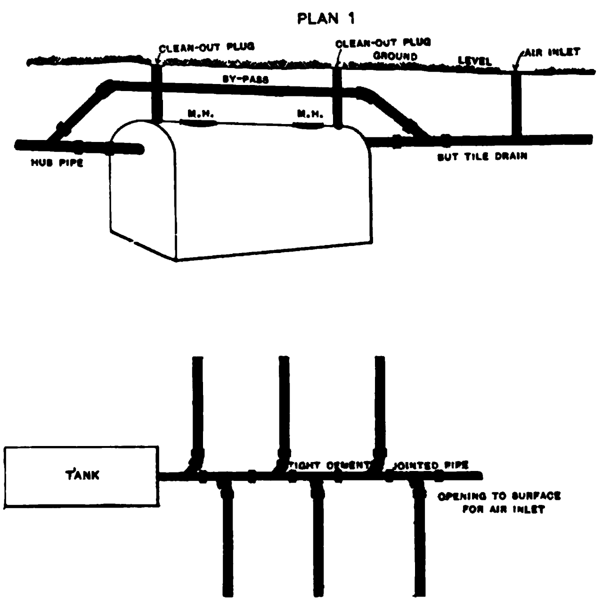


Fig. 3.—Tank with Underground Tile for Discharge.

Domestic Septic Tanks.

imperative) so that if the effluent has to be percolated into the subsoil its velocity will be greater through the tile drainage system, and consequently will be discharged over a greater area.

We are told by bacteriologists that the effluent of septic tanks is simply liquefied sewage—thus it gets the name "liquefaction," which really means that the organic matter is disorganized and made soluble in water, and, though the effluent may be perfectly odorless, it may contain a countless number of pathogenic or disease bearing bacteria. The character of the effluent may be such that it could be disposed of by drains running into the sea or other outlets not likely to become contaminated, but, on the other hand, in cases where the overflow would discharge, for instance into rivers or streams used for water supply, or into surface irrigation drains, it is highly important that the sewage pass through a second stage called oxidation or aeration. This is usually done in large systems by contact beds or percolating filters, which are designed so that the air is admitted on all sides, in order that perfect aeration may take place. This aeration is essential for the maintenance of the existence of the aerobic bacteria, which colonize in the interstices of the filter, and perform the second stage necessary to have the effluent free from all dangerous bacterial life.

Air Admission to Assist Aeration.

For small septic tanks filters or contact beds are not generally applicable, for the reason that they require considerable care and attention. For this purpose an underground system of drain tile, carefully laid out, with frequent openings to the surface for the admission of fresh air, lends itself as the proper and most effective arrangement for small systems of this kind as shown in Fig. 3. A by-pass around the tank to the sewer line would naturally encourage a draft down the openings and through the tile drain. In this way the liquefied sewage, on leaving the tank, is completely aerated and freed from dangerous pathogenic bacteria. This is, in my opinion, the best system of sewage disposal for isolated houses and will be found to overcome many difficulties which the use of the cesspit produces. It is simplicity itself, automatic, and without any syphonic or mechanical appliances. I have personally supervised the construction of at least 200 of such tanks and have yet to hear the first complaint of their not working satisfactorily.

Competition in Plans for Cottage Houses.

The Rochester Chamber of Commerce, Rochester, N. Y., realizing the necessity of interesting investors in providing cottage houses to care for the rapidly increasing population of the city, has offered $600 in prizes in a competition for three classes of dwellings, one to cost not in excess of $1500; the second not to exceed $1250, and the third $1000. There are three prizes for each class of cottage, and in making the awards the chief considerations will be convenience of arrangement, economical construction and tasteful appearance. The competition will close July 1, and is open to any who may desire to enter. Detailed particulars can be obtained from S. R. Clarke, secretary, the Rochester Chamber of Commerce.

Fireproof Houses of Terra Cotta Hollow Tile.

A new fireproof construction for houses of moderate cost and other small buildings is the subject of a most interesting little work which has recently been issued from the press, and which is of such a nature as to command the attention of architects and builders all over the country. It is well known that at the present time there are many fine residences in the United States which are of standard steel and terra cotta hollow tile construction, and while as a rule these are pretentious buildings, thoughtful minds in the architectural profession have been searching diligently for a solution of the problem how to construct fireproof houses at costs within the means of the average home builder. As a result of all this various residences and other small buildings, such as factories, garages, &c., have been erected of terra cotta hollow tile, and the point is made that these compare favorably as to cost with frame or brick and wood construction. The little volume under review has been issued as a working handbook of information on the subject, giving pictures, plans and details of finished buildings, also methods of construction adaptable to any proposed building. The point is emphasized that terra cotta hollow tile houses are moisture proof, soundproof and vermin proof, and while being warmer in winter they are cooler in summer.

The illustrations are halftone reproductions from photographs of buildings of various kinds in which terra cotta hollow tile is the predominating material. Accompanying many of the pictures of buildings are the floor plans showing the interior arrangement, together with brief descriptive particulars. Not the least important feature of the work is found in the detailed drawings clearly indicating the general methods of construction, as well as giving specific information as to the manner in which the work is carried out. Among the details mention may be made of a section through a cellar wall, centering for hollow tile and reinforced concrete floor, lintel construction of hollow tile and concrete for an 8-in. hollow tile wall, detail of floor and column construction, also of roof and floor construction, together with bathroom details. Various tables show the safe load in pounds per square foot for terra cotta hollow tile floors combined with reinforced concrete joists. The work is issued in attractive form by the National Fireproofing Company, Flatiron Building, New York City.

New Publications.

Modern Baths and Bathhouses. By Wm. Paul Gerhard; 311 pages. Size, 6 x 9¼ in. Illustrated with 130 figures. Bound in heavy board covers. Published by John Wiley & Sons. Price, $3.

Since the earliest periods of history the practice of bathing has been regarded in nearly all countries as conductive to the health and welfare of the human race, yet until recently not a single American book on bathhouses has been published. With a view to throwing much valuable light upon many phases of the subject Mr. Gerhard has brought out the present work based upon his wide and extensive experience in connection with hospital and people's baths in this country. The book brings together much valuable data and information on swimming baths, as well as details of rain baths and other bath appliances. The complete specification for the plumbing and water supply of bathhouses prepared by the author should prove of value to architects intrusted with the planning and execution of such structures. The general reader will find in the work much to interest him in the introductory chapter and in the appendix, which deal with bathing and bathing practices from a historic and geographical point of view.

The matter is embraced in 18 chapters, and is illustrated with figures gleaned from many different sources, as well as with plans and details taken from the author's own practice in the line of domestic sanitary engineering. The early chapters in the book describe the purposes of bathing, the different forms of baths, the modern rain bath, house and tenement baths, public bathhouses, people's baths, factory baths, school baths, &c. There are also chapters on baths for clubhouses, gymnasia, hotels and barber shops, river and sea baths, air and sun baths, as well as medical and electric light baths. The concluding chapters are devoted to water supply and plumbing of bathhouses and "Bibliography on baths and bathing." A comprehensive index alphabetically arranged completes the work.

Architectural Composition. By John B. Robinson. Size, 6¼ x 8¾ in.; 234 pages. Illustrated by 88 halftone engravings and 85 line drawings. Bound in board covers, with gilt side and back titles. Published by the D. Van Nostrand Company. Price, $2.50, postpaid.

About 10 years ago the author conceived the idea of the possibility of formulating the approved practice of architects in designing the exterior of buildings, and he wrote a series of articles upon the principles suggested by the title of this work, which were afterward reprinted in book form. Later the articles formed the basis of a course of lectures given by the author annually for some years at Columbia University before the students of the School of Architecture, and the present work develops the theories advanced in more coherent and logical form, the belief being expressed that it will serve to simplify the acquisition of a knowledge of the subject of which it treats.

It is comprised in 17 chapters, the first six of which discuss the standard of taste, define what is architecture and expatiate upon unity, individuality, similarity and subordination. The author next takes up the analysis of buildings, discusses primary and secondary masses and then goes into the question of details, showing proper and improper treatment and handling this phase of the subject in a way to provide much food for thought. He then considers horizontal division, describing the ways in which a building may be divided; deals with proportion and contrast, and then practical applications. The closing chapters are given up to the subject of a symmetrical composition, the flexibility of types, and finally, comparison and criticism. An index alphabetically arranged greatly facilitates reference.

Contracts and Specifications. By James C. Plant; 112 pages. Size, 7 x 9¾ in. Numerous illustrations. Bound in board covers. Published by the American School of Correspondence. Price, $1.00, postpaid.

One of the prime requisites of success in building operations is that after the scheme has been developed by the architect on the drawings, the materials and their quantities be so selected and designated that there can be no misunderstanding in relation thereto on the part of either the owner or the builder, and that only such materials be required as those for which the owner is prepared to pay. The matter consists of a working manual of forms and methods for architects, contractors and owners, wherein advices and responsibilities of each are fully explained. Methods of award and executing public and private contracts are discussed, and instruction is given in the art of specification writing.

The work is comprised in two parts, the first of which is intended to initiate the student in the fundamental principles of specification writing by setting forth the nature of the preparation desirable and necessary for successful work. The second part has been compiled from various sources with the intention of showing different phases of the work and aiding those who have carefully worked out the more fundamental lines. No one set of rules or directions, it is pointed out, will apply to all cases, and therefore the differences between the two parts, it is believed, will lead the student to compare in each case the two lines and choose the one best adapted to the case he may have in mind, or else to go on and work out some third or independent line which will better fit the case. The man who thinks and reasons, provided he is well grounded in fundamentals will rarely make a mistake.

The illustrations consist of both plans and elevations, and the entire make-up and arrangement is such as to render the work a very desirable addition to the builders' and contractors' library of trade literature.

Concrete Cottages.

Under the above title a most interesting little work has just been issued showing several types of concrete cottages, together with floor plans, specifications, &c., and embracing selections in the way of some of the successful designs submitted in a recent competition in concrete country houses conducted by the Association of American Portland Cement Manufacturers. The members of the committee who awarded the prizes were Edgar V. Seeler of Philadelphia, a prominent architect, and Sanford E. Thompson, Newton Highlands, Mass., a civil engineer and authority on the subject of concrete construction, and who has contributed in the recent past to the columns of *Carpentry and Building*. In connection with the designs and descriptive matter are comments of this committee. This partial reproduction of the prize designs submitted in the competition in question is published by the Atlas Portland Cement Company, 30 Broad street, New York City, with a view to meeting the demand for small concrete houses which is increasing more and more as the man of moderate means becomes familiar with the benefits to be derived from this type of construction.

Mineral Wool as a Building Material.

While mineral wool is undoubtedly a product of decided value to the building trade, there are many who know little or nothing of its nature or merits. It is essentially a vitreous substance converted to a fibrous condition. In appearance it consists of very fine fibers interlacing each other in every direction, thus forming an innumerable number of minute air cells. It is made by converting blast furnace slag and certain rocks while in a melted condition to a fibrous state. In converting the vitreous substance into mineral wool it is found that the material increases in bulk 12 times, so that the resulting fibers incase 12 times the quantity of air that the material did before conversion.

Its chief uses are the unsulation of heat and cold, for which it is admirably adapted, being one of the best non-conductors of heat. This can be readily accounted for in the fact that mineral wool holds in confinement a greater proportion of air than any other material. So long as air is circulating at all it is carrying heat from one place to another. When air is confined and held in place by a medium, the heat must be conducted, not conveyed.

It is manifest that a material so admirably adapted to heat insulation is equally valuable for frost proofing. For this reason it is a splendid material to use in filling the outside walls of frame buildings, the cost being moderate, and a house so protected can be warmed at very much less expense than would otherwise be the case. Where this material is known it is a common practice to protect residences in this way. It is just as valuable for the home of the man with moderate means as for the more pretentious residence.

As a deafener of sound it is valuable, and is used in hospitals, asylums, schoolhouses, public halls, theatres, hotels, apartment buildings and also lodge halls. Because of its nondecaying properties and that it contains nothing to harbor disease germs taken in connection with its insulating and fireproof qualities, makes this material preferable to other materials most generally used.

Death of Architect E. I. Nickerson.

Edward I. Nickerson, a prominent architect of Providence, R. I., died in that city March 15, aged 62 years. He was a native of Pawtucket, R. I., and after leaving the public schools learned his profession in the office of Clifton A. Hall, a Providence architect, and established an office of his own 40 years ago. During his long and successful career he designed many of the important buildings and residences of his city and the neighboring country. He was a fellow of the American Institute of Architects and secretary of the Rhode Island chapter of that organization. He was a member of the Hope Club, Agawam Hunt, University Club, Providence Art Club and Squantum Association, and was secretary of the board of trustees of the Providence Public Library.

Closing Exercises of School Department of Mechanics' Institute.

The closing exercises of the School Department of the General Society of Mechanics and Tradesmen of the City of New York were held at Mendelssohn Hall, 113 to 119 West Foriteth street, on the evening of Thursday, April 16. The exercises were largely attended and great interest was manifested. The address of the evening was by Professor Charles Sprague Smith, managing director of the People's Institute. An exhibition of the work of the School Department was held at the Mechanics' Institute, 16 to 24 West Forty-fourth street, on the evening of Tuesday, April 14.

Concrete Piles for Laundry Building.

A notable instance of concrete piles supplanting wood piling is found in the case of a reinforced concrete laundry building erected at Salem, Mass. This structure is four stories high, 100 ft. deep, 60 ft. wide, with a one-story wing for the boiler and engine room.

The soil conditions of the site, which was formerly occupied by an abandoned dock, called for a piling foundation. The original designs and estimates were for wood piles cut off below the level of tidewater, but it developed that the cost of the concrete footings could be decreased considerably by using concrete piling. Raymond concrete piles were ultimately selected of an average length of 20 ft. 6 in. in diameter at the point, 20 in. at the top and with a taper of half an inch to the foot. Each pile carries a load of 25 tons, this being double the load capacity per pile of the wood piles originally considered. Difficulty was anticipated from old wharf timbers which were found in the soil, but the sheet steel shell which is used in the Raymond system passed them with no delay or diversion of direction. Considerable brooming would undoubtedly have taken place had wood piles been used.

The piles are arranged in groups of four, spaced 3 ft. on centers in the form of a square. Each group supports a column or wall pier and is capped by a concrete slab 5 ft. 6 in. square and 24 in. thick, extending 15 in. beyond the center of the piles. The head of each pile projects 6 in. into the capping. The concrete chimney, 48 in. in diameter and 95 ft. high, is supported by a group of nine piles. These are reinforced with rods that extend into the footing of the chimney to form an anchorage.

Officers of Mason Material Dealers Association of New Jersey.

At the fourth annual meeting and banquet of the Mason Material Dealers' Association of New Jersey, held in Newark March 12, the following officers were elected for the ensuing year:

President, Walter C. Shultz of Hoboken.

Vice-Presidents, Charles Agnew of Paterson, J. C. Richardson of Trenton.

Secretary, James M. Reilly of Newark.

Treasurer, Horace P. Cook of Newark.

One of the interesting topics of discussion participated in by both manufacturers and retail dealers was "How Shall Cement Block Manufacturers Be Classified?" While much valuable discussion developed the question was not officially settled.

THE new municipal building which is to be erected in the Borough of Manhattan, New York, opposite the City Hall Park, will be 20 stories in hight and contain more than 600,000 sq. ft. of office space. The estimated cost is placed at between $6,000,000 and $7,000,000.

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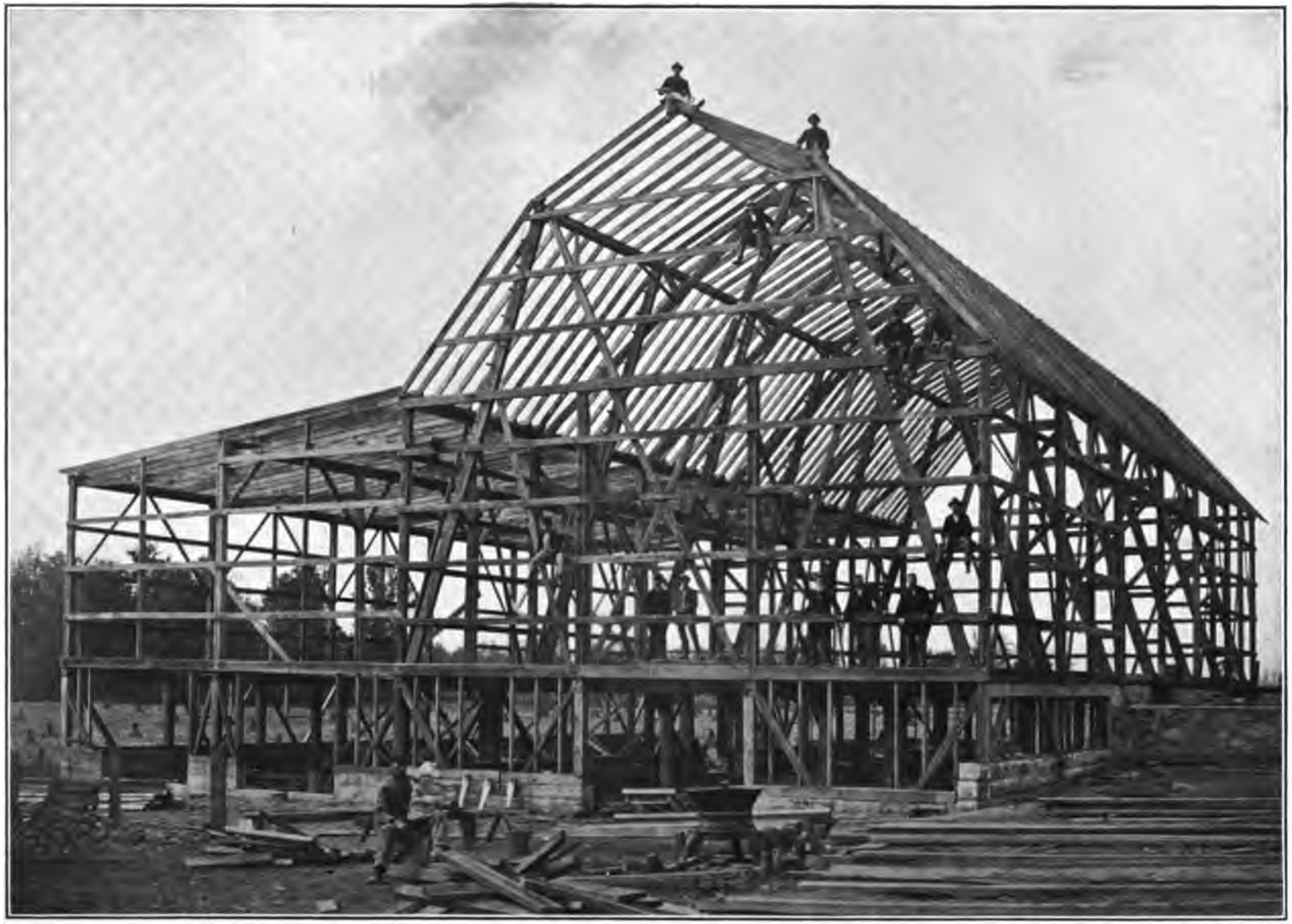


PLANK FRAME BARN IN COURSE OF ERECTION FOR MR. A. R. MORSE, PLYMOUTH, OHIO.

SHAWVER BROTHERS, BUILDERS.

Supplement Carpentry and Building, May, 1908

A SHINGLED BUNGALOW IN EUREKA, CALIFORNIA.

WILL S. FITZELL, ARCHITECT.

Carpentry and Building

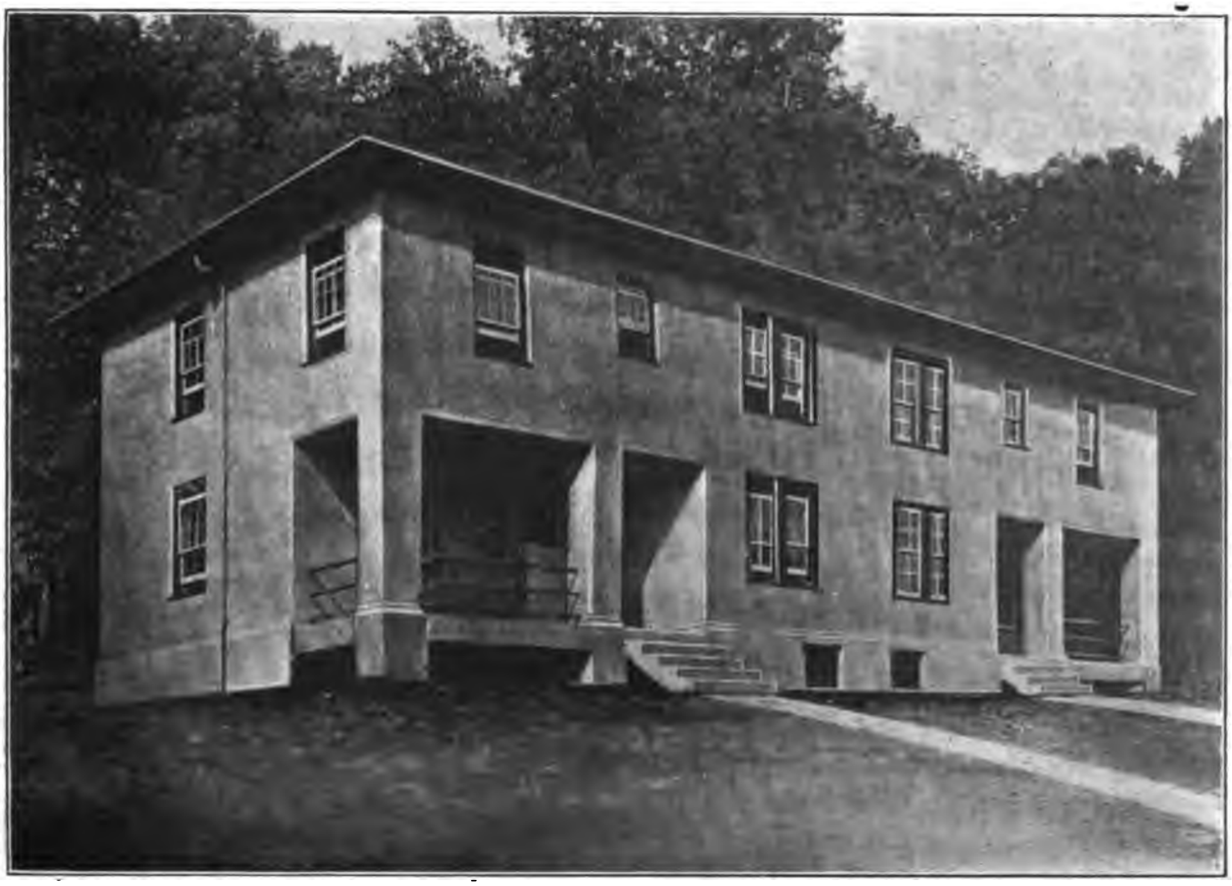
NEW YORK, JUNE, 1908.

Dwelling Constructed of "Metal Lumber" and Concrete.

APROPOS of the competition which we have been conducting in two-family houses and the prize designs in which are appearing in current issues, it may not be without interest to present at this time some pictures relating to a twin dwelling recently erected at Tuxedo Park, N. Y., and constituting an interesting example of the application of sheet metal products to modern fireproofing methods of house construction. The building is two stories in hight, and the arrangement of rooms upon the two floors is clearly indicated by the floor plans upon the following page. The picture herewith shows the external appearance of the completed structure, the finish being cement plaster on expanded metal lath. The half-tone supplemental plates accompanying this issue of the paper clearly indicate, in connection with the half-tone pictures upon a following page, the manner in which the work was done. The left-hand supplemental plate shows the construction of the roof of the building with ferro-lithic plate, and supported under the rafters at the ridge. The right-hand supplemental plate shows the ferro-lithic plate for the first floor before the concrete was applied, also grouting under the track on which the studs were placed. The upper picture on page 183 shows the men at work putting in place the attic joists and also indicates the studding, the first-floor joists and other members of the framing before the lath was applied. The lower picture shows the method of erecting the studding by means of a scaffold around the exterior of the building.

The house stands on a concrete foundation 24 x 60 ft. in area, with cellar under the entire structure, centrally divided by a concrete wall, which also supports the dividing partitions in the superstructure. The method of construction was similar to wood balloon framing, but the structural members employed consisted of specially designed sheet steel shapes known as "metal lumber." These, with ferro-lithic plates, metal bridging and expanded metal lath, together with various exterior and interior applications of concrete and plaster, constitute the structure proper, thus eliminating combustible material, with the exception of wood trim.

After the foundation walls were completed a steel channel track was attached to the foundation by means of expansion bolts. Suitable scaffolding was erected, extending entirely around the building, as indicated in the lower picture, on one of the following pages. This scaffolding was composed of 2 x 4 in. wooden studs, spaced about 14 ft. on centers, securely braced and provided with platforms at the various hights required. This scaffolding was used in placing and aligning the studs of the building, fastening lath on the exterior walls, setting window frames, plastering the exterior surface, attaching cornice, &c., and remained in position until the structure was entirely completed. The erection of studs for the exterior wall was commenced at the corners, special corner studs being first placed in position, and after plumbing and leveling were secured to the scaffold. Intermediate studs were then erected and aligned with the corner studs. The bottom of these studs were placed in the channel track on the foundation, the flanges riveted



General View of Twin House at Tuxedo Park, N. Y.

Dwelling Constructed of "Metal Lumber" and Concrete.—H. M. Naugle, Designer of Steel Construction.

to flanges of the track, and spaces between studs filled in with concrete to a depth of 1½ in., thus anchoring the studs to the foundation. Six-inch studs were used for exterior walls and extended from foundation to roof line, and leveled to bring them to uniform hight. Four-inch studs were used for the interior partitions for supporting second floor and roof, these studs being secured to channel track at the bottom and capped with crowning members on top for supporting joists or rafters.

The first floor was constructed of ferro-lithic plate, plastered underneath, and concreted on top to a depth of 2½ in., these floor plates resting on concrete girders having a special reinforcement, which also took the place of false work for the beams. The girders in turn were supported by concrete piers. In the second-floor construction specially designed I-joists 5 in. deep were employed, these joists resting on an angle wall ribbon, which was riveted to exterior studs at the second-floor line. The attic joists were formed of 6-in. channels and extended 2 ft. over the outer line of building. Six-inch metal rafters were employed, supported upon a ridge resting on ceiling joists. Upon the rafters were placed ferrolithic plates, which were plastered underneath and concreted above with cement mortar and covered by asbestos waterproofing material attached by heavy pitch. The rafters, joists and studs were braced with strap steel bridging.

The necessary ground for concreting and plastering was afforded by expanded metal lath, applied and fastened by means of prongs punched on the structural members. The various steel members of the construction were cut to the required lengths at the factory and erected in the field by means of erection derricks, similar to those used in structural steel building. This facilitated the assembling of different members and made a great saving of time and labor in completing the structure.

The finished floors were of wood secured to joist or reinforced concrete floor by means of nailing blocks. Where metal joists were used the blocks were placed directly on top of joists and nailed to same by driving the nails between the webs of the channels which compose the I-joists. The lath on the exterior of the building was covered first with a coat of cement mortar, then with a scratch coat, then with a finished coat left very rough. The inside of the exterior lath was plastered with a heavy coat of cement plaster, thus wholly imbedding the lath and producing a concrete slab 2 in. thick.

Interior partitions were plastered with patent hard plaster on expanded metal lath. Stair forms were constructed of ferrolithic plate concreted to form treads and risers, and with nailing blocks imbedded in the concrete for attaching wood finishing treads and risers. The under part of the ferrolithic plate, forming the soffit of the stairs, was plastered with cement plaster.

The chimney contained four flues of terra cotta flue lining, to which were placed metal furring strips and expanded metal lath, coated with cement plaster 2 in. deep, making the thickness from inside of chimney to outside of cement plaster 3 in. This construction proved very satisfactory and the chimney was quickly erected.

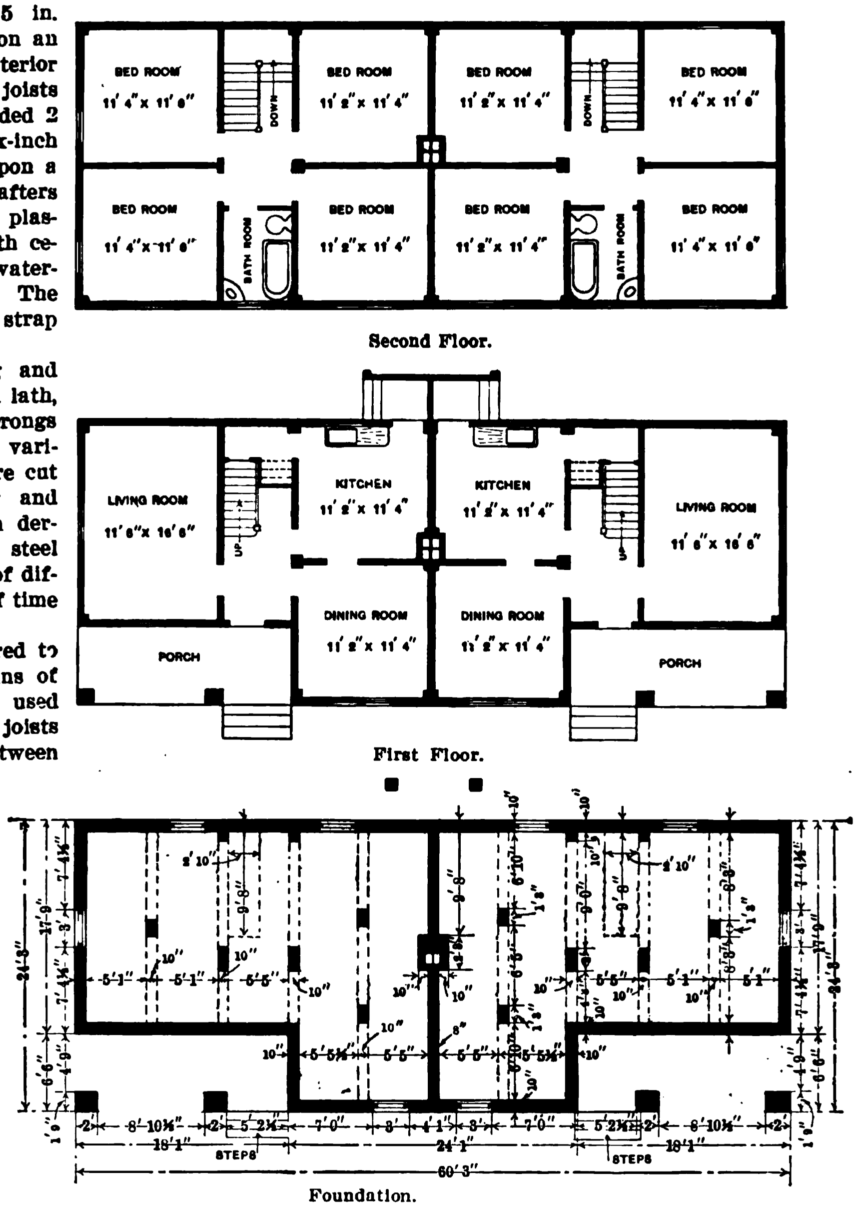
The porch columns were of combination form and reinforcement, consisting of four angles placed at corners and covered with metal lath, the interior being filled with concrete and the exterior plastered with cement plaster. All steps, floors, piers, &c., for porches were of concrete and were left under trowl finish.

The hot air ducts were carried up in partitions the same as in a wood constructed building, and the bathroom fixtures, plumbing, electric lighting, &c., were also installed in a manner similar to that in a frame structure. The cottage is heated by two furnaces in the basement.

The steel construction was designed by H. M. Naugle, Canton, Ohio, the contract was executed by the Taft-Howell Company, Cornwall Landing, N. Y., and the structural materials were furnished by the Berger Mfg. Company, Canton, Ohio.

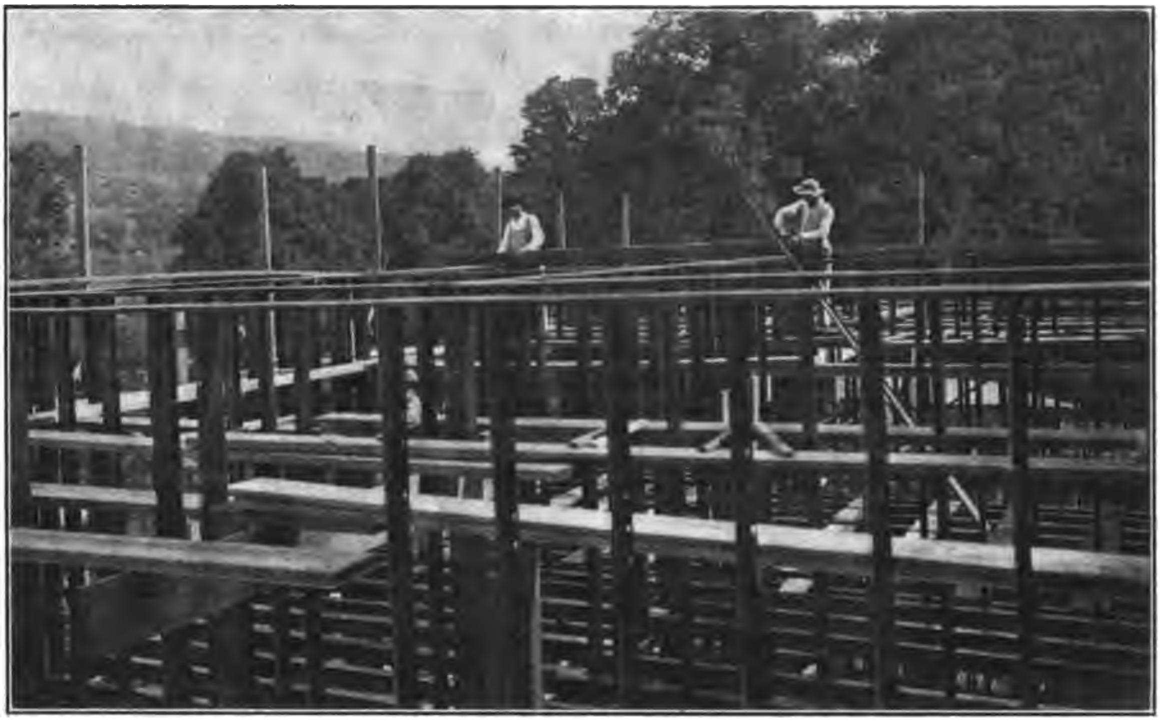
Greek Perspective.

Merely to observe the law of optical experience, that a thing in the distance appears smaller than one close at hand, is far from putting the picture in perspective.



Dwelling Constructed of "Metal Lumber" and Concrete.—Floor Plans.—Scale 1-16 in. to the Foot.

Perspective requires a single point of view, a defined natural horizon, and this was wanting in the old pictures. The ground plan in the pictures of Polygnotus, says an English writer, was not horizontal, but the background was so raised that the figures which ought to appear to stand one behind another appeared to stand one above another. And if this disposition of separate figures and their groups was general, as we may conclude from the old bas reliefs, where the hindmost figures always stand higher than the foremost, and look over them, then it is natural to suppose the same in Homer's description of the shield of Achilles, and not unnecessarily to separate those of his figures which he allows to be combined in one picture. The double scene of the city at peace, through whose streets moves the joyous procession of a nuptial feast, while in the market place an important lawsuit is being tried, does not necessarily require a double picture; and Homer might well consider it as a single one, while he put before us the whole city from so elevated a standpoint that he thereby opened a clear view simultaneously both of the streets and of the market place.



View Showing Attic Joists Being Put in Place; Also Position of Studs, First Floor Joists, &c., Before Lath Was Applied.

View Showing Method of Erecting the Studding of the Building by Means of a Scaffold Extending Around the Exterior of the Structure.

Dwelling Constructed of "Metal Lumber" and Concrete.

Lessing considered that true perspective was accidentally introduced into pictures through the medium of scene painting; and, although that was already in perfection, it could not have been so easy to apply the rules of it to a flat surface, since even in the later pictures discovered in the ruins of Herculaneum we find so many and such various faults of perspective as we should now hardly pardon in a beginner.

Pittsburgh's New Bank Building.

On the present site of the First National Bank, Fifth avenue and Wood street, Pittsburgh, Pa., the directors of that institution will erect a one-story structure. It will have a frontage of 80 ft. in Fifth avenue and 120 ft. in Wood street. The building will be a splendid production of architectural art, massive in exterior and elegant in interior.

ESTIMATING MILL WORK FROM BLUE PRINTS.*

AFTER listing the outside frames, it is well to list the windows next, and if there are any inside windows let them immediately follow the outside, with the notation that they are inside, or he will be trying to make them check up with the outside frames. After the windows should come the sash, giving the glass sizes and the opening sizes both, then following with the transoms, which will be 2-in. sash all around, unless otherwise specified. The inside transoms should be so marked in order to check against the inside door frames having transom bars.

The dimensions of transoms are given in feet and inches for width and in inches for hight, for example:

1 Tran 3-0 x 28 in., would be the sizes outside of the sash.

It is the custom among sash and door factories to give the glass size of sash in inches and the opening size in feet and inches, as: 1 sash 22 x 32, opg. 2-2 x 3-0, or if the bottom rail was 3 in. the opening would be 2-2 x 3-1. However, it is not a safe plan to depend upon lumber yards, contractors and carpenters to adhere to this rule. Many of them are not aware of its existence, and the only safe method when the notation does not accompany the order is to wait until it can be obtained.

While it is the custom of some mills to bill each opening or each set of identical openings complete, including frame, window and inside finish, practically all in one item, it is so very inconvenient, if the list is to be used as a working bill, that no up to date manager would allow the practice. The estimator can further save time for the mill if he will begin and list the doors which he knows the mill will have to make all together, and follow with those kept in stock.

Notations covering the required specifications for glazing all the windows, sashes and doors should be entered on the list in their proper places, as it is usually an element largely affecting the cost of the items in question, and again will prevent the necessity of the glazier hunting up the specification when the open sashes come to his department.

The above is especially true when the sashes are to go out open, or are to be glazed with art, plate or obscure glass, for in the absence of any notation on the bill, the sashes are apt to be filled with plain glass before any one who is wise is any the wiser.

Door Frames.

The next section of mill work on the job will be the inside door frames, or jambs, as they are commonly designated, and if there are no details, the width of the walls should be given, the thickness of the jambs themselves, whether rabbeted or plain, size of transom, if any, and depth of transom bar, as follows:

25 I S Dr Fras 2-8 x 6-8—Tr 2-8 x 24-inch Rab 1⅝—3-inch Bar.

If there are many sizes and the specifications fill more than a line of the paper used, it is just as well to leave the specification relating to the thickness of the jambs and the depth of the transom bar until the end of the list and then put them down with some distinguishing mark, as a ring around the note or a heavy underscore, so that the feature may not be overlooked. It is rather an expensive experience to get out a set of jambs for a large building and then have to go to work and get out another set a little different.

If the jambs are plain—that is, have no rabbet for the door to hang in—it will be necessary to figure stops either in connection with the jambs or the casing finish.

It is a good custom to bill the inside finish, excepting the item of door jambs already mentioned, as so many sides of trim. This should be divided into window trim and door trim, and following the items or number of sides of the various sizes required on the job should be a specification as to what comprises a side of trim for each class. Taking the numbers from the Chicago molding book for an example, we might specify as follows:

One hundred and fifty sides door trim consisting of Nos. 8342, 8410-11-12-13. Base blocks round edge.

Or they can be given in any required number, as base blocks are not listed in all the catalogues in the same numbers the same as moldings.

Forty-five sides window trim for 36 x 40 2 lt wds, consisting of Nos. 8438, 8084, 8269, 8379, 8060, 8410-11-12-13.

As will be seen when we take up the matter of pricing the items, each one of these catalogue numbers has a list price given in the catalogue, so that it will not be a difficult matter to figure the material in the finish for a frame, and after having figured and put two or three jobs through on a satisfactory basis, a price may be established for sides of trim of various character, so that after a while the estimator's work will become easier if he keeps his records.

After all the openings have been disposed of, the base, base-mold and shoe or quarter-round should be figured up, as also the wainscot cap or dado mold, picture molding, and all outside molds, brackets, columns, balustrades, screens and any other mill work in the building except the stairways, which should be listed separately.

Listing Window Screens.

When listing window screens, care should be taken to bill them the same length as they will have to fill in the frames, and the estimator having the plans and details before him will be able to give the opening size of the screen, for the length of window screens vary greatly in different details of frames. Specifications as to the kind of wood, thickness, style of wire and number of meshes to the inch, color of paint, whether sliding or hinged, buttoned or nailed on, should be jotted down in the estimate. If the job is a large one it will make considerable difference in money whether the job is done one way or another, and then if the order is placed, the work can be turned into the screen department and move off with that celerity which means a pleased customer, foreman, superintendent, manager and company, to say nothing of the workmen and the estimator.

Stairs.

When listing stairs it is a good plan to begin with the newels and give the size and style of the starting newel, and then follow with the angle and landing newels, which are usually an inch or two smaller. It often occurs that an angle newel will extend nearly from floor to ceiling, especially if the platform is high and the walls under the rake of the strings are paneled. These long newels should be figured considerably higher than the regular 5-ft. newel, so that the length of newels should be given in the list.

It often happens that the newel shown in the drawings is like one carried in stock, but when the stair comes to be put up it is discovered that the stock newel is one riser too short, and this should have been discovered by the estimator unless the builder has varied from the plan.

After listing the newels, put down the number and dimension of the treads, risers and nosings. If the stair is a hardwood one, it is no more than safe for the mill to figure the flooring for the platforms, as it is likely it will have to furnish the same under a blanket bid.

The string boards should be listed as so many running feet, and if the outside is a closed string with a foot rail, it should be listed as so many lineal feet of that material separately from the wall string. The baseboards for the platforms should be included, and the well hole casings, angle moldings, scotia under the nosings, base molding over the wall strings and under the skirtboard. Put down the lineal feet of handrail, stating its size, give the number and size of balusters, also stating whether square or turned.

IT has been made public that on account of faulty construction extensive repairs will be necessary on the new Catholic Cathedral, which was completed two months ago in Seattle, Wash., at an expense of nearly $500,000. It is probable that the big dome will have to be closed on the inside, as at present it is hardly possible to hear a speaker half way back from the pulpit.

* Continued from page 159, May issue.

ESTIMATING THE COST OF BUILDING ALTERATIONS.*

BY ARTHUR W. JOSLIN.

IN my serial article on the subject of estimating, which appeared in the columns of *Carpentry and Building* last year, I assumed a new building for the purpose of illustration. I think I made it plain, although I do not recall having expressed it in so many words, that I did not consider the estimating of costs of buildings an exact science. While results are reached, as a rule, by various mathematical processes, the element of judgment enters so largely into each and every item, especially in methods of measuring plans for quantities, allowances for waste and determining cost of labor, that on the whole such estimating may be considered more as an art than a science.

I doubt if it will be questioned that determining the probable cost of alterations and remodeling operations requires the exercise of even greater judgment than new work. Nearly all that I wrote on the main subject last year can be applied in a measure to the work now in hand, and in the matter to follow I will try and bring out details of the subject especially applicable to alteration work.

In the first place, have a method or system and stick as close to it as circumstances will permit. My former article suggested taking up the items in the order in which they appear in the specifications, not forgetting meanwhile, some matters seldom or never mentioned there. In case there are no specifications take up the items in the logical order in which the work would be done.

Before beginning to figure at all you should visit the building which it is proposed to alter and carefully note existing conditions. This is an absolute necessity as, at best, it is difficult to make plans for an alteration show with accuracy just what is to be done. The plans usually make plain enough the end sought, but you must see the building to determine with any accuracy the cost of accomplishing it.

It is very important to know whether you are going to have a vacated building or must do the work in such a manner that the business of all occupants can be carried on. If the latter is the case you must find out about how much room you will have given you at a time in which to work, and what measures for the protection of occupants' stocks must be taken.

These two questions settled, you can see what advantages or disadvantages you will have to work under. It is highly probable that some work will have to be done overtime. At "double time" and by artificial light, construction work of all kinds is most expensive—so expensive, in fact, as to be prohibitive at times.

The loose leaf book sheets described and used in my former article are perfectly adaptable for the present case, and as the carrying of quantities to the same was sufficiently described there, I will not use them in this case, but stick wholly to text.

Razing.

This is the first and usually a very important item. Generally there is a little of everything to pull down and get into shape to be used over again or carted away. By taking each part separately; such as stone work, brick work, plastering, frame, &c., and analyzing it to determine the probable amount of labor involved, and adding for a total, a much closer and more accurate estimate will be made than if you try to consider them collectively.

Bear in mind while making this analysis, that such of the razed materials as are to be removed must be brought out to some place accessible to the teams. In some cases this involves considerable handling under adverse circumstances. In any case the probable cost is a matter of judgment rather than mathematics. Where materials are to be used over again it is unwise to make any allowance for them unless there are large quantities in excellent shape. There are any number of little items and wholly unforeseen circumstances that delevop in an alteration job, and the salvage on materials is needed to offset them.

Shoring.

As the work of razing progresses many existing parts that are to be retained must be shored. As most of the material used in shoring is heavy timber or old steel beams kept in stock for the purpose, the cost of this part of the work is practically all labor and teaming. By making a mental survey of about the quantity of material required one may judge of the teaming to and from the job. Now by taking each separate wall, floor or other part to be shored, and mentally analyzing, we are able to determine the probable labor required to place shores and remove them when other or permanent support has been installed. Labor of cutting needle holes in brick or stone, or slots in masonry walls, holes through floors of frame or other construction, must be foreseen and taken into account.

It may be possible to do all shoring on a large job without a great quantity of timber and iron if the work is arranged in such a way as to permit of certain parts being shored and secured and then the material may be used over several times. This saves considerable in teaming, but it must be a matter of judgment with you whether to resort to this saving or not, as it may involve other expenditures that would soon more than offset any saving made. In the large cities where numbers of difficult and extensive jobs of shoring are done every year there are contractors who make a specialty of this work, and there will be cases when it will be advisable for you to take sub-bids and sublet such work.

Temporary Partitions.

These are usually made of matched stock ⅞ in. thick. In cases where extreme precautions must be taken against dust it is customary to paste paper on the exposed side. I have found that the cheapest way to paper partitions if there is much area, is to have a paper hanger do the work, using wall paper that can be found in any wall paper store that is out of style, and can be purchased for 2 or 3 cents per roll. This should be put on with the face of paper toward boards, thus leaving the plain color of back in sight, and two thicknesses should be applied, otherwise the boards will season enough in a few days to break the paper at each joint. By assuming imaginary lines on your plan in the various places where you have concluded that these partitions will have to be erected, it is a simple matter to obtain areas and quantity of stock required.

Excavation.

Most excavation in alteration work has to be done under very adverse conditions, and the labor involved to get excavated material to the street or to the teams must be taken into account. As the conditions are seldom twice alike the cost is all a matter of judgment. You must frequently excavate considerably more than strictly implied by the plans, in order to make room in which to handle materials or to give the men a chance to work. After listing on the estimate sheet the dimensions of the several excavations you must mentally average the conditions and determine upon a price per cubic yard, or other unit, including the disposition of the material, on the premises or elsewhere. Under conditions frequently occurring in our city (Boston) the cost, including teaming away, will be as high as $2 per cubic yard.

Concrete Foundation Work.

It is generally easy to locate on the plan the new foundations, and there should be sections showing thicknesses and other particulars. If no sections are shown you must use your judgment and take the chances. I am sorry to say that the larger part of our architects give very meager sections, either from their inability to foresee conditions or unwillingness to spend the time and money necessary to have test pits dug at the side of existing foundations, so that it may be known to a certainty what conditions exist. There is no difference in the method of taking off quantities or entering dimensions on the estimate sheet than would be the case in a new building. These latter points I fully explained in my article in *Carpentry and Building* last year. There may be, however, and there usually is a great difference in the cost, and practically all of it comes in the labor. Frequently the concrete must be mixed in an alley or a distant part of the cellar, then carried in pails or mortar hods to the location of the work and be deposited in shovelsful. These conditions, coupled with the fact that there is seldom much in bulk in a place, and many places, make the cost run from $8 to $15 per cubic yard for the ordinary mixtures. Pick out what seems to be an average piece of foundation and picture yourself there with the help and putting it in. Arriving at what you consider a fair estimate of the labor, figure out what it would be per cubic yard for the number of yards in the piece of your foundation used for the experiment, and you have a fairly accurate cost per yard for labor, to which you can add costs of materials, which latter would be as usual in any work, old or new, thus obtaining a price per yard to use for the whole quantity.

All my explanations above for concrete apply fully to foundations of other materials. The price might be different on account of local conditions, but the method of arriving at a cost would be the same as for concrete.

Concrete Floors.

Areas of new concrete floors would differ in no way but price (and this all on the labor) from new work. In making good existing floors, where they have been broken out to get in new foundations, pipe trenches, &c., do not measure or assume too small an area. Nine times out of ten, unless you are there yourself, about twice as much as was necessary will be broken out. This statement about cutting out to admit of the installation of new parts holds good on more than this one item. In fact, it must be borne constantly in mind when figuring an alteration of any kind. In making price in concrete floors picture to yourself the disadvantages under which the particular job in hand will have to be done and be governed accordingly.

Brick Work.

The brick work found in the usual alteration job would not be altogether unlike that in a new building. The only difference that amounts to anything is that instead of the continuous and connected walls, there are detached walls, parts of walls, openings made or filled up, &c. The work being thus disconnected and scattered, will cost a great deal more for labor than would be the case under normal conditions. In making a survey of the number of brick required it is seldom advisable to take into account any old brick taken out, as the cleaning and care of these latter until such time as they can be used, usually costs as much as new brick delivered when and where wanted. Quantities should be entered on your estimate sheet the same as demonstrated for new brick work (page 95, *Carpentry and Building*, March, 1907). In taking off quantities I always disregard all openings cut in existing brick work for doors, windows, &c., and immediately after making brick survey, count and enter on estimate sheet the number of these openings, noting the average size of same and thickness of walls in which they occur.

In making a price per 1000, laid, proceed the same as for new brick work, taking care to fully consider the question of labor before assuming the probable cost. In my judgment a first-class mason will only be able to lay one-half as many brick per day as on new work, on account of the usual peculiar disadvantages attending alteration work. Now consider the openings to be cut in walls: The cost in this case is probably from 90 to 95 per cent. labor, so that in most cases you can consider it purely a labor item. Picture yourself cutting the average opening and toothing and bricking up the new jambs. Having determined to your own satisfaction how long it would take, figure the cost of labor involved, not forgetting before carrying said cost to the estimate sheet, that you are not going to cut these holes yourself, but that some man in your employ about half as interested to see it done as you are, will do the work, and adjust the supposed cost accordingly.

The item of washing and pointing will invariably cost more than on new work of equal area. This work, in either case being almost wholly a matter of judgment as well as labor, must be analyzed as such and in the same manner as outlined in *Carpentry and Building*, March, 1907, page 96.

Cut Stone.

The only difference in cost of cut stone of any kind or ornamental terra cotta would be the additional labor involved in setting it under adverse conditions, and with little or no rigging in many cases. Being wholly a matter of judgment, you can see the great benefit of having some reliable data at hand from which to draw conclusions. Otherwise the estimate for cost is a guess, pure and simple.

I do not know of anything I can say in regard to terra cotta floor arches and partition blocks or reinforced concrete floors other than that you must fully consider the labor cost per unit of each of the above items, and make it sufficient to cover the cost on the particular job in hand, considering all of the surrounding conditions.

Iron and Steel.

The process of taking quantities from plans would be no different than in the case of new work, except that as generally drawn, plans for alterations are apt to be somewhat vague, and the architect, to protect himself and the owner, embody clauses in the specifications that compel the builder to "supply all needed materials whether shown or specified" to accomplish the desired result. While this is decidedly wrong, there seems to be no immediate help for the contractor, on account of the general lack of organization among them. This makes it necessary for the builder, when estimating, to foresee the possible wants of the job beyond that shown and listed, and figure upon them. Having found and listed all of the iron and steel shown and "implied," compute into pounds and set a price. The cost of setting will usually be as much as double that of new work for reasons before stated, and not infrequently the handling and setting will cost as much as the material itself.

We recently had occasion to set eight 2-ton girders and six 1-ton columns all built up of structural shapes and costing $70 per ton delivered, where the cost of erection exceeded the cost of material, being about $75 per ton. These girders went into the ceiling and the columns extended through the first floor to the foundations in the cellar in a large and busy jewelery store, where business was never suspended for a moment during the operation. All handling was done with hand rigging, and everything was taken into the second-story windows and lowered into place, preparation having been made for this by building tunnels on the store ceiling—which fortunately was quite high—for the girders and boxes about 4 ft. square through the store in which to lower and set the columns. While circumstances are seldom as adverse as this, they are usually of such a nature as to require the exercise of fine judgment to arrive at a safe probable cost for labor.

Roofing and Metal Work—Marble and Mosaic Work.

Roofing and metal work and marble and mosaic work are subject to the same changes in price as most other items entering into alterations, but as a rule the increase is not so marked. There would be no material change in method of listing quantities, but care must be used where old and new work joint to figure enough material. There will be cases where it will be cheaper to tear away and dispose of existing work and supply new than to retain same, even though the plans and specifications permit of said retention. A little analysis of questionable parts should determine for you the better course to pursue in estimating.

(*To be continued.*)

The production of lumber, lath and shingles in the United States in 1906 was 37,490,067 M feet board measure, against 30,502,961 in 1905, and 34,127,165 in 1904. The figures cover returns from 21,077 miles in 1906, 11,666 in 1905, and 18,277 in 1904.

COMPETITION IN TWO-FAMILY HOUSES.

SECOND PRIZE DESIGN.

ACCORDING to the announcement made in our last issue in connection with the decision of the Committee of Award having charge of the Forty-first Competition, being that for two-family houses, the second prize was awarded to the study furnished by John H. Ramberg and Le Roy Barton, associated architects, 287 Clinton street, Brooklyn, N. Y., we have pleasure in presenting herewith the study of these contestants, together with the specifications and estimate of cost accompany it.

In referring to this design, the committee in its report says: "The exterior of the building is very neat and well proportioned, the color scheme outlined in the specification being perfectly adapted to the structure. The rooms are so laid out as to give a spacious and square appearance. An excellent feature of the design is the dining room at the front of the house. The butler's pantry is well arranged, with space for everything necessary. The kitchen, though small, is arranged to be convenient, and has the pot closet which so many plans omit. Each hall has a coat closet conveniently placed—a small but necessary feature for completeness. The bathroom is spacious and strictly up to date in finish and fixtures. The smaller rear bedroom is so placed that it could be used as a servant's room if required. The closets are excellent, and the linen closet, which has been provided, is conveniently situated. The interior details are well worked out and well proportioned. There is plenty of light in every portion of the house, and the design is one which is well adapted for a two-family structure.

"The house has only one furnace for both families, which, while common practice in the city of Brooklyn in connection with buildings of this character, is in the opinion of the committee objectionable, as there should be a separate furnace for each family. This, however, is a difficulty easily overcome. The cellar windows are rather small, and should be larger so as to have a good light cellar. The rear entrance for both families is well arranged at the side of the house, and occupies comparatively little room, and is without the usual unsightly rear addition and stairs so often provided. The specifications call for 18-in. shingles laid 6 in. to the weather, which of course gives no lap to the second course below. Shingles of this dimension should be laid not more than 5½ in. to the weather."

Front Elevation.—Scale, ⅛ In. to the Foot.

Competition in Two-Family Houses.—Second Prize Design.—John H. Ramberg and Le Roy Barton, Associated Architects, Brooklyn, N. Y.

Specifications

The specifications accompanying the design awarded the second prize in this competition are as follows:

Mason Work.

Excavation.—The entire cellar is to be excavated to a depth of 6 ft below grade, and 6 in. outside of area covered by plans.

All surplus earth is to be removed from the site, except such as may be required for filling in and grading.

Footings and Foundation Walls.—All walls to have concrete footings, 12 in. deep, and 6 in. each side, wider than wall above.

Foundation walls to be of concrete, of size shown, and extending to within 2 in. of finished grade. Contractor to erect the necessary forms for this work.

Concrete to be mixed in the proportion of one barrel of Portland cement; three barrels of sharp, clean sand; and five barrels of 2 in. broken stone. All to be mixed by measurement; four bags equal one barrel of cement; and to be deposited in 6 in. layers and well rammed.

Brick Work.—Front and side walls, as far as returns, are to be faced with Sayre & Fisher's Harvard brick, laid up Flemish bond, with white mortar.

Returns on sides, as well as side and rear walls, and the backing of face brick, to be best quality, hand made, hard burned common brick, laid up in cement mortar; one Rosendale cement. to three of sand. Every sixth course to be a header course. All joints to be struck and at the completion of the work face brick is to be cleaned down with dilute muriatic acid.

All exposed parts of chimneys are to be faced with Harvard brick, the top five courses to be laid in Portland cement mortar. All flues to be lined their entire length with tile flue lining. Build skew-back arches under all hearths.

Fireplace in living rooms to have brick hearth, &c., as detailed.

Stone Work.—Water table to be limestone, and to extend 2 in. below grade.

All sills and lintels to be limestone.

Front porch steps and base blocks for columns to be of limestone.

Cement Floor.—The entire cellar is to have a 4-in. concrete floor, with an inch cement finish.

Carpenter Work.

Beams and Girders.—All beams and girders are to be of spruce. Girders to be of size shown:

First tier beams, 3 x 8 in. — 16 in. o. c.
Second tier beams, 3 x 8 in. — 16 in. o. c.
Third tier beams, 3 x 6 in. — 20 in. o. c.
Roof tier beams, 3 x 6 in. — 20 in. o. c.

All beams to be cross bridged every 8 ft.; and all headers are to be hung by wrought iron hangers. Every sixth beam is to have a wall anchor.

Partitions.—All partitiens, except those between closets, are to be constructed of 2 x 4 in. studs, 20 in. o. c. Closet partitions to be 2 x 2 in. studs.

Cellar partitions are to extend from floor to ceiling, and are to be built of ⅞ N. C. pine boards on studs. Coal bins to be of 2-in. plank.

Furring.—All exterior walls are to be furred and grounds set for all interior finish.

The ceilings of corridors and all closets are to be furred down to 7 ft. 9 in. in hight.

Flooring.—Over entire area of first and second floors lay ⅞ x 6 in. tongued and grooved N. C. pine, laid diagonally.

In living rooms, halls and dining rooms a parquet floor; body to be square blocks, laid herringbone pattern with double mahogany strip.

All other floors to be ½ x 2½ in. Georgia pine, tongued and grooved.

Front stairs, including treads, risers, rails, and balusters to be of oak.

Rear stairs to be of pine. Provide scuttle on roof and ladder for same.

All interior doors to have five horizontal panels.

All cupboards in pantry and all closet shelves to be of white pine. Closets to have two shelves and a hook strip. Linen closet to have four shelves and two drawers.

All rooms and halls to have white pine picture moulding.

Hardware.

All windows to have brass faced pulleys, sash cord and weight.

All hardware to be old brass finish and to consist of knobs, for doors, cupboards, &c., butts, hinges, locks and keys, window fasteners, drawer pulls, &c.

Carpenter is to furnish 4 in. heavy Lally columns, in cellar, as shown.

Iron Woak.

Set up iron balustrade, as shown.

Furnish all angle iron lintels to be set by mason.

Lathing and Plastering.

All walls and ceilings are to be lathed with pine lath.

All plastering to be the best two coat work.

In the kitchens and bathrooms there will be a 4 ft. 6 in. high wainscot of Keene's cement, with a cap, and blocked off into 5 x 5 in. squares.

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

Competition in Two-Family Houses.—Second Prize Design.

Roof.—To be sheathed with ⅞ x 8 in. N. C. pine; covered with heavy building paper. Shingles to be 18 in. cypress shingles, 6 in. to the weather.

Outside Finish.

The house is to have a wooden cornice of cypress, to be well secured to wall.

Entrance porch is entirely of wood, as detailed, using thoroughly seasoned cypress. Columns are to be patent lock joint. Roof of porch to be covered with heavy canvas.

Panels over front windows and ornamental shutters are to be, as shown, of cypress.

Side steps and porch are to be of cypress.

All window and door frames to be made of white pine. All windows are to have box frames, with 1⅛ in. jambs and heads, ⅝ in. parting strips, ⅞ in. back lining and 2 in. sills.

All exterior doors to have 2 in. rebated jambs and heads of white pine.

Both front entrance doors to be 2 in. oak veneer doors, with ¼ in. veneer on white pine core. Side entrance door of white pine.

Inside Finish.

All interior trim for doors and windows, base, picture mould, panels and plate shelf, for vestibules, halls, living rooms and dining rooms, are to be of white pine. All interior doors opening on these rooms are to be of birch. Bookcases in living room to be of birch. Wooden part of mantels in living and dining rooms to be of white pine.

All other trim, &c., to be of seasoned cypress, and all doors to be of white pine.

Terrazzo Floors.

Floors of vestibule and bathrooms to be of Terrazzo, laid on concrete, set between beams.

Painting.

Exterior.—All windows and doors, including frames, panels, porch, cornice and all leaders to be painted with two coats, lead and oil, and two coats of Ripolin.

Ornamental shutters to be stained with Cabot's shingle stain.

Shingles are first dipped, then, after laying, are painted with shingle stain.

Iron balustrade to be bronzed.

Gutter to be given two coats of red roofing paint.

Interior.—All the woodwork in vestibules, halls, living rooms and dining rooms to be finished with one coat of lead and oil, and two coats of Ripolin, and finished with a semi-gloss.

Doors and bookcases to be stained mahogany and polished.

Floors to be given two coats of hard oil finish and one coat of prepared wax.

All other woodwork, including stairs, to be finished natural, with paste filler and wax, excepting kitchens, bathrooms, and pantries, which are to be finished, including wainscot, in white enamel.

Georgia pine floor, to be finished same as parquet.

Glazing.

All sash to be glazed with double thick glass, with the exception of bathrooms, which are to have Florentine glass.

Front entrance doors to be beveled plate glass, with leaded glass for side light.

Doors to book cases to be leaded glass.

Plumbing.

House sewer to connect with public sewer.

All soil, waste and vent pipes and house drain to be ex. h. c. i. There is to be a fresh air inlet at house trap.

Leaders to be of galvanized iron, above grade, and ex. h. c. i. below.

Fixtures.—Water supply pipes to be wrought iron.

Water closet is siphon jet, solid porcelain; overhead tank.

Lavatory is enameled iron, wall hanging type.

Bath is enameled iron finish, both sides.

Trimmings are nickel plated.

Laundry tubs and sinks are enameled iron, with brass trimmings.

In kitchens a 40-gal. copper boiler connected to range. Range to be coal burning, with two underneath ovens.

Gas Fittings.—Entire house to be piped for gas, outlets, as shown, pipes to start from company's mains. There is to be an outlet in kitchen for range.

Electric Lighting.

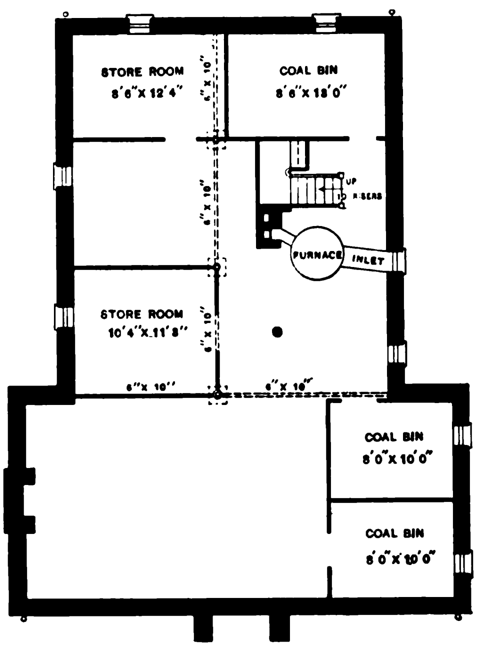
Fixtures.—To be combination fixtures, old brass finish.

Electric Wiring.—The house is to be wired for electric light under the rules and regulations of the National Board of Fire Underwriters, with all necessary cutout, switches, &c.

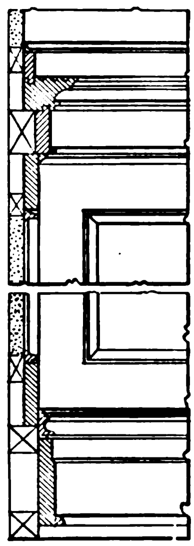
The current will be brought underground from the company's mains. This will be run in with three wires. The neutral wire to be twice the area of each outside wire.

All wires are to be run in enameled iron conduits, which are to be securely fastened in place. Conduits to be of ample size for three wires for mains and two for branches. All outlet boxes for lights or switches to be fitted with separate iron or steel enameled boxes.

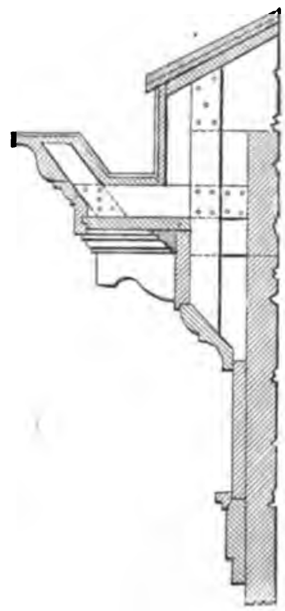
All wires to be of best quality double braided rubber covered wire.



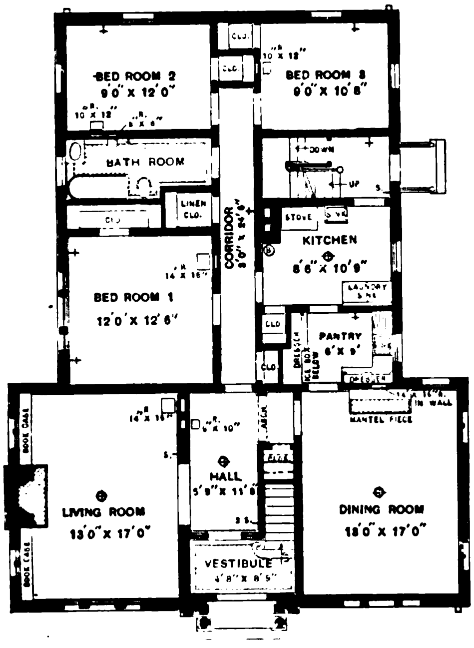
Foundation.



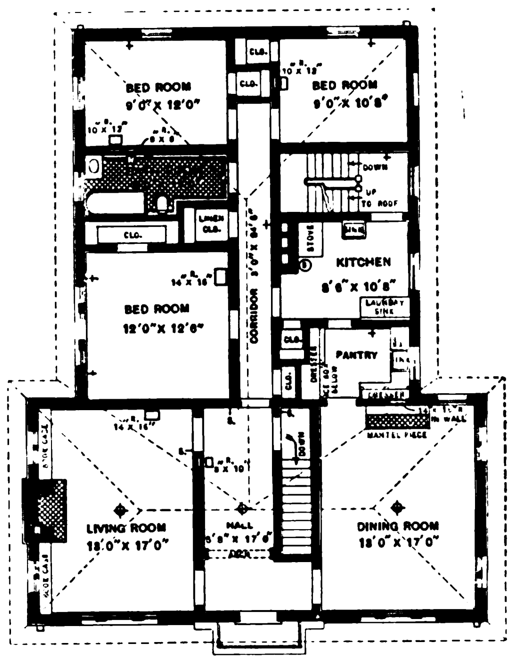
Section and Elevation of Wainscot in Dining Room.—Scale, 1 In. to the Foot.



Detail of Main Cornice.—Scale, 1 In. to the Foot.



First Floor.



Second Floor.

Scale, 1-16 In. to the Foot.

Competition in Two-Family Houses.—Second Prize Design.—Floor Plans and Miscellaneous Details.

All switches to be of the flush push button type, and of old brass finish.

Where service enters building, there is to be a switch of sufficient size to carry the current for all lights. This is to be a three-pole fused switch, with enclosed fuses, and mounted on a slate slab, enclosed in a slate frame: the whole enclosed in a wooden box, with 3-in. sheet iron gutter.

Door Bells.—There are to be two electric push button bells at each entrance door, one set to ring in each corridor, there being a seperate 4-in. bell for both front and side doors.

Wire for bells to be No. 20 copper wire, tinned, rubber coated and insulated by cotton. All wire to be concealed and secured by staples.

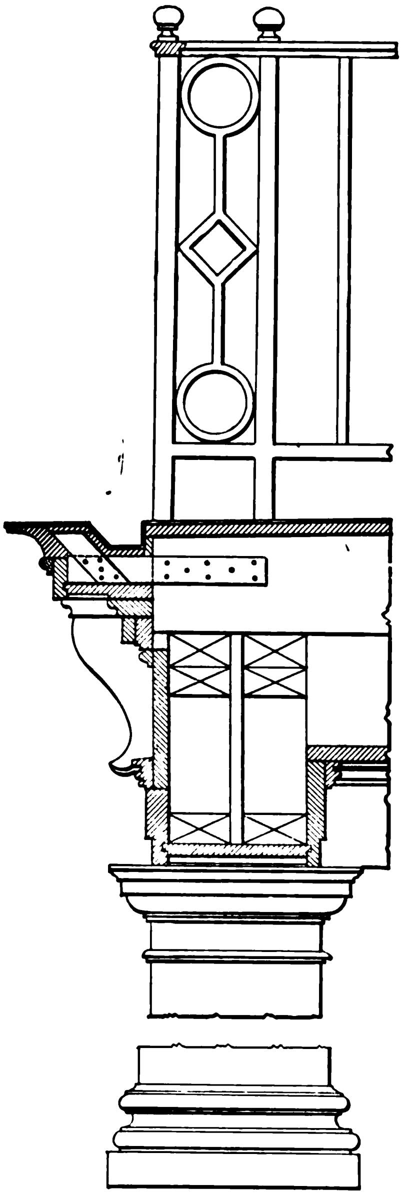
Bells to be operated by a sufficient number of dry cells to insure a strong current.

Heating.

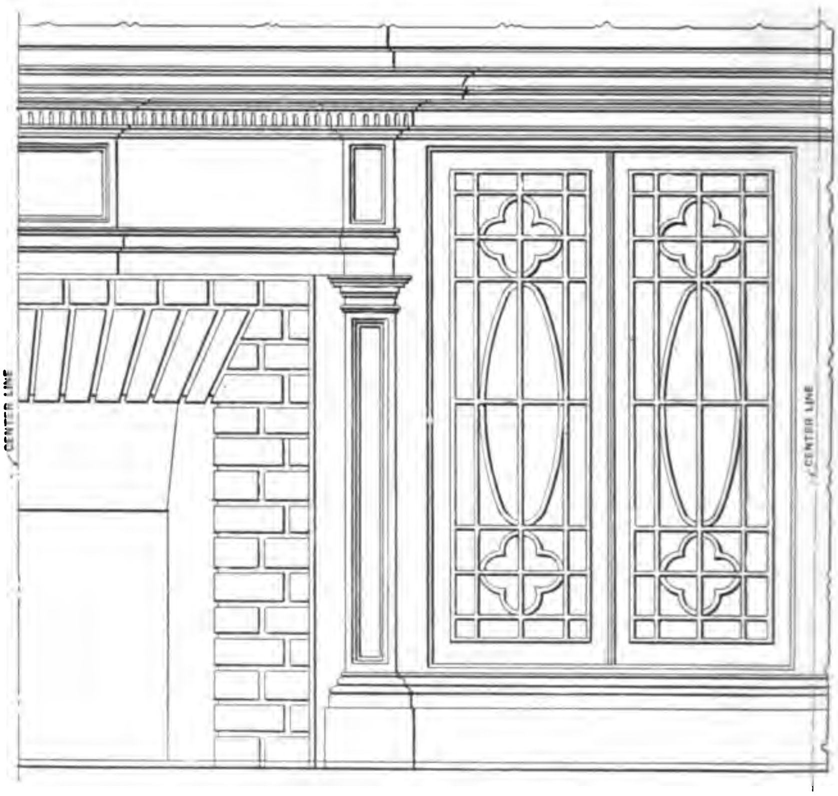
The house is to be heated by means of a warm air generator. The furnace is to set on a brick foundation, and is to be of the portable, double casting type, complete with all connections, tools, smoke pipe, &c. It is to be of ample size to heat the entire house to 70 degrees in zero weather.

The fresh air box is to be of galvanized iron, with a wire netting at entrance, and a damper.

The hot air pipes are to be of double thick bright tin, and to be of ample size to supply registers, indicated on plans.



Section Through Entrance Porch, Showing Balustrade, Cornice and Column.—Scale, 1 In. to the Foot.



Elevation Showing Part of Fireplace and Bookcase in Living Room.—Scale, ¾ In. to the Foot.

Competition in Two-Family Houses.—Second Prize Design.—Miscellaneous Constructive Details.

All registers to be of iron, with floor plates, and finished by painting.

Color Scheme.

The body of the house will be the dark red Harvard brick laid up Flemish bond, with dark leaders and white mortar. The stonework will be buff colored limestone. The window frames, porch, cornices and leaders are painted white. The shutters and roof shingles are to be stained green.

Detailed Estimate of Cost.

The authors furnish the following estimate of cost with rates of wages in the various branches of the work:

Excavation, 685 cu. yd., at 50 cents	$342.50
Teams, $7; labor, $1.60 per day.	
MASON WORK.	
Cost of concrete, including forms, &c., $5 per yd.; cost of laying brick, including materials, $15 per M.; wages per day: Mason $5.60; laborer $3.	
Concrete footing and foundation walls	$428.00
Cellar floor	162.00
Face brick in walls, at $20.50 per M	205.00
Common brick in all walls, at $17 per M	510.00
Flue lining, at 50 cents per ft	62.50
Four mantels, complete	150.00
Limestone and bluestone	715.00
Angle irons for lintels, &c	269.00
	$2,501.50
CARPENTER WORK.	
Wages per day: Carpenters $4.50, helpers $2.	
1000 ft. rough lumber for scaffolding, &c	$30.00
Beams, girders, rafters, studs and furring	385.00
Sheathing	112.00
Rough flooring	109.00
Cellar partitions	60.00
Outside trim, including cornice, porches, &c	250.00
Shingles, at $10 per square	400.00
Parquet floors, at 35 cents per sq. ft	400.00
Georgia pine floors	186.00
Interior finish and mill work	140.00
Doors, interior, $132; windows, $310	442.00
Bookcases, $120; cupboards and shelves, $75	195.00
Stairs, complete	150.00
Ferrazo floors	51.00
Hardware	69.00
Glazing, including leaded glass	80.00
Iron columns	10.00
	$3,069.00
PLASTERING.	
Wages, $4.50.	
Regular work, at 18 cents per sq. yd $314.69	
Keene cement 75.00	
	$389.69
PAINTING.	
Wages, $4.	
Cost of work complete	416.00
PLUMBING.	
Wages, $5.	
Cost of work complete	275.00
TINSMITH.	
Wages, $4.50.	
Gutter, flashing around chimneys	50.00
ELECTRIC WORK, INCLUDING FIXTURES.	
Wages, $4.50.	
Work complete	383.00
HEATING.	
Wages, $4.50.	
Cost complete	250.00
IRON WORK.	
Balustrade over porch	49.00
RECAPITULATION.	
Excavation	$342.50
Mason work	2,501.50
Carpenter work	3,069.00
Plastering	389.69
Painting	416.00
Plumbing and Tinsmith	325.00
Electric	383.00
Heating	250.00
Iron work	49.00
Total	$7,725.69

The builder's certificate was signed by Robert B. Mitchell, 909 St. John's place, Brooklyn, N. Y.

Metal Window Frames Must Be Tested in New England.

A bulletin has been issued from the office of Samuel C. Eastman, secretary of the New Hampshire Board of Underwriters, and F. A. Waldron, secretary and surveyor of the Insurance Association of Providence, that dating from March 1 only such metal frames for wired glass as bear the inspection labels of the Underwriters' Laboratories will be recognized as standard by the organization. In commenting on this action by the underwriters the engineer in charge of the laboratories says:

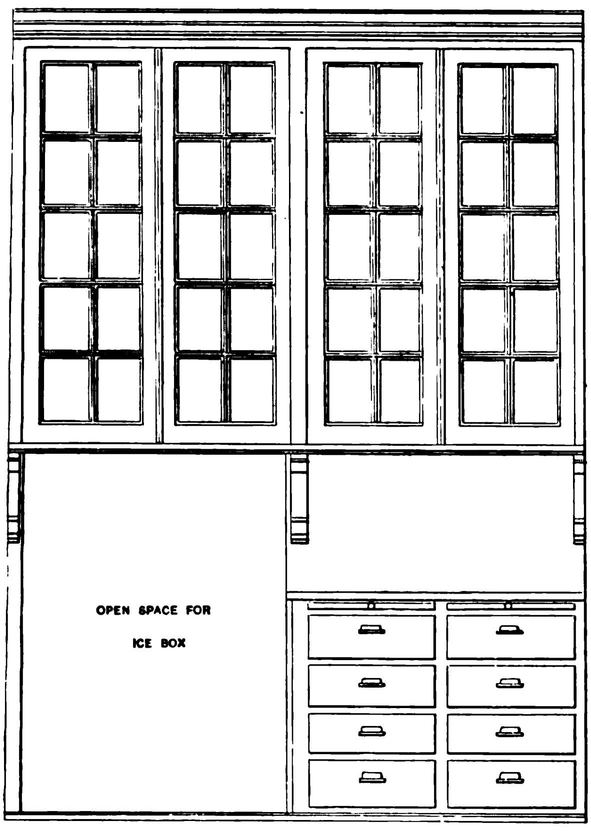
Although metal window frames and wired glass have not reached the degree of popularity in New England which they enjoy in other sections of the country, the representatives of the companies in this territory are nevertheless very keen that such installations as are made, however few, shall show standard construction. The fire resisting qualities of window frames for wired glass are peculiarly difficult to determine through examination of the finished product in the field.

Our fire tests have shown conclusively that many so-called " fire windows," which have in the past been commonly accepted as fire retardants, are of comparatively small value in preventing or retarding the entrance of fire through wall openings. Beyond the fact that their frames and sash are constructed of metal, and consequently will not add fuel to a fire, but little good can be said of them, even though they are glazed with wired glass. Wired glass to prove serviceable must be adequately secured in sashes and frames properly designed and competently constructed to hold the glass in position under exposure by heat. The mere fact that a metal sash or frame holds a pane of wired glass at ordinary temperatures is no criterion of the efficiency of the device as a fire stop. And yet this seems to have been the only requirement which many of the builders have followed or the users desired.

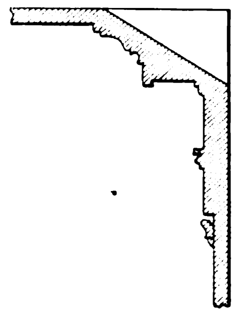
We have been supervising fire tests of wired glass windows and their frames pretty constantly for four years. No manufacturer has on first test shown a device which could be rated as efficient, and up to this time last year only five had as yet learned from the lessons of their repeated tests how to build a window which would withstand the wholly practical conditions of the tests. This places an unpleasant emphasis upon the false sense of security prevalent in the field where wired glass windows have apparently been accepted by the public largely from the appearance of their glazing and without regard to the fire resisting qualities of the device as a whole.

The laboratories' label service in this industry is the first comprehensive effort which has been made to alter these conditions. First, we determine by practical fire tests the forms of construction submitted by the different makers which will insure the device as a whole being as good a fire stop as the weakest material entering into its composition—*i. e.*, the glass. Then our engineers visit the factories to inspect the sashes and frames during process of construction, and such of them as show design, material and workmanship fully equivalent to the sample which withstood our tests are distinguished by metal labels attached to the inside of the window, generally on the sill or transom bar.

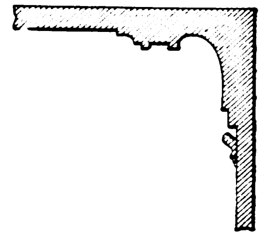
It is obvious that the only adequate way to determine the efficiency of a wired glass window as a fire stop is by fire test, and the best time and place to inspect a window to determine whether or not it is built in accordance with the pattern determined by the fire test is during process of construction in the factory. At present there are 19 factories in the country that have demonstrated their ability to make a satisfactory window.



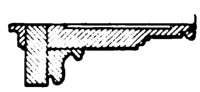
Elevation of Dresser in Pantry.—Scale, ½ In. to the Foot.



Plaster Cornice for Living Room, Dining Room and Hall.

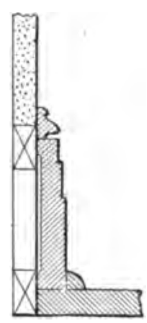


Plaster Cornice for Bed Rooms.

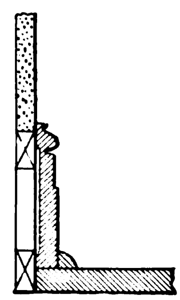


Trim for Living Room and Dining Room

Trim for Balance of Rooms



Section Through Base for Living Room and Hall.



Section Through Base for Balance of Rooms Except Closets.

Scale, 1½ In. to the Foot.

Competition in Two-Family Houses.—Second Prize Design.—Miscellaneous Constructive Details.

THE Advisory Board of the School Trades of the city of Milwaukee has decided to recommend to the School Board the establishment of a class in carpentry. This decision was reached after hearing arguments on the part of a committee of 10, consisting of architects, millmen and woodworkers, which appeared with other manufacturers before the Advisory Board.

Interesting Problem in Reinforced Concrete Building Construction.

THAT there is still much to be learned in reinforced concrete building constructions especially on a large scale, is being impressed upon us as new or novel conditions and situations arise, which demand practical and efficient solution.

One of the lessons we usually learn in such cases is the value of thorough consideration of every detail of the finished building before any construction is undertaken. To leave such essentials as the prevention of dampness in the building or the method of applying the plaster to a smooth interior concrete surface for consideration until the walls are in place is to invite extremely annoying and costly consequences.

The instances where such details are permitted to remain open questions until their solution is imperatively demanded are numerous, says *Waterproofing*, and only very recently the attention of the writer was called to an instance of this nature in the case of an extremely large reinforced concrete structure, and his opinion asked as to the best course to pursue.

The walls and floors having been erected and the time for interior plastering approaching, it became imperative to decide upon some method of applying the plaster to the smooth interior of the concrete walls, and at the same time prevent the penetration of dampness from the outside to the plaster, producing discoloration and the usual injurious accompanying consequences.

The owner and contractor of the building had in mind the application of an asphaltic compound to the interior of the wall, which would serve as a dampproof course and later the application of the plaster directly upon this asphalted surface.

Some Methods Available.

Whether the porosity of the brickwork or the uneven surface created by the mortar joints is the principal element that produces an efficient adhesion of the plaster to the waterproof film, is still a disputed question, but such adhesion in case of brick walls is beyond dispute. The lack of sufficient experience in case of the dense and opaque concrete walls placed the builder under the necessity of adopting this method of dampproofing at his own risk or adopting some other method of dampproofing and plastering the building. Some of the other methods available were:

1. The use of metal furring against the concrete.
2. The use of hollow tiles.
3. The application of plaster directly upon the concrete surface and covering the outside of the walls with a dampproof film.

The use of metal furring was precluded on account of the difficulty of attaching it to the concrete surface, no provision having been made for it in the wall design.

The use of hollow tiles against the concrete would have taken up 4 in. of space for the entire depth and hight of the building, and as the location was very costly, no loss of space was desired. In addition, a dampproof course would have been advisable between the concrete and tile.

The only feasible solution remaining was to dampproof the outside of the building and apply the plaster directly upon the concrete.

The question then came up as to the adhesion of plaster to smooth concrete.

Had this question been considered in the design and construction of the walls, and recesses and projections specially provided for, the bonding of the plaster would be a matter easy of accomplishment. This not having been done, and the wall being dense and smooth, in order to eliminate any possible danger of separation of the plaster, the use of the sand blast for removing the glaze and of the pneumatic punch for pitting the surface would be necessary, causing increase in the cost of the work.

The question also came up as to the necessity of applying the dampproof coat to the exterior, it being said that the concrete was in itself so dense as to be practically watertight. This opinion, as well as that concrete was not porous, was held by the builder, and only a complete discussion of the physical phenomena of capillarity with evidence of the absorptive power of concrete and its permeability under pressure, served to convince him of the possible danger of injury to the plaster by water finding its way through the concrete.

Some of these reasons are sufficiently interesting to deserve repetition:

1. That concrete has never been prepared so as to be absolutely watertight.
2. Practically impossible to proportion materials so as to entirely eliminate the voids in the concrete.
3. That as shown by experience the mixture of 1—4, which was used in this case, contained about 5 to 10 per cent. less cement than that required to produce theoretically impervious concrete.
4. That even if the sensible voids are closed the aggregate itself may absorb as much as 1 per cent. or more of its weight of water on account of its own porous character.
5. That the minuteness of the pores does not tend to retard the passage of water; on the contrary, the well-known law of capillarity being that the finer the pore (all else being equal), the greater the capillary attraction.
6. That checks unavoidably occur in concrete work owing to shrinkage, expansion, contraction, &c., and water will find its way through them.
7. That in excessively high wind storms the rain drops are hurled at the building with a high velocity and are forced into pores under pressure.
8. That practical imperviousness of concrete in reservoirs results from the closing action of the pores by the continual seepage of water, and the conditions are not the same in concrete walls exposed to the air and rapid changes of temperature and humidity.
9. That slight seepage, while unimportant in the case of reservoirs, may be fatal in the case of buildings.

Comparison of Costs.

After a thorough discussion of all the elements and principles involved a comparison of cost of the several methods considered showed up as follows:

COST PER SQUARE YARD.	
Asphaltic film between wall and plaster	$0.20
Metal furring between wall and plaster	.30
Hollow tiles excluding dampproofing	.63
Hollow tiles including dampproofing	.75
Outside coating applied under pressure	.30
Cost of preparing concrete surface for plastering	.55

The amount of work to be done in case the outside coating method was used was only 60 per cent. of what would have been required for interior dampproofing, as some of the walls were built directly against the adjoining property, and, therefore, not exposed; the total cost of the latter method was then about 60 per cent. of any of the others.

If the consideration of the question of dampproofing and plastering before construction was undertaken could have (1) eliminated the necessity of preparing the concrete surface to receive the plaster, or (2) provision could have been made by recesses or projections, for efficient application of an interior asphaltic dampproofing course so that a key for the plaster would have been provided, or (3) provided for holding metal or other furring to the wall to receive the plaster.

Too much detailed study cannot be given to these questions by those in charge of designing reinforced concrete work.

THE prospectus for 1908 of the Working Men's College at Melbourne, Australia, contains much interesting information concerning the various courses of instruction at this institution. Mention may be made of courses in architecture and architectural drawing, building construction, modeling, painting, wood carving, house painting and decorating, plumbing, carpentry and hand railing, woodworking, &c. The prospectus describes in detail the courses of study, gives the names of instructors, requirements for admission, prizes offered and other particulars likely to prove of interest in this connection.

FRAMING DOMES, PENDENTIVES AND NICHES.—IV.

By C. J. McCarthy.

The construction of a spherical niche on a semicircular plan is precisely the same as that of a spherical dome. The ribs stand in planes, which would pass through the axis if produced, and they are similar in curvature. Referring now to Fig. 41, the portion marked No. 1 is the plan, while No. 2 represents the elevation of the niche, together with the manner of finding the projections of the ribs from the plan. In No. 3 is shown the beveling of the back ribs *a b* against the front ribs at *f g h* of the plan. Here *a b* is the bevel of *a* and *b c* the bevel of *b*.

The next construction is a spherical niche on a segmental plan, in which No. 1 of Fig. 42 represents the plan and No. 2 the elevation. The dotted lines *f g h i* show the manner of finding the representation of the ribs on the elevation. It will be seen that *a b* and *c d* are quired radiating from the center D, and cutting the plan of the front rib in *a*, *b c*, *d e*, through the center D draw the line G H parallel to A C. From D describe the curves *m l* and A G; also *m l* and C H, cutting the line G H. Make D F equal to E O of the elevation. Then from F as a center describe the curves *l p l* and G I H for the depth of the ribs. This is also the true curve of the back ribs.

To find the lengths and bevels of the back ribs proceed as follows: From the center D of the plan describe the quadrant and arcs *a f g b*, *d h h e*, &c., and draw *f f*, *g g*, *h h*, perpendicular to D H, cutting the curve *l p l*. The lines of intersection will give the lengths and bevels of the several ribs.

A niche, the plan of which is the segment of a circle and the elevation a semiellipse, is represented in Fig. 45.

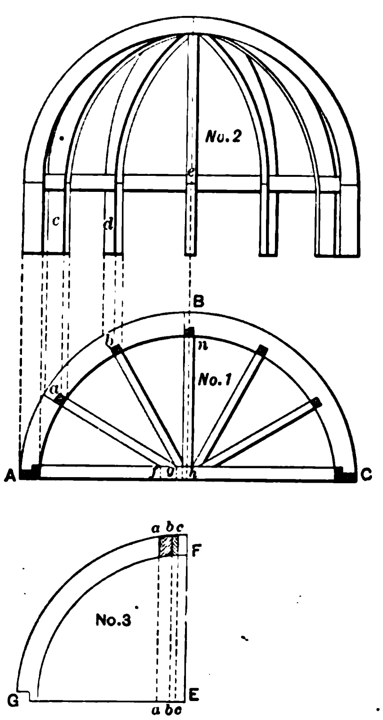


Fig. 41.—Showing Manner of Framing a Spherical Niche on a Semicircular Plan.

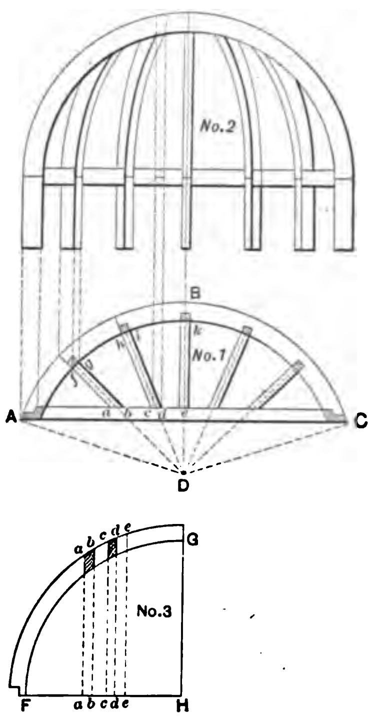


Fig. 42.—Framing a Spherical Niche on a Segmental Plan.

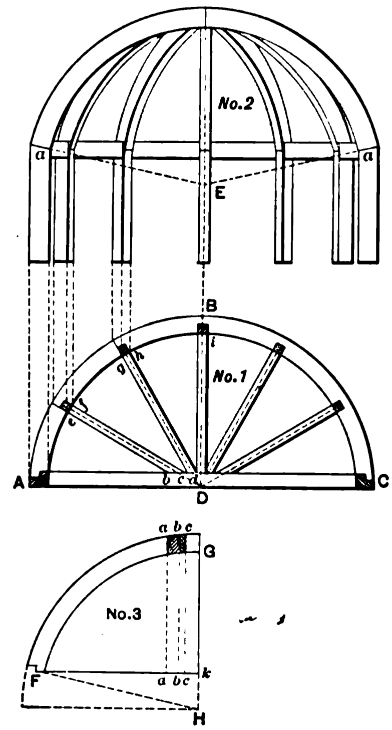


Fig. 43.—Framing a Niche Semicircular in Plan and Segmental in Elevation.

Framing Domes, Pendentives and Niches.—IV.

the bevels of the back ribs, where they fit against the front rib. In No. 3 the quadrant F G is drawn with the same radius as the plan of the niche D A, and the lengths and bevels of the back ribs are found by taking the lengths *f a* and *g b* from the plan and setting them on the line F H of No. 3. Referring now to Fig. 43 we have a niche, the plan of which is a semicircle and its elevation a circular segment. The plan designated No. 1 and the elevation No. 2 will be easily understood upon inspection. The manner of laying out the back ribs is shown in No. 3. With the radius H F of No. 3 equal to E *a* of the elevation describe the segment F. G. Draw H G and make G *k* equal to the hight of the segmental head of the niche. Draw *k* F at right angles to G H; then F *c* will be the center back rib *i d* of the plan. The lengths and bevels of the others will be found in the same manner as before.

The next phase of our subject is a niche of which both plan and elevation are segmental. In No. 1 of Fig. 44 is shown the plan A B C, which represents a segment of a circle, the center of which is at D. The elevation is represented in No. 2, the center being at E. The niche may be of any depth, and the manner of finding the ribs is the same as that already described.

Having drawn the plan and as many ribs as are required

Let D of No. 1, the plan, be the center of the segment forming the plan. Through D draw E F parallel to A C, and continue the curve of the plan to E and F. Then to find the curve of the back ribs proceed as follows: From *k*, *l*, *m*, *n* of the elevation, No. 2, let fall perpendiculars to the line A C, cutting it in *a b c d*. Then from D as a center describe the curves *a*, *e*, *b f*, *c g*, *c h* and *d h'*; now from their points of intersection with the line E F draw the perpendiculars *e k*, *f l*, *g m*, *h n*, *h' o*. Set upon *e k* the hight *e k* of the elevation, and the corresponding hights on the other ordinates, when E, *k*, *l*, *m*, *n*, *o* will be the points through which the curve of the back ribs may be traced.

The manner of finding lengths and bevels of the ribs is shown on the opposite side of the diagram and does not here require special description, as that given in connection with Fig. 44 applies herewith.

The manner of laying out the framing of a niche elliptical in plan and elevation is illustrated in Fig. 46. Here as in the other cases No. 1 represents the plan and No. 2 the elevation of the niche. All the ribs being portions of ellipses having the same minor axis they may be drawn with the trammel, as indicated in No. 4 of the diagrams. The rib *c* of the elevation No. 2 is seen at *a f* of the plan. The bevel at the end *h i* is seen at A *a* in No. 3 and that of the end *e f* is seen at *b c* of No. 3. The diagrams so clearly indicate the method of laying out the framing that minute particulars would appear to be unnecesary. The method of laying out the ribs of a niche elliptical in plan and elevation, so that the ribs will stand at right angles to the curve of the plan at

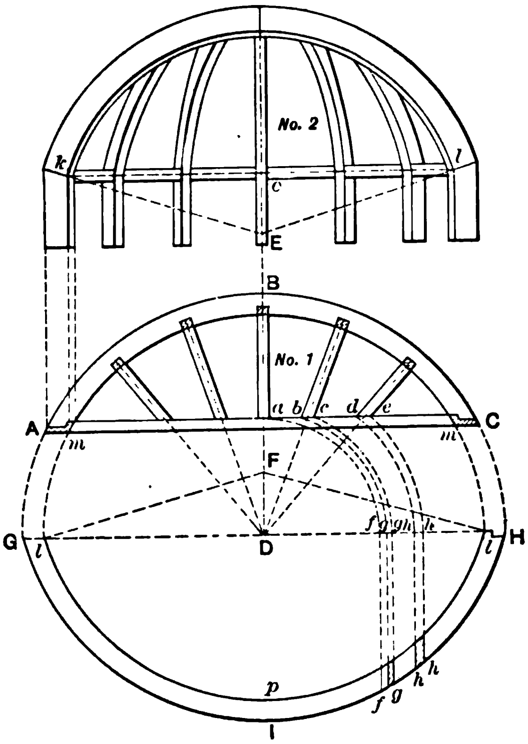


Fig. 44.—Plan and Elevation of Segmental Niche.

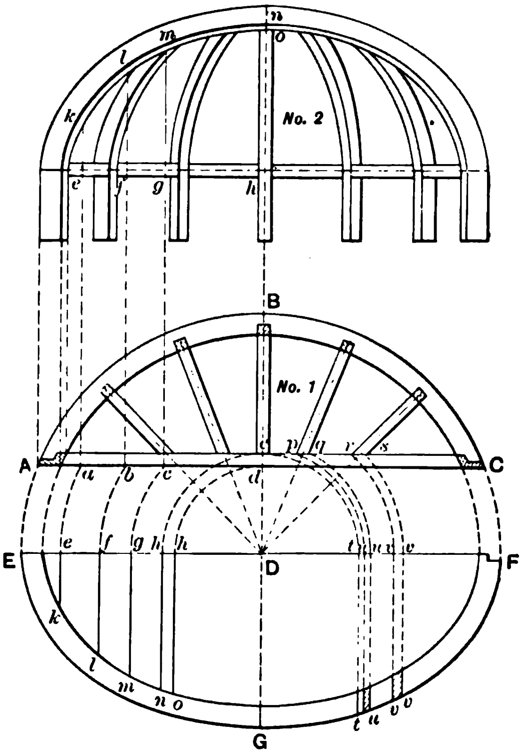


Fig. 45.—A Niche the Plan of Which Is the Segment of a Circle and the Elevation a Semiellipse.

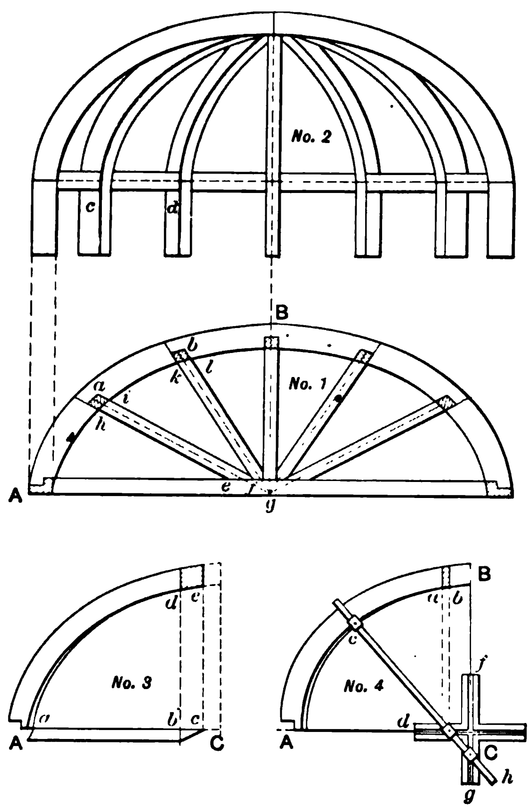


Fig. 46.—Framing a Niche That Is Elliptical in Both Plan and Elevation.

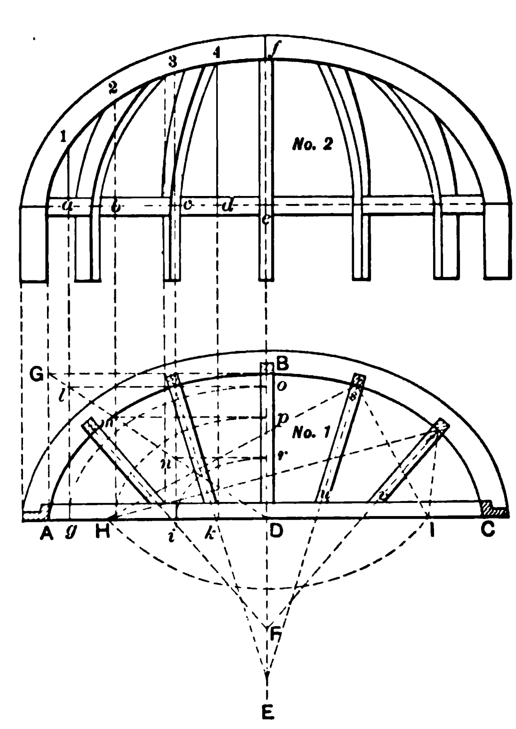


Fig. 47.—Laying Out the Ribs of a Niche Elliptical in Plan and Elevation, the Ribs Standing at Right Angles to the Curve of the Plan.

Framing Domes, Pendentives and Niches.—IV.

their points of junction, is illustrated in Figs 47 and 48. Referring to the former figure, No. 1 represents the plan and No. 2 the elevation. Set off the divisions for the ribs on the curve A B C of the plan. Then from the center B, with D C as radius, describe a circular segment, indicated by the dotted line H I, thus finding the focii of the ellipse. Join H *s*, I *s*, H *t*, I *t*. Bisect the angles H *s* I and H *t* I by the lines *s u* E and *t v* F, meeting the center line B D of the plan produced in F and E. Complete the parallelogram A G B D and draw its diagonal G D. In B D take any points, as for example, *o*, *p*, *r*, and through them draw the lines *o l*, *p m*, *r n* parallel to D A and meeting G D. Then draw *l g*, *m* H and *n i* parallel to G A. In the parallelograms thus formed draw the elliptical quadrants, shown by the dotted lines all parallel to the original curve A B. The intersections of these curves, with the seats of the ribs as *o p r*, will give the points on which the hights of the ordinates of the front rib at *a* 1, *b* 2, *c* 3, *d* 4, *e f* are to be set up, as shown in the several diagrams in Fig. 48.

Referring now to Fig. 49 we will describe the method of laying out the ribs of an octagonal niche. Here No. 1 represents the plan and No. 2 the elevation of the niche, which, on inspection, shows that the center ribs on each side, as H G, are of the same curve as either side of the front rib. In Fig. 3 of the diagrams, therefore, draw A B C E D equal to A B C H G of the half plan of the niche shown in No. 1. Make D G E equal to half of the front rib. Divide D G into any number of equal

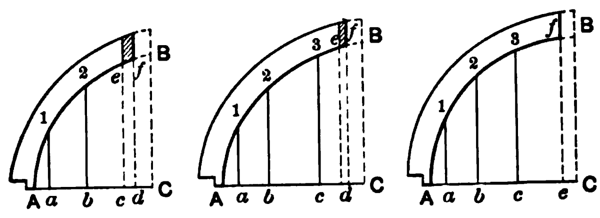


Fig. 48.—Diagrams for Setting up Ribs of Niche Shown in Previous Figure.

as 1, 2, 3, &c. Through the points of division draw *d* 1, *c* 2, *b* 3, *a* 4 perpendicular to G F, and produced to the seat of the first angle rib G F. Through the points of intersection draw lines parallel to the ribs E D of the niche, meeting the seat of the second angle rib D G. Through the points of intersection again draw parallels to D C, and so continue until all the ribs are laid out. The curve of the center rib is found by setting up from *n, o, p, q,* G the hights *d* 1, *c* 2, &c., of G F on the parallel lines which are perpendicular to K G. The curve of the rib B G or E G is found by drawing through the points of intersection of the parallels perpendiculars to the seat of the rib and setting up on them the hights *d* 1, *c* 2, &c. In No. 4 of Fig. 50 is shown the rib C G, and in No. 5 the intermediate rib H I of the plan.

In Fig. 51 of the diagrams is shown the method of laying out the framing of a semicircular niche in a concave circular wall. Referring to the plan designated as No. 1 let A *p* C represent the line of the wall and A B C the plan of the niche. Join A C and bisect it at D. Draw

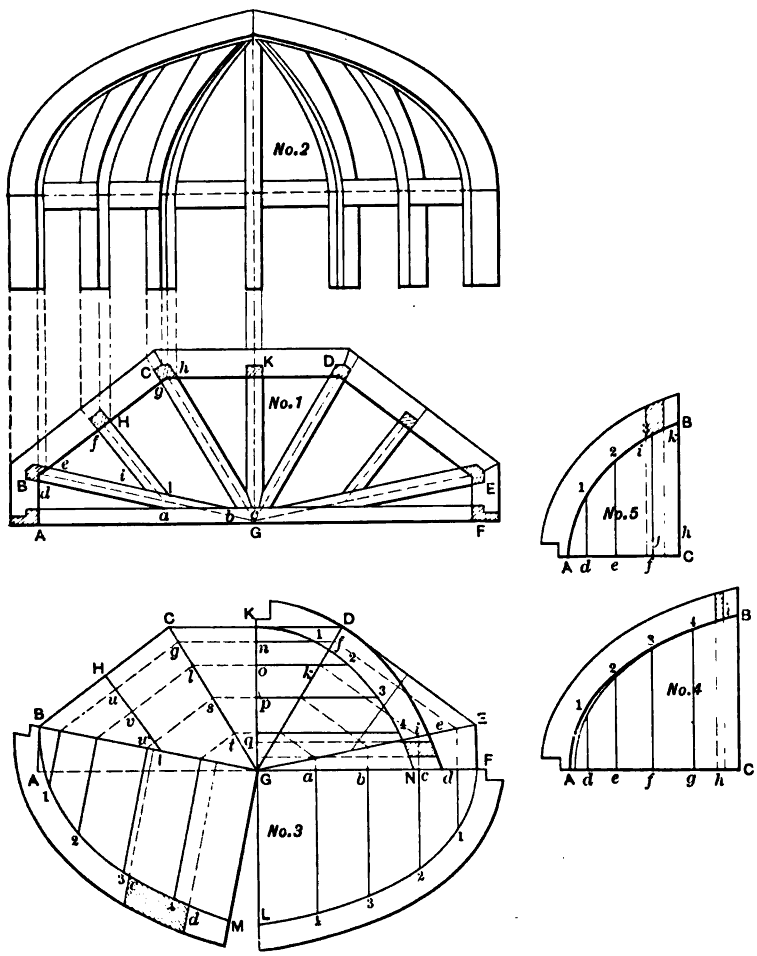


Fig. 50.—Details of an Octagonal Niche Irregular in Plan.

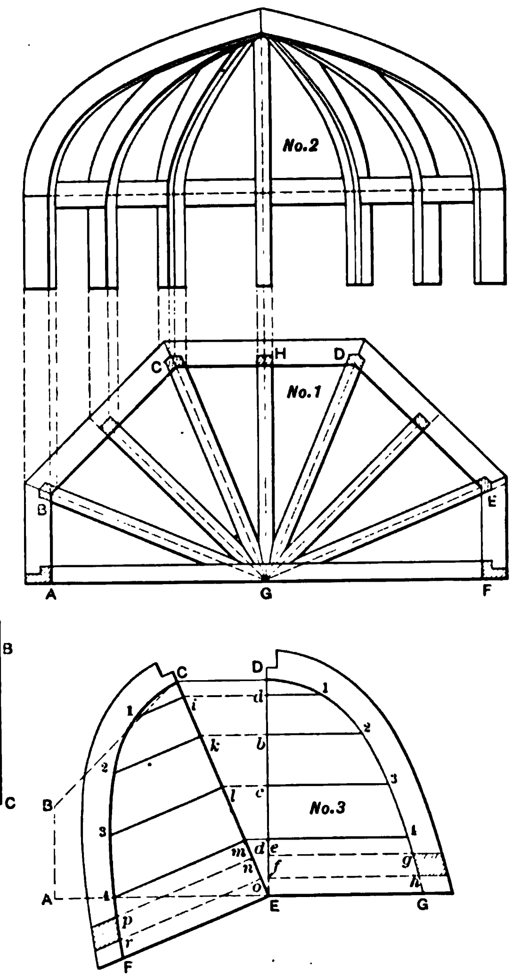


Fig. 49.—Method of Laying Out the Framing of an Octagonal Niche.

Framing Domes, Pendentives and Niches.—IV.

parts, as 1, 2, 3, 4, &c., and through the points of division draw lines parallel to A G, meeting the seat of the angle rib C E in *i, k, l, m, n, o*. On these points erect perpendiculars, continuing them indefinitely, and set upon them the hights *a* 1 on *i* 1, then *b* 2 on *k* 2, and so on. A curve drawn through the points thus found will be the curve of the angle rib. The shaded portions show the bevel at the meeting of the ribs at G of the plan.

We next lay out the ribs of a niche of an irregular octagonal plan, as illustrated in the diagrams, Fig. 50, where No. 1 represents the plan and No. 2 the elevation. Draw as in No. 3 the outline of the plan of the niche A B C D E F, and draw the center lines of the sides of the ribs, as B G, H I, C G, K G, D G and E G. Draw also G L F equal to half the front rib as given in the elevation, No. 2, and divide it into any number of equal parts, the seats of the ribs *l s, u n, h p,* &c., and their elevation, as in No. 2, finding their intersections on the plan at *r s, t u, h l m, n o* and *p*.

The ribs in this case being segments of a circle will all have the same curvature and their lengths will be obtained by describing the quadrant A B C of No. 3, in which the radius C A is equal to A D of the plan. Their lengths and bevels at their intersections with the front rib *l m, n o* and *p* of the plan or *e f* K of the elevation will be obtained by transferring the lengths *r l, s m, t n, u o,* &c., from the plan to the points *a, b, c, d, e,* &c., on the line A C of No. 3, and drawing the perpendiculars *a f, b g, c h, d i* and *e k*. The back rib *v w x* of the plan, A B C of the elevation and D of No. 3 is a circular segment, its outer edge being described from the center D of the plan, with the radius D *v* of the plan, or C D of

No. 3, and the curve of its inner edge with the radius D y of the plan.

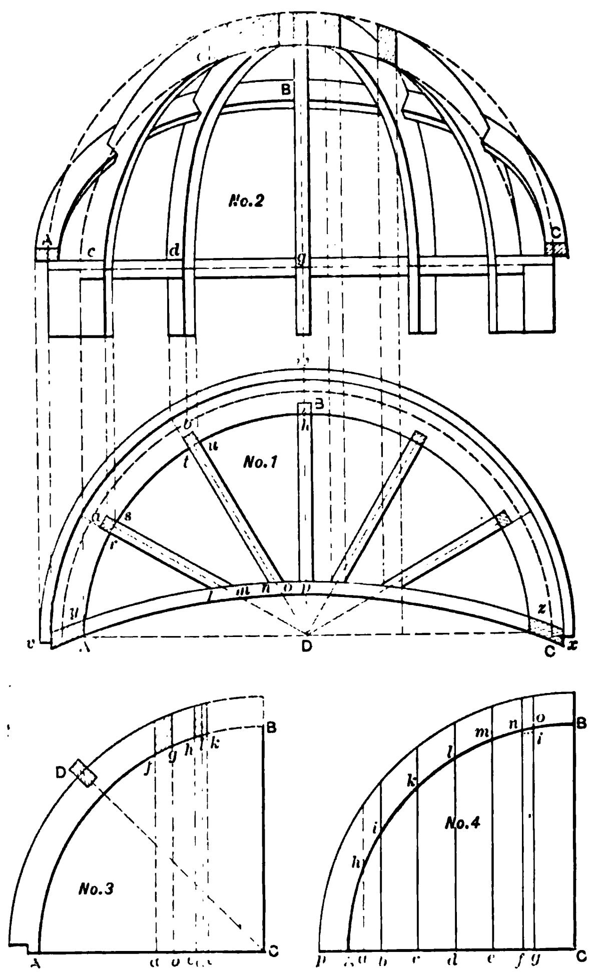


Fig. 51.—Method of Laying Out the Framing of a Semicircular Niche in a Concave Circular Wall.

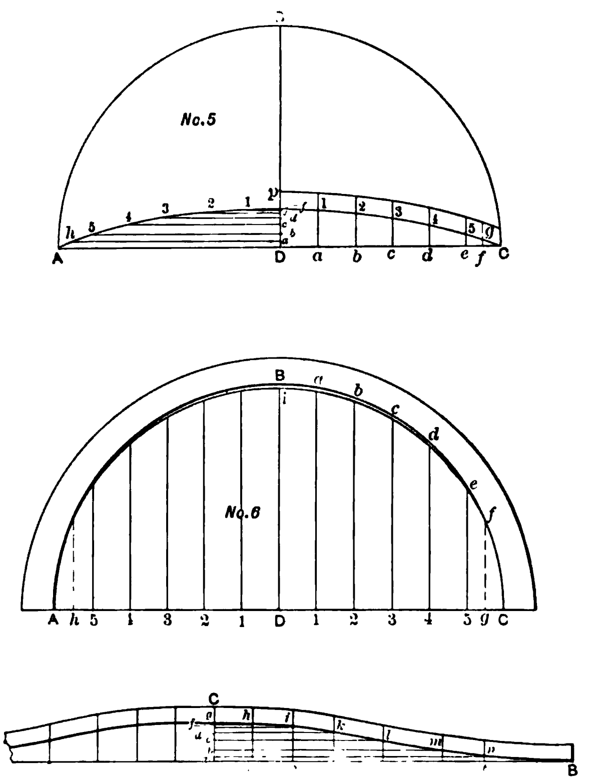


Fig. 52.—Laying Out the Ribs of Niche Shown in Fig. 51.

Referring now to No. 5, make A D C equal to A D C of the plan in Fig. 51. Describe the semicircle A B C. Draw D B perpendicular to A C and describe the curve of the wall A *f* C. The figure is thus a plan of the niche, and in like manner in No. 4 of Fig. 51, A B C is an elevation of half the niche on the line A C, or it is a

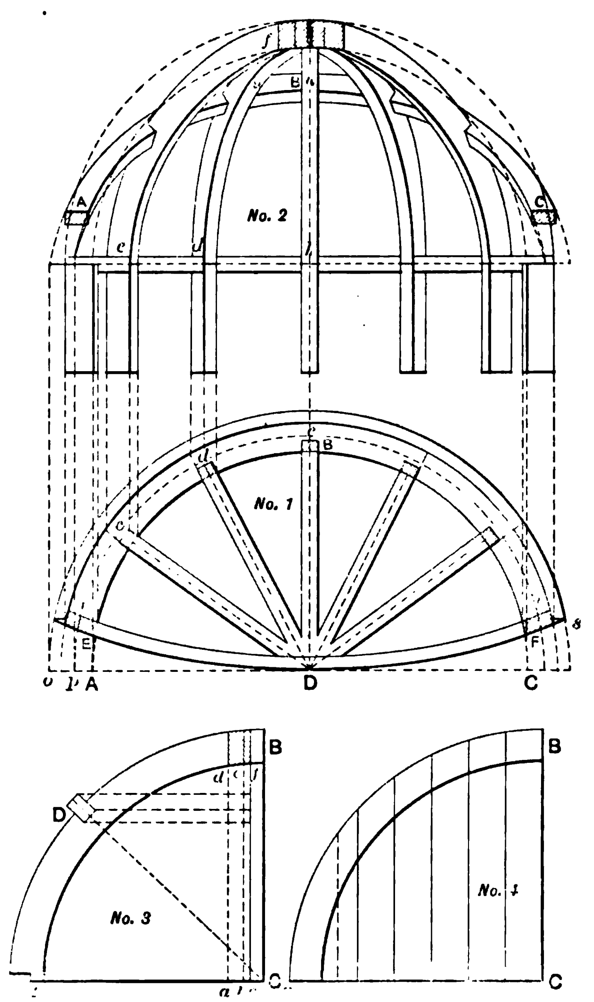


Fig. 53.—Laying Out the Framing of a Semicircular Niche in a Convex Circular Wall.

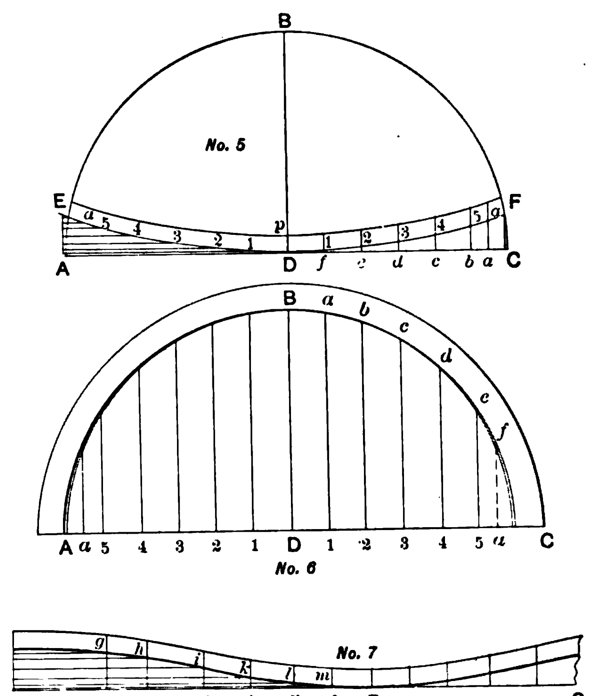


Fig. 54.—Describing the Front Rib and Its Mold.

Framing Domes, Pendentives and Niches.—IV.

The front rib standing over A *p* *c* of the plan is a semiellipse found in No. 4, also in Nos. 5 and 6 of Fig. 52.

section on the line B D of the plan. Divide the curve A *f* and C *f* into a number of equal parts, as 1, 2, 3, 4.

&c., and draw 1 *a*, 2 *b*, 3 *c*, 4 *d*, 5 *e*, perpendicular to D C. Draw the line A D C of No. 6 of Fig. 52, and transfer to it the lengths *f* 1, 1 2, 2 3, &c., of No. 5, laying them off from D to C and from D to A. Through these points raise lines indefinitely perpendicular to A C. Transfer also the divisions *a*, *b*, *c*, *d* of the line D C of No. 5 to *g*, *e*, *d*, *c*, *b* on the line A C of No. 4, Fig. 51, and make C *f* equal to D *p* of No. 5 in Fig. 52. Then draw the perpendiculars *g o*, *e m*, &c., and transfer the hights to the corresponding ordinates in No. 6 of Fig. 52, as *g o* of No. 4 in Fig. 51, to D B of No. 6 in Fig. 52; then *f n* of No. 4 in Fig. 51 to D *i* of No. 6 in Fig. 52. Then in succession transfer *e m* to 1 *a* and *d l* to 2 *b*, and so on. To more accurately complete the curve divide the last space into two parts in the point *g* of No. 5. Then draw *g f*, transferring the points in like manner to No. 4 of Fig. 51, and No. 6 of Fig. 52, for the ordinates *a h* and *g f*.

To find the mold of the front rib proceed as follows: On the line A B of No. 7 in Fig. 52 make the divisions A, *o*, *p*, *q*, *r*, *s*, *t*, B, respectively, equal to those of the curve *a b c d e f* C of No. 6. Draw A*g*, *o h*, *p i*, *q k*, *r l*, *s m*, *t n* perpendicular to to A B, making them equal respectively, to D *f*, *a* 1, *b* 2, *c* 3, *d* 4, *e* 5, *f g* of No. 5. Through *g*, *h*, *i*, *k*, *l*, *m*, *n*, B draw the curve *g* B, which is the edge of the mold of the front rib.

To frame a semicircular niche in a convex circular wall, as illustrated in Figs. 53 and 54, we proceed as follows: Let E B F of No. 1 in Fig. 53 represent the plan of the niche and E D F the curve of the wall. Draw the ribs, as in Fig. 51, and draw A C perpendicular to D B. The elevation is developed in the manner indicated by the dotted lines in No. 3. The lengths and bevels of the ribs are found as in the last problem. In No. 4 of Fig. 53 and in Nos. 5, 6 and 7 of Fig. 54 are shown the manner of describing the front rib and its mold, which must be so easily comprehended, if the foregoing diagrams have been understood, as not to require detailed description.

We might remark, however, in this connection that Figs. 49 and 50 may be used to advantage in an inverted position in finishing the bottom of the overhanging bay window or turret, as it does not matter what may be the shape of the ribs, the manner of finding the shape of the angle rib and the lengths and bevels are the same.

Employers' Liability in the United States and Workmen's Compensation in Foreign Countries.

"The legal liability of employers for injuries to their employees in the United States" and a "Summary of the workmen's compensation acts of foreign countries" are the subjects of articles in Bulletin No. 74 of the Bureau of Labor of the Department of Commerce and Labor.

In the first article Lindley D. Clark discusses at length the more important principles of the common law as generally applied to the subject of employers' liability in this country, together with such variations as appear in certain States. The article also reproduces the laws of those States which have passed enactments on the subject, and presents the construction put thereon where they have been reviewed by the superior State courts or the Federal courts.

The impossibility of adequately securing to the workman the needed protection by a mere grant of right of action for injuries for which the employer can rightly be charged is only too evident from the discussion of the principles of law applicable.

In striking contrast with conditions in the United States is the position of the foreign workman who is injured by accident in the course of his employment. Practically every foreign country of any importance industrially has by legislation recognized the principle that the workman is entitled to compensation for injuries from accidents received in the course of his employment. Twenty-two foreign States have enacted such legislation —namely:

Austria, Belgium, British Columbia, Cape of Good Hope, Denmark, Finland, France, Germany, Great Britain, Greece, Hungary, Italy, Luxemburg, Netherlands, New Zealand, Norway, Queensland, Russia, South Australia, Spain, Sweden, Western Australia.

While there is some variation in the provisions of the foreign laws as to the circumstances under which workmen are entitled to compensation, as a rule compensation is not payable unless the injury causes disablement for a specified number of days or weeks.

The employer may usually be relieved from the payment of compensation if he can prove that the injury was caused intentionally or by willful misconduct, or, in some countries, by the gross negligence of the injured person or during the performance of an illegal act. In none of these 22 countries does ordinary negligence on the part of the injured employee work a forfeiture of the right to compensation.

The industries usually covered by the laws are manufacturing, mining and quarrying, transportation, building and engineering work and other employments involving more or less hazard. In Belgium, France and Great Britain the laws apply to practically all employments. In a considerable number of countries only workmen engaged in actual manual work, and in some cases those exposed to the same risks, such as overseers and technical experts, come within the operations of the law. These countries are Austria, Belgium, Denmark, Finland, Germany, Italy, Luxemburg, Netherlands, Norway, Russia, Spain and Sweden. On the other hand, in France, Great Britain, the British colonies and Hungary the laws apply to salaried employees and workmen equally. Overseers and technical experts earning more than a prescribed amount are excluded in Belgium, Denmark, Germany, Great Britain, Italy, Luxemburg and Russia. Employees of the state, provincial and local administrations usually come within the provisions of the acts.

The entire burden rests upon the employer in all but four of the countries, Austria, Germany, Hungary and Luxemburg, where the employees also bear a part of the expense. The laws in every case fix the compensation to be paid. In all the countries but Sweden the compensation is based up the wages of the injured person. It consists of medical and surgical treatment and of periodical allowances for temporary disability, and annual pensions or lump sum payments for permanent disability or death.

In most countries employers may contract with state or private insurance institutions for the transfer of the burden of payment of compensation. In a number of countries such transfer is obligatory. Provision is usually made for the protection of the beneficiaries in case of insolvency of employers.

The acts of nearly all of the countries are framed with the view of obviating the necessity for instituting legal proceedings. The laws are so specific with regard to the compensation allowed and the regulations for its payment that agreements are usually amicably made between the employers and the victims of the accidents. If disputes arise, however, the law specifies the necessary procedure for their settlement either by special arbitration tribunals or by the ordinary law courts.

Co-Operative Apartment House in Chicago.

A firm of architects in Chicago has worked out a plan by which five persons may own an apartment house on the co-operative scheme. The idea is practically the same as that which obtained in Greater New York many years ago, where each of the men interested owns the flat he occupies. Instead of paying rent each pays his share of the cost of operating the building, including heating, lighting, janitor's service, &c. The buildnig which is to be put up in Chicago will cover an area 45 x 60 ft., thus dividing the floor space into front and rear rooms, and without the necessity of a court. The structure will be in the old colonial style of architecture and the first floor will be used as a garage, with room for five machines. The entrance, or driveway, will be modeled after the old French dwellings where carriage driveways entered upon the first floor. Another feature will be a room on the first floor occupied by a valet for pressing clothes and doing other work of a similar character. The architects who are moving in the matter are Marshall & Fox, and it is expected that the building will be ready for occupancy about the middle of October.

Carpentry and Building

WITH WHICH IS INCORPORATED
THE BUILDERS' EXCHANGE.

DAVID WILLIAMS COMPANY, - - PUBLISHER AND PROPRIETOR
14-16 PARK PLACE, NEW YORK.

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(Entered at the New York Post-Office as Second-Class Mail Matter.)

JUNE, 1908.

Building Destruction Exceeding New Construction.

The marked falling off in building operations since the panic of October last has been a cause of no little comment in these columns, but few probably realize that during the first quarter of 1908 the value of buildings destroyed by fire practically equaled the contemplated new construction during these three months, and these figures do not, of course, include the Chelsea fire in Boston on April 12. A careful compilation of fire losses published month by month estimates the total losses for the first three months of 1908 at $64,795,600. During the same time the estimated cost of new buildings, according to plans filed in the larger cities of this country, which represents probably between 80 and 90 per cent. of the total construction, aggregated $64,796,850. These figures mean that the wastes in the building trades at present are hardly being repaired, for the destruction losses represent those by fire alone, and there are many other losses in the building trades, such as ordinary wear and tear. This shows that the building trade is experiencing the same condition of things that was authoritatively stated to be true in the iron trade—that is, that the pace at which business was ruling was not even taking care of the wastes. This condition of affairs probably will not last long, but it is a remarkable fact, nevertheless, that in a period of three months when there were no great conflagrations destruction should exceed construction.

Instructing the Young Workman.

It seems strange to those who have made a careful study of the various methods of instructing young men to take a place of usefulness in the various practical trades that there are many with no sympathy with any other method of instruction than that which is gained through serving an apprenticeship. To some the apprenticeship has been demonstrated as no longer capable of furnishing competent workmen in sufficient number to meet the demand. While all feel the effect of this condition, which is generally conceded to be unsatisfactory, those who cling tenaciously to the apprenticeship system can see nothing but the defects for other methods of instructing young men for practical work. Frequently information comes to hand of bodies of tradesmen meeting in convention and condemning the trade school, the correspondence school and manual training in every form except that which is given, or, rather, supposed to be given, to the apprentice in the shop. Men who express their opposition to the methods of instruction which have been brought into use through necessity and through an interest in young men fail to compare the defects of the two systems of training and to endeavor to supply that which would remove all objections from either method. It is unfortunate that there still lingers in many trades an opposition to the modern methods of training young men to work at the trades. It is a matter of fact that however defective the systems of manual training and lectures to young men may be, they have the merit of making young men acquainted with the underlying principles and provide them with a proficiency in the handicraft, which only needs experience in actual work to prove indisputably that the systems are a valuable supplement to the apprenticeship system. The most advanced advocate of the school system of training makes no claim that it is an absolute substitute for the apprenticeship, which, though insufficient in real instruction, affords an invaluable experience as to actual working conditions through direct contact with them. One of the foremost of schools in training young workmen has the supervision in all the branches taught of leading New York tradesmen. The public is fortunate in having a cordial invitation extended by this school—the New York Trade School—to investigate its plan, its equipment and its methods. Its generosity has been the means of starting useful schools of instruction in other centers, and the spread of this method of training young men is the evidence that it possesses a merit which will survive the opposition of those who have neglected to become fully conversant with it, when they, too, doubtless would be disarmed in their criticism and be numbered among the advocates.

Chelsea's New Building Laws.

The city government of Chelsea, Mass., has voted to enact rigorous building laws before the erection of new structures shall begin to replace those recently destroyed. An exceptional opportunity for progressive action in this direction is afforded, constituting an outcome of the great fire of April 12 which should be far reaching in its effects as an example to other communities when their own ordinances are amended in keeping pace with the times. Chelsea is hemmed in between thickly built sections of the immediate suburbs of Boston, a location that has its duplications in all of the larger cities, especially those old enough to contain a large percentage of the ramshackle construction which characterized the buildings of the period before the means of fireproofing had been provided for. A great area, approximating a square mile, thickly covered with buildings, has been completely destroyed, so that practically every wall will be razed before new construction can begin. There will be little difference between the old and the new city as to proximity of buildings, unless it be that density will be increased. Therefore the necessity for the application of the most modern ideas of fireproof or slow-burning construction is imperative. Anything but the strictest of building laws, founded on the most recent lessons taught by the science of design and materials, will result in the deteriorating influences which would again subject the city to the peril of conflagration should a combination of unfavorable conditions unite with fire. The opportunity exists to advance beyond the usual limits of buildings ordinances. Baltimore and San Francisco have done this as large cities. Chelsea can do it as a smaller community. The new construction will include factory, business and residential buildings, probably in somewhat haphazard combination as to location. Laxity of laws governing the building of one class of property will threaten those erected on better principles. Modern progress in fireproofing materials and architecture has been very rapid. Concrete and metal have taken important places, while the difference in cost as compared with wood has grown less, partly because of the increase in price of lumber and partly because fireproof materials are less expensive, all things considered. The item of roofing alone shows a vast betterment.

The New Fifth Avenue Building.

The structure which will rise upon the site of the old Fifth Avenue Hotel, now rapidly being demolished, will in many ways be interesting from the standpoint of the architect and builder, as it will embody features which will place it among the most attractive buildings of the city. It will be 14 stories high, with a front entirely of stone, there being polished granite at the base with limestone above, including the cornice and balustrade. Fireproof material will be used throughout, and where wood is ordinarily employed for trim, doors and windows, heavy drawn steel will be substituted. There will be concrete floors throughout and all the base in the building will be of polished marble. All the glass for interior doors and windows for interior partitions will be wired glass, so that in combination with the metal doors there will be fire resisting qualities which will tend to prevent the spread of any blaze should any of the furniture catch fire. The plans prepared by Architects Maynicke & Franke provide for 2085 structural columns, having a total length of nearly 7½ miles. There will be a total of 4216 windows covering 105,000 sq. ft., and there will be 1720 doors in the building. The structure will have its own electric plant, and the electric wires in the new building, it is stated, would reach from New York to Philadelphia. The plumbing pipes will have a total length of about 6¼ miles and the steam pipes 14½ miles. Filtered and cooled drinking water will be furnished by a special plant, and each of the 600 offices will be supplied direct. Another important feature of the building is that of light and air, there being no dark or poorly ventilated offices, the width of the interior court being as wide as an ordinary city street. There will be two arcades on the ground floor, one 23 ft. wide, extending from the center of the front, past the elevators, of which there will be 19, to the center of the building, where it will meet with the other arcade of the same width, extending through the building from Twenty-third to Twenty-fourth street. At the intersection of the arcades will be a great rotunda with glass dome and lined with white marble pilasters. The entrances will be of the barrel vault design, more than 40 ft. high. The building will have a frontage of 200 ft. on Fifth avenue and Broadway, and will be 240 ft. deep on Twenty-third street and 265 ft. deep on Twenty-fourth street. The site covers 56,000 sq. ft. and the value of the land alone is placed at more than $6,000,000. The structure will cost $2,500,000, making a total of $8,500,000. The street floor will be devoted to stores and the upper floors to offices. The stores and entrances will be flanked with a series of Doric columns, two stories high, while around the top stories will be a series of three-story bays.

Views on Industrial Education.

Continuing the extracts printed last month of addresses at the recent meeting in Chicago of the National Society for the Promotion of Industrial Education, we give the following:

Addressing on "The Effect of Trade Schools on the Social Interests of the People," Prof. Graham Taylor said: "The trade schools must be considered in relation to the public schools in order to forecast any appreciable effect they are to have upon the social interests of the people. The technological schools, while helping to make work and raising the standard of efficiency, start on a plane far beyond the reach of the rank and file of American labor. The trade schools, therefore, must not only be a part of the public school training, but must dominate their elementary grades, for two reasons. Because the great majority of children in our greatest industrial centers fail to go beyond the sixth and seventh grade, and because their interest and aptitude for skilled pursuits must be elicited, if at all, before they reach the fifth or sixth grades. Hereditary skill in certain trades might be developed here as it has been in Europe, if the child could be encouraged to follow its parent's occupation and improve upon it. The interests of the whole people need to be safeguarded from the abuse of an unlimited apprenticeship by the monopoly of natural resources and the limitation of the opportunities for skilled labor. Otherwise wages and the standard of living could be exploited whenever and wherever the access to natural resources or the tools of production and an unlimited supply of skilled labor might be controlled. The caution of our trades people is therefore natural. It is born out of bitter experience of intermittent work and the restriction of skill to some small part of a trade which affords little opportunity for expert skill or increased wages. To the curriculum of the trade schools there should be added, both for the sake of the employer and employee, instruction in the history, psychology and ethics of industrial relationships. Trade schools cannot fail to promote the special interests of the whole people."

Weighing Big Buildings.

If one goes through the offices of one of the big skyscraper construction companies these days he may see a roomful of young men all figuring away on interminable sheets of paper. The layman is astonished to learn that they are weighing skyscrapers, and that the tallest and most extensive buildings, up to the thousands of tons are carefully weighed before they are built. The evolution of the tall building has brought forth remarkable engineering specialization along many lines, but none more noteworthy than in the case of the skyscraper weighers, for this weighing of the skyscrapers is no easy job. One cannot dump the material, like a pound of sugar, into a pair of scales and declare there is so much weight, because, in the first place, the scale has never been invented that will weigh 100,000 tons, and, in the second place, the material is not on hand. A skyscraper must be weighed before it is built—before the first caisson is sunk for the foundation or the first steel column is set up. The scales are pencil and paper, balanced by specially trained brains. And, finally, the operation of weighing a modern tall building may cover, when completed, as many as 30 or 40 typewritten pages. The weight of New York's mammoth skyscraper in Cortlandt street is estimated at 86,000 tons.

THE ADDITION to the present Whitehall Building, located on Battery place, Borough of Manhattan, New York City, will consist of two wings and a tower. The east wing on Washington street will have a frontage of 170½ ft. and a hight of 16 stories, while the wing on West street will have a frontage of 206¼ ft. and a hight of 31 stories. The tower will rise partially between the two wings and directly in the rear of the present Whitehall Building to a hight of 36 stories, or 447 ft. It will be practically square, measuring 95½ x 94¼ ft. The structure will rank as the third highest tower building on Manhattan Island, the first rank being awarded the Metropolitan Life Building tower, rising 700 ft. above the sidewalk, and the second highest being the Singer Building tower, 612 ft. The estimated cost of the latest skyscraper is placed at a little more than $4,500,000. It will be put up for the Battery Place Realty Company and the Century Investing Company. The architects are Clinton & Russell of 32 Nassau street, Borough of Manhattan.

CORRESPONDENCE.

Finding the Bevels in Truss Construction.

From C. J. M., St. Johns, Newfoundland.—Referring to the inquiry of "J. A. K.," Detroit, Mich., as to the correct method of finding by means of the steel square the bevel or miter cut between the end of a brace and that of a straining beam of a truss, I would suggest the following method: Take 12 in. on the blade and the rise for 1 ft. of run of half the angle formed by the brace and the tie beam, on the tongue. Referring to the diagram, Fig. 1, we will suppose the radius of the dotted arc *a e* to be 12 ft. and the line *k j* to bisect the angle *a e j*, formed by the brace B and the tie beam D. Draw the perpendicular *e d*, and also the line *b a* perpendicular to the bisecting line *k j*.

Now we have three right angled triangles identically equal, because the lines *a j*, *b j* and *e j*, being radii of the same arc *a e*, are therefore equal. The line *b j* being the bisecting line of the angle *a e j*, the angles *a c b* and *d f e* on opposite sides of this line are equal. This being so the perpendiculars *a b* and *d e*, having the same length of base and being perpendiculars of equal right angled triangles, are also equal.

Again the angle *g h i* having the same base and perpendicular are equal. Their bases being in the same straight line *k j*, their hypothenuses are also equal. This being so the angles *c a* C and *k g* C are equal, and the perpendicular *a b* bisects the angle *k l j* formed by the brace and straining beam. Now as the perpendicular *d e* is equal to the perpendicular *a b*, and as the base *c f* is 12 in., the length *d c* is the rise for 1 ft. run of half the angle *a j e*, which, taken on the tongue of the square with 12 in. on the blade and applied to both brace and straining beam, gives the correct cut.

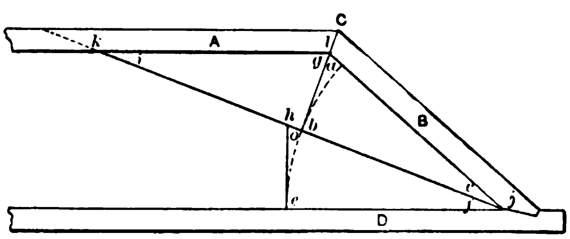


Fig. 1.—Diagram Submitted by "C. J. M."

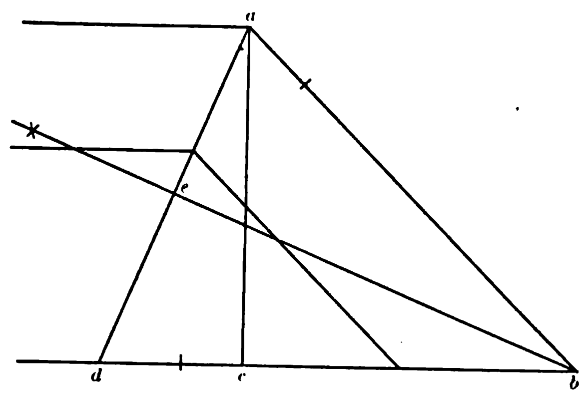


Fig. 2.—Diagram Accompanying Letter from "F. G. M."

Finding Bevels in Truss Construction.

From F. G. M., Canton, Ohio.—The following is my method of cutting the brace for a truss, making use of the steel square: Referring to the diagram, Fig. 2, from the length of *a b* take *b c*, leaving the distance *d c*; then

$$(d\ c)^2 + (a\ c)^2 = {}^2(a\ d)$$

$\frac{1}{2}\ a\ d$ = the figures to use on the tongue of the square.

$$(a\ b)^2 - (a\ e)^2 = {}^2(e\ b)$$

Then *e b* on the blade and *a e* on the tongue will do the work. The tongue gives the cut of the brace and straining beam.

All the above can be worked out with square and 2-ft. rule.

Design Wanted for Camp Ground Tabernacle.

From H. G. A., Barrington, Ill.—I have been greatly interested in the Correspondence Department of the paper and have thought I would like to have the ideas of some other contractors who are readers of the paper as to the construction of a camp ground tabernacle to have a seating capacity of about 3000 people all under one roof and not to cost over $3500. There would be no necessity for a wooden floor, as benches placed upon the ground would be used as is usual in such cases. If possible I would like to avoid having posts inside of the building, but I see no other way of supporting the roof and keep the cost within the sum stated. I have no doubt that many of the contractors who are readers of *Carpentry and Building* have been called upon to do work of this kind, and if they will tell their experience it will be of service to me, and at the same time doubtless interest many others. I therefore hope that none will hesitate to express his opinion fully and freely to the end that many may be benefited.

Finding Side Cut of Valley Rafter.

From J. A. K., Detroit, Mich.—Although the finding of side cuts of a valley rafter in a roof of unequal pitch has been quite thoroughly discussed and illustrated by various diagrams, I am greatly interested in this phase of the subject, and if the editor will allow me a little space I will tell how I learned to get these cuts. It was from a back number of *Carpentry and Building*—the issue for August, 1901, page 208. The operation is shown to be performed by the steel square by a correspondent signing himself "G. L. S.," Temple, Ind., and as I prefer the use of the steel square for laying out a roof, I decided going about the work of getting the required bevels as he described and illustrated it. He said take the run of the rafter in the large gable on the blade and the length of the rafter in the small gable on the tongue, and the tongue gives the cut against the ridge in the small gable. The bevel against the ridge in the large gable is obtained in the same way, by simply taking the run in the small gable on the blade and the length of the rafter in the large gable on the tongue; mark by the length of rafter for cut.

From a certain point of view this looked good to me, and it was easy to remember what otherwise seemed quite difficult bevels to obtain. Well, last summer there occurred an opportunity for me to frame such a roof and I took advantage of the steel square rule. All went well. We soon were ready to raise the roof, and then of course I could see how good my bevels would fit; but I found that it had all been in vain and that the problem was "no good." This opportunity, however, set me thinking and I have since studied out where the trouble was. The bevels are indeed quite difficult to obtain, but "G. L. S.'s" proportions are not right for them. I would add that "Kese," Westover, Pa., is no better in obtaining the side cuts for the valley rafter. By his method the rafter does not fit any better than would a rough guess. Please try it once. In the January issue "E. A.'s" method is the best I ever saw, outside of the use of the steel square his being perfectly correct.

In conclusion I wish to say that *Carpentry and Building* is the initiative in solving and demonstrating problems in the trade.

Designs Wanted for Village Bank and for a Boarding-House.

From W. A. W., Paxson, Va.—I would be glad if some of the readers would furnish for the correspondence columns a design for a village bank building, to be constructed of brick and cover an area 40 x 50 ft. It should have a room 16 ft. wide, cut off from the bank portion, to be used for a post office, and the cost should not exceed $5000.

I would like to have the readers furnish drawings for a three-story house about 36 x 40 ft. in plan and suitable for erection in a village. It will be used as a house to room boarders and some time it will be sold for a residence. If any of my brother chips can help me to secure what I desire I shall be greatly obliged.

I would say for the benefit of any reader who may be interested that I consider *Carpentry and Building* the best carpenter's paper I have ever seen and I find it of great assistance to me.

Size of Timbers for Roof Truss Construction.

From P. C. D., Fryeburg, Maine.—I am sending a sketch, Fig. 1, representing the cross section of the upper portion of a structure, which the "K. of P." intend building, and I would like to have the advice of Mr. Karr as to the size of timbers and construction of the truss. The building is to be 36 x 75 ft. in area, and I have planned to have five trusses and five posts under the girders, so they will be about 12 ft. on centers. The wall studs are 2 x 6, and there will be 6 x 10 in. posts under the trusses. The timber is of spruce. The first floor will be for stores and the second for a lodge room, with 12-ft. ceiling. It is the wish of the society to use the attic space as a dining room. I, therefore, want to do away with the center rod in the truss, if I can. The building will be lathed and plastered, and will be located on a corner, and I would therefore like to have some of the readers send a side and end elevation. Any advice that Mr. Karr gives will be greatly appreciated.

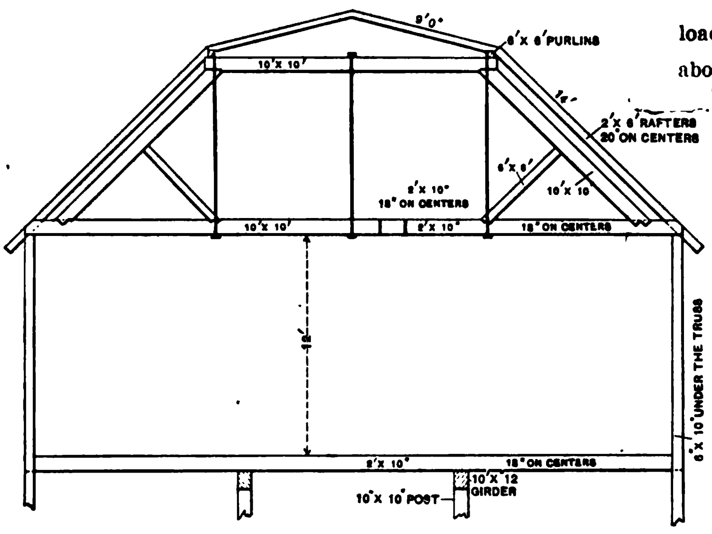


Fig. 1.—Sketch Submitted by "P. C. D."—Scale, 3-32 In. to the Foot.

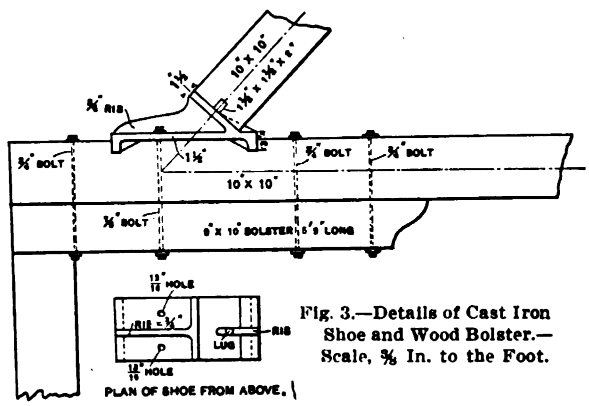


Fig. 3.—Details of Cast Iron Shoe and Wood Bolster.—Scale, ¾ In. to the Foot.

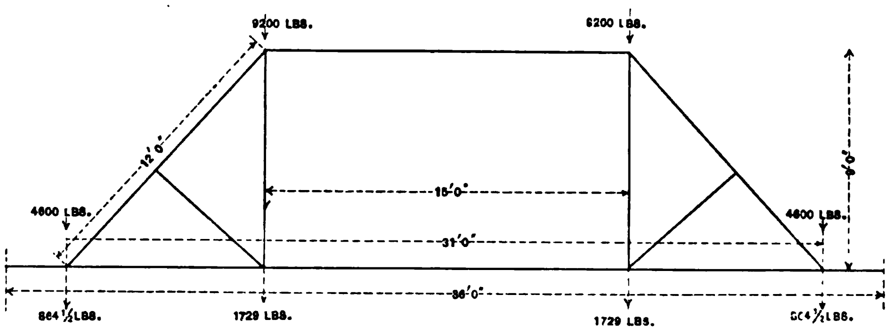


Fig. 2.—Diagram of Truss.—Scale, ⅛ In. to the Foot.

Size of Timbers for Roof Truss Construction.

Answer.—As the trusses are spaced 12 ft. apart, and the span from post to post is 36 ft., the truss span center to center of stress on lower chord being 31 ft., the hight of the truss center to center of chord 9 ft., and the lineal feet of roof along the line of the rafter being 46 ft., then the area of the roof supported by each truss is 552 sq. ft., which at 50 lb. per foot is 27,600 lb. The additional load on the lower chord of the attic flooring and ceiling below amounts to 5187 lb.

We shall consider for purposes of calculation that these loads are divided into three parts, one part each being concentrated at the points where the tie rods are indicated on the diagram, Fig. 2. This would make 9200 lb. at each of the two upper apices, with 4600 lb. distributed to each support, 1729 lb. at the lower end of each tie rod, the latter load being the weight of the attic floor, beams and ceiling underneath. To each support from this load goes 864½ lb. in the same manner as from the roof load. Compression in the truss rafter equals (9200 + 1729 lb.) x 12 ÷ 9 = 14,572 lb.

The tension in the lower chord equals 10,929 x 8 ÷ 9 = 9715 lb. Compression in the upper chord equals the tension in the lower chord, that is, 9715 lb. The tension in each tie rod equals the sum of the loads theoretically concentrated at those points, namely, 10,929 lb.

To find the value of the truss rafter

$$l \div d = \frac{12 \times 12}{10} = 14.4,$$

which corresponds to an ultimate load of 3261 lb. per square inch, or a safe load of $\frac{3261}{4}$ = 815 lb. per square inch.

As our section is 10 x 10 in., the safe load is 10 x 10 x 815 = 81,500 lb., which in comparison with the actual load of 14,572 lb., gives a factor of safety of $\frac{81{,}500}{14{,}572}$, or about 5½.

The tension in the lower chord equals 9715 lb. The safe tension value for spruce equals 800 lb. per square inch, or 80,000 lb. for the section given, which yields a factor of safety of $\frac{80{,}000}{9715}$ = a little more than 8.

Compression in the top chord is 9715 lb., and $\frac{l}{d} = \frac{15 \times 12}{10} = 18$, which corresponds to an ultimate strength of 2998 lb. per square inch, or a safe strength of 727 lb. per square inch, or a safe load of 72,800 lb., which yields a safety factor of $\frac{72{,}800}{9715}$, or a little over 7.

The tension in each rod is 10,929 lb., and would require an area of $\frac{10{,}929}{16{,}000}$ = .683 sq. in., which corresponds to a rod whose diameter in the shank is 15-16 in., upset end to be 1¼ in. diameter.

The design of the end of the truss is weak in the lower chord because the bearing axis of the truss rafter is so far out from the wall supports. It should be strengthened by a solid bolster, as shown by the detail, Fig. 3, or by a supporting knee. The center rod may be omitted if the top chord be trussed by a ¾-in. rod over a short central strut, particularly if the attic ceiling is to be plastered.

The center portion of the lower chord has a floor and ceiling load that produce upon it a transverse stress, but it is so small in proportion to the total load and the factor of safety is so large that it is unnecessary in this case to consider it.

Posts carrying the trusses may be considered as 12 ft. long as the theoretical length for purposes of calculation, because each post is braced and stayed at the upper girder line; hence $\frac{l}{d} = \frac{12 \times 12}{6} = 24$, which corresponds to an ultimate strength of 2592 lb. per square inch, or safe strength of $\frac{2592}{4} = 698$ lb. per square inch. Safe load then, using the correspondent's sentional area, is 60 x 698 lb., or 41,880 lb.

The total reaction of each truss post is 16,393½ lb., and this would yield a safety factor of $\frac{41{,}880}{16{,}393\frac{1}{2}}$ or about 2½.

The posts on the first story carry an additional floor and ceiling load, and should be fully braced with long braces cut in between the studs.

The ceiling can be furred down below the attic floor to conceal the bolsters. The small braces from the foot of the tie rods to the truss rafter may be two 2 x 10 in., bolted or spiked firmly together. The 2 x 6 in. studs to carry the floors are the proper size to be employed.

C. P. KARR.

Freak Specifications.

From A. E. T., Salem, Ind.—The following is a copy of the specifications for a five-room cottage, to be built in this place for a client who, on the ground of economy, was not disposed to pay for a set of working plans:

"House to have six windows, 24 x 30; two windows, 40 x 30; three glass doors, two being long glass. House to have a 12-ft. wall; inside finish to be of chestnut; 9½-ft. ceiling. Studding and top joists to be poplar. Three coats of good paint outside. Cellar, 8 x 10. Woodhouse, 10 x 20. Outside closet. Pine floors, with edges painted in two rooms for rugs and one floor painted."

The above was given to the local contractors with the request that they make up their bids at once. Will the practical readers kindly express their opinions concerning these specifications, and tell what they would be likely to do under the circumstances?

Fastening in Place Interior Trim in Concrete Block Houses.

From T Square, Sheridan, Wyo.—I would like to have some of the readers of *Carpentry and Building* who have had experience in this line to give their methods of fastening the base, casings and other interior trim to the walls of cement block houses. I think this will be an interesting subject for discussion to all who read the best building magazine published.

Plans Wanted for Small Planing Mill and Lumber House.

From R. E. B., Clarksville, Tenn.—I would be very glad to have some of the practical readers of the paper furnish me a plan for a lumber house and small planing or job shop combined. I want a building in which to store manufactured building materials, such as flooring, ceiling, siding, doors, sash and blinds, &c., all easily accessible to load and unload on wagons. In connection with the above, I desire to run a small job shop with a few machines operated with power from a gasoline engine. The building must be cheaply constructed and covered with iron or steel for walls and roof. I would prefer that the building be only one story in hight.

In this section of the country nearly all the cottages built are only one story and have neither cellar nor attic. I would therefore like very much to see more plans of such a class of houses in *Carpentry and Building*

Note.—We shall be very glad to have our Southern architectural friends furnish for publication designs of cottages of the character indicated by the correspondent above.

Building Plans Wanted for a Packing House

From Information Seeker, Daysland, Ala.—I take the liberty of asking for suggestions regarding a building plan for a packing plant 30 x 60 ft. in size, with basement full size of the building, the foundation walls being of stone and the floor of cement. The first floor is to form the refrigerator, office and shipping room, while the second floor will be used as the slaughter house with covered runway from stock yards. The building is to be framed and covered with galvanized iron with galvanized iron roof. I would like to know the necessary sizes of joist and girders, as there will be about 15 head of cattle in the slaughter house at one time, besides what stock may be hanging in the refrigerator from the ceiling.

Some Comments on the Two-Family House Competition.

From Architect, California.—I was very much interested in the article and illustrations relating to the competition in two-family houses, published in the May issue of the paper, and I now wish I had taken a hand in the work, as I think it is a splendid educational feature and well worth keeping up. I hope the editor will see his way clear to have a similar contest on the same lines in the near future, as I would like very much to enter as a contestant; not so much with a view to securing a prize as for the knowledge likely to be gained, especially where there is such a lively interest taken as there seems to have been in this case.

Note.—We shall be very glad to have our correspondent take part in the future contests conducted under the auspices of this journal, and for his information, as well as that of others who may be interested, we desire to state that the next contest will be announced in the issue for December. At the moment we cannot state what the subject of it will be, but every effort will be made to select something which will be of the greatest interest to our readers.

Proper Hight of Stair Rail.

From W. H., Baltimore, Md.—I have been taking *Carpentry and Building* for several years, but I fail to find in its columns a statement as to the proper hight to place the hand rail in a flight of stairs. I find that some builders set it at one hight and some at another, indicating that there is a difference of opinion as to what is proper. I would like to have the practical readers express their views on the subject, and tell the proper hight for setting stair rails, as the information may be of interest to others than myself.

Note.—While there may be a difference of opinion among stair builders as to the proper hight to which to place the hand rail of stairs, a safe rule is to make the hight about 2 ft. 6 in. above the tread, measured on a line with the face of the riser. On the landings the hight of rail should be equal to the hight of the hand rail measured at the center of the tread, the usual hight in residences being 2 ft. 8 in. to 2 ft. 10 in.

Estimating Cost of Buildings.

From L. H. H., Bloomfield, Ind.—Replying to the letter of "R. G. D.," which appears in the March issue, I would say that one of the most successful contractors I ever met had a lot of short ways of arriving at the cost of buildings. He had less than a common school education, but would look at a set of blue prints of a dwelling house for example and give a man figures in half an hour. He estimated the lumber bill (or guessed at it from his great familiarity with buildings of that class) and added one-half for labor. The correspondent, "R. G. D.," does not mention painting, which we estimate here at 20 cents per square yard for three-coat work. Judging from the description of his building I presume he will use some felt or ruberoid roofing, the cheaper grades of which can be laid and coal tarred for $1.75 and upwards per 100 sq. ft. Cement foundations cost here 22½ cents per cubic foot with gravel at $1.50 per cubic yard. Brick is about the same.

The Articles on Perspective Drawing.

From G. M. R., Middleboro, Mass.—I have found the articles on "Elementary Perspective Drawing," by George W. Kittredge, especially valuable, and they have been exceedingly interesting to me. I am constrained to offer these comments by reason of the fact that these articles possess a great advantage over the average contribution on this complicated subject in that the various points are logically and intelligently explained, and the articles are almost entirely free from the confused technical expressions usually employed by authors writing on this particular subject.

Stucco Work on an Old Brick Building.

From J. O. S., Terre Haute, Ind.—Will some one please tell me through the Correspondence columns of the paper whether or not stucco work (some call it "pebble-dash" or "rough cast") can be used on an old brick building which is too substantial to destroy, but wish remodeled? Also please explain the process of doing the work, if it can be done.

I have the last four volumes of *Carpentry and Building* complete, and am having them bound in book form. I could not get along without them.

A Problem in Roof Framing.

From R. J. A., New York City.—I am sending sketches, Figs. 1, 2 and 3, showing plan and elevations of roof in reply to the request of "J. E. D.," Milton, Iowa, in a recent issue of the paper. The drawings so clearly define my solution of the correspondent's problem that extended comment would seem to be unnecessary.

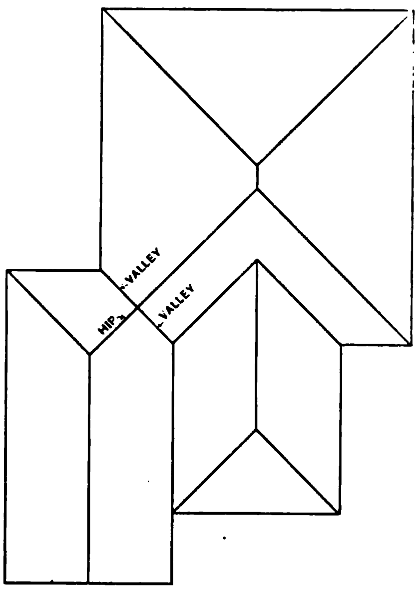


Fig. 1.—Plan of Roof Submitted by "R. J. A."

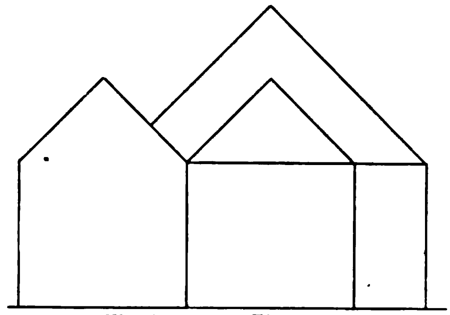


Fig. 2.—Front Elevation.

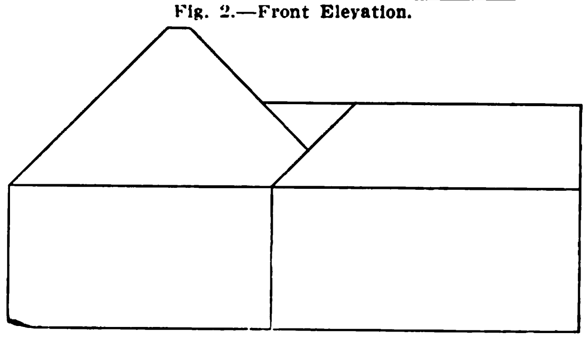


Fig. 3.—Side Elevation.

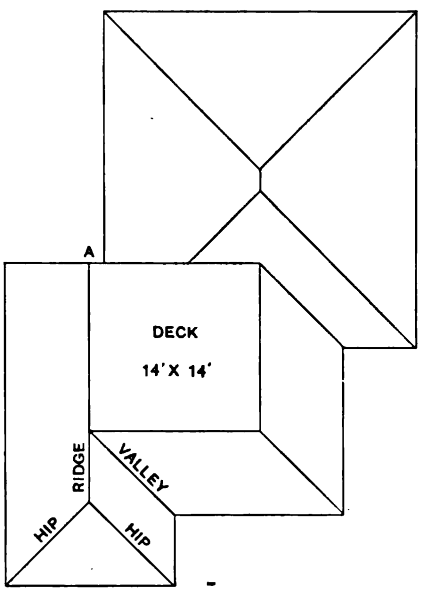


Fig. 4.—Roof Plan of "A. H. J. C."

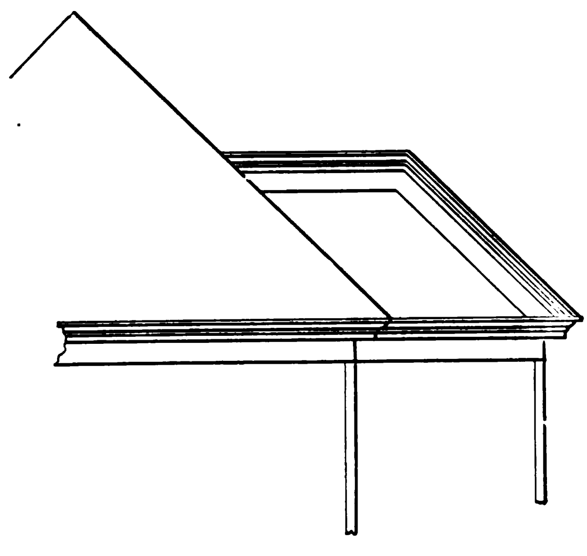


Fig. 5.—Elevation of Roof at "A" of the Plan.

A Problem in Roof Framing.—Solutions Submitted by Various Correspondents.

From A. H. J. C., Kennebunkport, Maine.—In reply to the inquiry of "J. E. D.," Milton, Iowa, I would state that if I had to roof the addition he describes I would do the work in accordance with the inclosed plan, Fig. 4. This shows a gable at the end of the addition with a deck 14 x 14 ft., extending from the ridge of the addition to that of the main roof. I also send a partial elevation of the roof, Fig. 5, at the point A of the plan.

Test of Building Materials.

The first of a series of elaborate tests has just been completed by the structural materials laboratories of the Geological Survey in Chicago under the direction of Richard L. Humphrey, engineer in charge. Thirty panels of various building materials, including concrete building blocks, common, hydraulic pressed and sand lime brick; concrete of gravel, cinder, limestone and granite; glazed building and partition terra cotta tile; sandstone, granite and marble building stone were tested. The materials were subjected to the direct application of heat for two hours and were then immediately quenched with water. An effort was made to obtain a maximum temperature of 1700 degrees F. within half an hour after starting the tests and to maintain this temperature as nearly as possible constant through the succeeding half hours.

The building materials were placed in a sliding panel, which, when arranged for the fire tests, formed one side of the furnace. In the furnace, gas flames were forced by a blast of air against one side of the panel. After two hours, the panel was brought from the furnace and the water turned on from a hose with a pressure of 50 pounds to the square inch.

Tests Unusually Severe.

The conditions under which these tests were made were unusually severe, and as none of the materials passed perfectly, it proved a good test for comparative purposes. The temperature used would hardly be reached in an ordinary fire, but might be in a conflagration.

While these tests are not conclusive, being but the beginning of a general line of investigations, according to Director Smith of the Geological Survey, they bring out a number of important facts. The brick panels probably withstood the tests better than any other materials. They were two lots of common brick tested—one was an unused, recently manufactured brick, and the other a brick that had been in an engine foundation for some years. The latter seemed to withstand the test the better. Fifty per cent. of the new brick were split, while 60 to 70 per cent. of the old bricks were not damaged. The bricks at the back of the panel were entirely unaffected. The hydraulic pressed brick stood the test better than any other material. No damage was apparent whatever after the firing and before the water was applied, and, although a number of bricks cracked, 70 per cent. of them were found to be sound after the drenching. There was apparently little difference in the strength of the bricks before and after the firing. The natural building stones behaved the worst of all the material tested. The almost complete destruction of these stones preclude any comparison between them. The sandstone panel entirely collapsed soon after the test was started.

The testing engineers report that it was difficult to determine whether the concrete made of limestone, granite, gravel or cinders sustained the least damage. Their surfaces were all rather badly pitted by the fire and washed away by the stream of water. The test was unfair to cinder concrete, as the sample of cinder was very poor, containing a large percentage of unburned coal, which ignited and left the surface of the concrete badly pitted. The granite probably behaved the best. The damage in no case extended very far into the concrete, probably not more than 1½ in. The evidence shows that even at this depth, the temperature was comparatively low. The rapid heating of the face of the concrete, while the back remained cool, caused the concrete to crack vertically for some distance back from the face. The cracking of the concrete can be avoided, it is believed, by using metal reinforcement, which would distribute the effect of the expansion. The tests also brought out most clearly the low rate at which the heat travels through concrete. This is one of the desirable qualities in materials intended for fireproofing purposes.

Linen tags which were placed in the hollow concrete blocks, when they were molded, were found to be undamaged after the fire test. In many instances the hollow blocks split after being subjected to the fire and water test. It was noticeable that the richer the mortars used in these blocks the less they were affected by the test. The mortars mixed with the greatest percentage of water gave the best results.

Severe Fire Test for Skyscraper.

There have been several fires in "skyscrapers" within the last few years, but perhaps none of them has afforded such striking test of modern fireproof construction as that which occurred recently on the eighteenth floor of the Tribune Building, in Chicago, Ill. It is said to have been the "highest" fire, worthy of the name, that has ever occurred in any building in that city. The Tribune Building is eighteen stories high, with storage rooms on the Dearborn street side of the top floor. The fire started, from some unknown cause, in one of these rooms, just under the roof, and had gained great headway before an alarm was turned in. The glass skylight, with reinforcing wire, melted in spots, and in others became so soft that it dropped down in fantastic shapes.

The significant feature of the fire, from the viewpoint of the constructor, was that it was confined to three small storage rooms. The firemen reported that it would probably have been confined to one, had it not been for small windows in the partitions of hollow terra cotta blocks. These partitions were not seriously damaged by the fire, though there was nothing left, afterward, of the asbestos composition covering a six-inch water pipe that ran through the room. The pipe itself was heated to a cherry red, indicating the intensity of the fire.

When the fire reached a hollow tile partition without a window it went no further, the terra cotta preventing any damage to the steel, and the partitions were practically intact after it was all over. The floor beams of the same material were found to be uninjured, though the wooden finish flooring was burned entirely through at several places. In an adjoining room were stored the records of the auditing department and the files of the *Tribune* for the 67 years that have passed since the paper was established. Though the fire raged for some time on the other side of a partition from them, the records and files were not damaged.

House Built of Lithographic Stone.

A plain, plastered stone house about 50 yd. from the ancient city hall of Nuremberg, Germany, has nothing to distinguish it from the other old houses of the neighborhood except that it is built of lithographic stone, worth from 6 to 21 cents a pound. So lithographers who go to Nuremberg wander from the worn tourist trails to see the wonder.

The house was built about 1680, nearly 100 years before Alois Senefelder, the discoverer of lithography, was born. Andreas Lichtenstein, who built it, took the stone easiest to get and secured it for the trouble of carrying it away. Now the material in the building is worth about $4000.

The present Andreas Lichtenstein, a descendant of the man who built the house, has said "Nein" about once a month for the last 20 years to speculators who want to buy his home and tear it down for the stone. It is his home and was that of his forefathers, and he refuses to part with it. So lithographers, with thoughts of rising prices, look and sigh.

Lithographic stone is found in commercial quantities only in Bavaria. The largest quarries are near Nuremberg.

WHILE the record of building operations for the entire country for the first quarter of this year has shown a gradual but steady improvement in the industry month by month, since December last there has been a marked shrinkage, as compared with the first quarter of last year. According to statistics compiled by Bradstreets covering nearly 80 cities of the country, the value of the improvements for which permits were issued in the first three months of this year was $88,722,762, while in the same quarter of last year the value was placed at $148,-732 497, showing a shrinkage for the current year of a trifle over 40 per cent.

ELEMENTARY PERSPECTIVE DRAWING.—VIII.

BY GEORGE W. KITTREDGE.

THERE are systems of perspective other than those heretofore explained, which are claimed as such more in respect to matters of detail than to any new principle employed. All depend upon the decrease in the size of objects as they recede from the point of sight, as determined by lines beginning in the picture plane and meeting in a point representing the infinity of distance. Prominent among these is a system whose main feature is the same as that shown in Fig. 11. This method, it will be easily seen, can be applied to figures lying in a horizontal plane as well as to those vertically placed. According to this system the plan of the object is first placed in such a position with reference to the picture plane as to give the desired view, as shown in the upper part of Fig. 4, after which lines are dropped vertically from the necessary points of the plan to the picture plane, as shown in the lower part of Fig. 16. This gives a system of parallel lines receding from the picture plane, which can easily be put into one point perspective, as shown by the lines converging at V, immediately above the plan. According to the methods of one point perspective, therefore, the measuring point or points may be located at a distance from V equal to the desired distance to the point of sight. It will be found convenient to use the measuring point at the left in obtaining distances on the receding lines at the left of V, and the one at the right for distances on the lines at the right of V. The distance C c of the plan is set off from C on the ground line, as shown by C c′, and the point c′ is then carried toward the measuring point locating c″ in the view. On a vertical line erected at C the required hight of the point represented by c of the plan is set off, as shown by c‴, from which point a vanishing line locates the point c in the view, on a perpendicular from c″. The same course must be pursued in the case of each point, all as shown. By an inspection of Fig. 16 the course of each point can be traced, one letter only being given to each point. The description given of the point C can be applied equally well to any other point upon the plan by substituting its letter in the place of C, c, c′, &c

A still shorter, though less accurate method consists in dividing the space occupied by the plan, into small squares, after the manner of a checker board, then putting the small squares into one point perspective and afterwards locating upon them the position of each point or angle of the building in accordance with the squares first drawn upon the plan. A perspective plan being thus obtained, heights are fixed as already explained in Fig. 16. These latter methods are especially available in the case of large drawings wherein it would be inconvenient or impossible to use distant vanishing points.

However simple the theory of perspective may seem or well it may be understood, its operations necessarily involve extreme care and the use of many construction lines before the desired result is obtained. Perhaps the most dreaded part of the work to some, is the getting ready. The determining of the angle of the view, the finding of the vanishing points and the preparation of the drawing board, require in some cases such an effort as to deter one not familiar with the work from trying. With those persons of more or less artistic accomplishments, there is a disposition to rely upon the eye rather than to puzzle the brain over what seems like an intricate problem. To those afflicted with mental lassitude and to those desirous of economizing their labor as well as their time to the greatest extent, it should be said that this part of the work can be reduced to a minimum by a little preliminary labor in preparing a drawing board especially for perspective work which shall answer for all occasions.

Such a drawing board should be as large as is consistent with available space and the character of the work to be done, that is, of such dimensions as to give as long a horizon line as possible, and should have lines drawn or scribed upon it as shown in Fig. 17. The lines should be of such a character as not to be easily erased. For this purpose a black pencil of the same kind as those made in blue, red and other colors, will answer very well. The line nearest the top represents the picture plane and should be far enough away from the lower edge to permit of drawing the complete semicircle shown. The line V V below, representing the horizon line, should be near enough to the lower edge of the board for convenience in working and still give room for a plan in perspective below the principal view, and should have the vanishing points V and V exactly below the points P and P. Upon the semicircle a number of points can be chosen as view points as indicated by S¹. S², S³, &c. To obtain these it will be well to divide one-half of P P into five or more equal spaces and from the points of division to drop vertical lines to cut the semicircle at the points mentioned. These lines can then be numbered at their crossings of the horizon line, as shown by the figures 1, 2, 3, &c. The two measuring points for each viewpoint can now be easily located in the following manner, and as previously

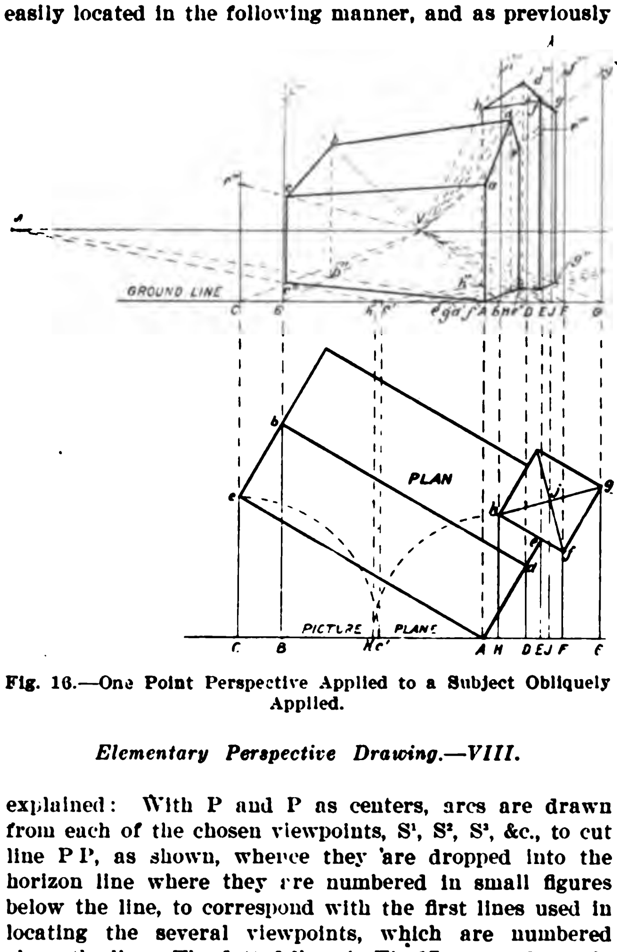


Fig. 16.—One Point Perspective Applied to a Subject Obliquely Applied.

Elementary Perspective Drawing.—VIII.

explained: With P and P as centers, arcs are drawn from each of the chosen viewpoints, S¹, S², S³, &c., to cut line P P, as shown, whence they are dropped into the horizon line where they are numbered in small figures below the line, to correspond with the first lines used in locating the several viewpoints, which are numbered above the line. The dotted lines in Fig 17 are used merely to show how the positions of the several measuring points are obtained and need not remain upon the drawing board after said points have been fixed.

It should be explained that if lines be drawn from any one of the viewpoints to P and P, such lines will form a right angle at the viewpoint, and will thus represent the visual rays which are parallel to the two sides of the subject to be represented, and which would under ordinary conditions determine the position of the vanishing points. By the arrangement of lines above described upon the drawing board it will be seen that any one of the vertical lines can be used as the center of the field of view and that the measuring points for the chosen line are those bearing the corresponding number.

A choice of either of the vertical lines shown in the figure will, of course, produce a view in which the right side of the object will be foreshortened more than the left side. For obtaining results in which the left side is most foreshortened, it will be necessary to repeat this system of lines and points in the other half of the board, being careful to distinguish between the figures of the two sides in some way, as by using different colored pencils. The angles which the sides of a rectangular object will make with the picture plane for any of the given points of view can easily be estimated, or can be determined exactly by first drawing a horizontal line through said viewpoint, as for instance, S^4, and then drawing lines from S^4 forward P and P. When such a test has been made for each point of view, one is then prepared to select at once the view point which will give the desired result in a prospective drawing. Instead, therefore, of having to find the vanishing points and measuring points for each particular case, one can by the use of the drawing board above described, shift the paper to the position which will give the required view and proceed without delay. If, for instance, the line 3 be selected as the position to give the required view, the paper is simply placed so that its center shall be over the crossing of this line with the horizon, when pins are placed at V and V for the vanishing points, and two others at points marked 3 by the figures below the horizon, which are the measuring points. In proceeding with the work then, draw first the ground line at a convenient distance below the horizon line for the construction of a plan in perspective, upon which locate the point of contact of the angle of the subject with the picture plane, which point we may call G, as shown in Figs. 4, 5 and 7. Erect a perpendicular at this point for a line of heights and draw lines from G toward V^L and V^R. Now set off from G toward the right and the left, the required dimensions of the two sides of the subject, and carry lines from the points so located, toward the proper measuring points to cut the lines from G, and continue the work all as previously explained in connection with Fig. 5.

With a drawing board so prepared, no further thought need be given to the problematic part of perspective drawing. The scale to be used in constructing the work and the obliquity of the view are all that need be considered in each individual case. These having been determined, a few moments are sufficient to place a general outline of the subject upon the paper.

In applying the subject matter of these articles to examples for practice, the student is advised to begin with the representation of simple rectangular subjects, taking afterwards those of a more complicated plan, as buildings having wings and towers. Following these may come arches (circles in a vertical plane) then round towers (circles in a horizontal plane).

Linear perspective, although accomplished by mechanical means, deals with the pictorial aspect of objects and thus forms an intermediary step between mechanical and artistic representation, and is thus closely related to freehand drawing. The practice of linear perspective will be found a valuable aid to freehand drawing, by training the eye to accurately estimate angles as they appear when viewed obliquely, as distinguished from what they really are upon the plan, while facility in the use of the pencil in sketching by eye alone will spare much labor in supplying small details when employing the linear method.

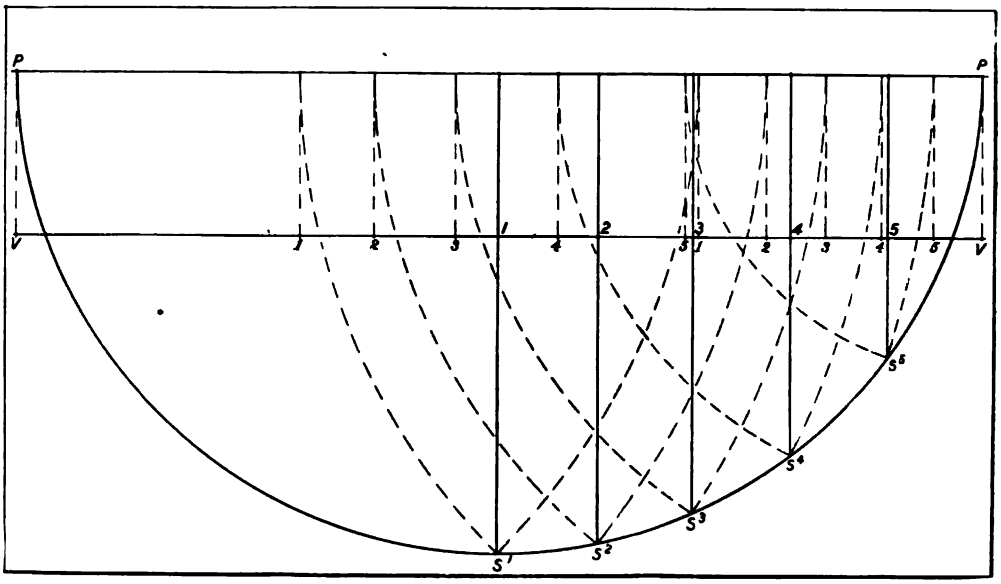


Fig. 17.—Drawing Board so Prepared as to Be Ready for Any Occasion.

Elementary Perspective Drawing.—VIII.

Weight of Building Materials.

According to an English exchange a bushel of chalk lime (dry) weighs 50 lb., and a bushel of stone lime (dry), 56 lb. A measure is 1 cu. yd., and contains 18 heaped bushels, or 23 striked bushels; from this the weights can be calculated. A bushel of Portland cement (dry) weighs from 110 to 116 lb. A bushel of hair for plaster, 14 to 15 lb. A load of 500 bricks, 9 x 4½ x 2¾ in., weighs about 32½ hundredweight, and a load of 1000 plain tiles, 10½ x 6½ x ⅝ in., weighs about 23 hundredweight; a load or cubic yard of sand, 26 to 28½ hundredweight; the same quantity of building mortar mixed (semidry), 24 to 26 hundredweight. Approximately, as filled into carts, 21 cu. ft. of river sand weigh 1 ton; pit sand requires 22 cu. ft. to weigh 1 ton under the same conditions.

21 cu. ft. of river sand equal 1 ton approximately.
22 cu. ft. of pit sand equal 1 ton approximately.
22 cu. ft. of Thames ballast equal 1 ton approximately.
21 cu. ft. of gravel equal 1 ton approximately.
60 cu. ft. of ashes equal 1 ton approximately.
25½ cu. ft. of shingle equal 1 ton approximately.

The weight of sand as given by different authorities ranges as follows: Pit sand, 90 to 100 lb. per cubic foot; Thames sand, 91 to 102 lb.; river sand, 117 to 118 lb.

When a Building Is Inclosed.

It has been held by the courts that a building to be inclosed must have a roof to cover it completely, to shut out the rains and the snow. In an action brought to recover an instalment of money due under a building contract providing that when the building was inclosed the contractor should be paid 18 per cent. of the whole cost of the building, the testimony was undisputed that, while the sheathing was on the sides of the house, the roof of the structure was not covered with shingles, but was covered with nothing more than small, narrow shingle boards set about 4 in. apart to receive the shingles, and that consequently the rain or snow or matter of any kind could come through. It was held that the house was not inclosed within the meaning of the contract, and that therefore the instalment claimed due could not be recovered.

THE ART OF WOOD PATTERN MAKING.—VI.

By L. H. Hand.

THE pair of eccentric straps shown in Fig. 78 of the drawings embrace some points worthy of investigation. It will be noticed that the location of the bolts which hold the parts together requires a cavity in the casting which must be cored out in order to enable the molder to draw the wood pattern from the sand. The groove shown at *a* in Fig. 79 also requires a core. This pattern parts in the center and casts half in the cope and half in the drag, and should be made of four thicknesses of stuff.

In order to produce this pattern make a full size working drawing on heavy manila paper. Next provide two pieces of stuff of sufficient size, which when doweled together will be of exactly the thickness of the groove *a* in Fig. 79. To one side of this piece when so doweled together fasten the working drawing, making the line *b c* correspond with the edge of the plank, and with a pointed instrument prick through the pattern and transfer the drawing to the face of the plank. Prepare two more pieces of stuff sufficient to build the pattern to the required thickness and in like manner transfer the working drawing to one of them. Tack these two together and cut out on the band saw. It will make an easier job to finish if the cut from *d* to *e* and the cuts from *f* to *g* and from *h* to *i* in Fig. 79 only are made, and the remainder of the band sawing done after all four thicknesses are together. Having carefully finished the curved line *d e* with spoke shave and sandpaper, secure the two outside sections in position, fastening with glue and brads, taking care that the lines on the inside sections correspond with the cut on the outside section. All remaining surplus wood can then be cut away on the band saw and the pattern finished. The core prints *f g* and *h i* in Fig. 79, will not be quite thick enough, but will require thin blocks glued to both sides to obtain sufficient thickness of the core print. The material for this pattern should be gotten out so that the grain will cross at *j* to avoid warping. The other half is so near like the part already described that further reference to it may be omitted. The large core box can be made without top or bottom, the core maker using his table for the bottom and striking off the top with a straight edge, as indicated in Fig. 80.

The eccentric strap, Fig. 81, was cast with a cavity for holding waste for lubricating purposes, which constitutes a new feature in coremaking; that is, the core is so light in one place that it would almost certainly break off in casting and the part inside of the casting is only supported by one side; also, if a short, round core print were used the core would twist about and fall down into the sand. This we remedy by inserting a ¼-in. iron rod in the center of the neck of the core. The casting came from the foundry all right so we assume no difficulty was experienced by the molder.

I promised to tell the readers of *Carpentry and Building* where I experienced difficulty in getting the desired casting and noting points where I could have done better. I can call to mind only one case where a piece was thrown back entirely. I was instructed by the superintendent to make a pump cylinder pattern, Fig. 82, as quickly as it could possibly be done, the superintendent placing an old cylinder on my bench for a guide. Here is where I made my first mistake. I should have taken enough time to think carefully how best to serve his purpose, which would have been to clean up the old casting, fill up the sand and bolt holes, put in suitable core prints and finish with shellac, thus saving almost the entire time and all the material required to make the pattern. As this core box would require cutting up a lot of valuable lumber and consume considerable time in making, I decided to take a short cut to make up for lost time by carelessly overlooking the fact that I had a pattern all made. By methods already described I quickly prepared a half core box to produce the part marked in Fig. 83 "molded core."

Now it is generally supposed that there is no way of packing sand or even flour so uniformly as with a roller. I had been instructed to leave the groove at *a* in Fig. 82, so that in boring out the tool would not have to cut clear down into the corner. This in an ordinary core box would require some rather tedious work, and may have been the cause of my failure. At any rate I prepared a plank, *a*, in Fig. 84, to which I fastened the half round end pieces *d*, *d*. To the center of this plank I fastened a half round strip, *b*, to make a half round groove, which would receive the molded core. I then

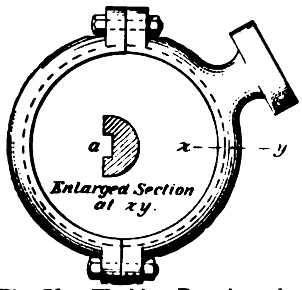


Fig. 78.—Working Drawing of Eccentric Strap.

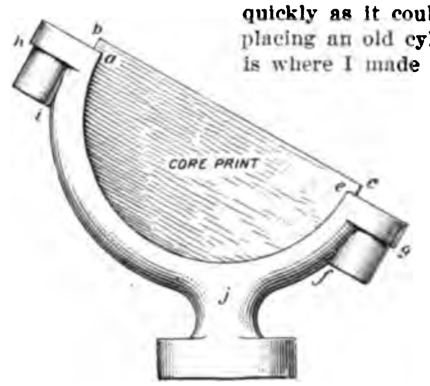


Fig. 79.—Pattern for Half of Eccentric Strap, Ready for Molding.

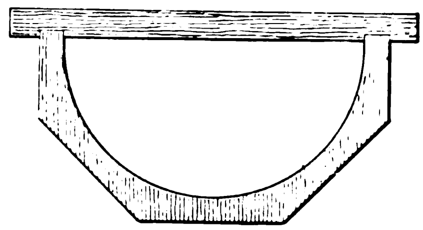


Fig. 80.—Core Box.

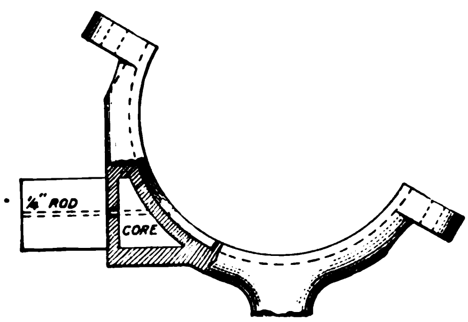


Fig. 81.—Detail of Eccentric Strap with a Cavity for Waste, Showing Construction of Core for Same.

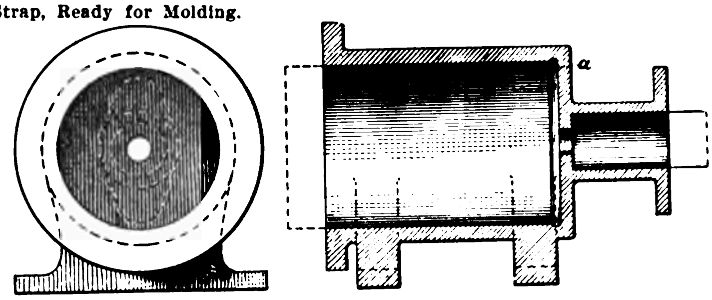


Fig. 82.—End and Sectional Views of Pump Cylinder.

The Art of Wood Pattern Making.—VI.

turned up the roller *c*, which I fitted into the swinging frame, as shown. My idea was that the coremaker could pile sand on the bottom plank and work the swinging roller back and forth and the core marked "rolled core" in Fig. 83 would make itself. When I had completed the job I took it down to my room that night and showed it to a particular friend who had worked in a foundry for seven years, and had charge of men most of the time. He was enthusiastic about it, slapped his leg and threw his head back and said, "By George! It beats anything I ever saw." Well, it did. Next day the superintendent laid it on my bench and told me I would have to make a common core box. I asked him what was wrong, but he did not know. I hunted up the teamster and asked him what was said at the foundry. He said they told him to bring that —— thing back and get a core box. They got it. I then wrote as courteous a letter as I knew how, illustrated with some drawings, showing a very complicated and costly core box, but one almost impossible to make of wood, but which could be made in a few minutes by this method, all the grooves, &c., in the core being simply a piece of lathe work turned the reverse of the profile of the core. I sent this letter to the superintendent of the foundry inclosing return postage. He kept my 6 pennies.

Now if this pattern had gone to our little home factory, I could have taken two cigars and sauntered into the core room, given one to the core maker, asked him as a personal favor to let me make a core, and I will bet dollars to brick bats that I could not only have made the core quicker, but I could have made a smoother, truer and more solid core than ever was rammed up in a box. This core box went to a big South Chicago foundry with a big superintendent, and besides this it did not do "*sweep work*," unless it received two or three prices for it, and I expect this was "sweep work."

It is safe to be a mixer, especially with molders and core makers, but if your pattern does not suit them do not argue the case. Fix the thing that they want fixed just the way they want it. A molder can turn down any pattern the least bit out of the beaten path, "and what are you going to do about it?" I remember once a pattern that "J. B." made. It was turned down in the foundry and a telephone message sent to the office. I was out in the yards, but received a "hurry call"; rushed over to the foundry and hunted up the foreman of molders. The pattern was dead wrong, could not be drawn at all. I talked to the foreman 20 min. and the pattern got better. I took out my pocket knife and whittled a minute, the pattern was better still. Yes! they would try it. The pattern was cast 20 times after that and they may be using it yet for all I know. Again I say, be sure of your molder. He can "cast a cup and saucer with the spoon in it," or says he can, but he can't cast your patterns if he has "got it in for you."

Occasionally it is very convenient to make use of a short method in attaining a desired result. I recall an instance where the superintendent came to me only a few minutes before quitting time and asked me to make a rod bushing pattern in time for the early train in the morning. This required me to work overtime, and with the disadvantage of having no machinery in motion. Rod bushings are all pretty much alike except as to size, and are sufficiently illustrated in Figs. 2, 3 and 4, on page 17 of the January issue of *Carpentry and Building*, to give the reader an idea of just what they are. It will be noted that, provided sufficient stock is allowed, the outside of the rough casting can quickly be shaped in the lathe. When time is precious thoughts come quickly, so while the superintendent yet stood at the bench I procured a block of stuff from an old bridge timber, across the grain of which I laid out the length of the part desired; making two straight cuts with the band saw I secured a block exactly the length of the pattern, and on the end of this block I laid out the small end of the bushing and struck the tangent lines *a c* and *b d*, as shown in Fig. 86. On one side of the block I laid out the lines *a e* and *b f* at the angles required to produce a plain beveled ring of suitable size to allow sufficient stock for turning up the bushing. Adjusting the angle of the saw table to the line *b f* I cut around the outside. I then leveled the table, and cut through to the inside of the block to get a start on the inside cut *g h*. I then adjusted the table to the line *a e*.

It must be noted that as a saw table only tips one way, the inside cut is made to the opposite side of the saw from the outside cut. I then ripped out a thin strip, *a b* of Fig. 87, to fill the saw kerf in the ring, and glued it in place, using very small brads to hold it until the glue dried. Now as a sharp band saw cuts very smoothly lengthwise of the grain very little finishing was required. As a matter of fact, it has taken longer to tell how it was done than to do the work itself. To produce this pattern on the lathe, however, requires both time and skill.

There is no workman who can be so ruinously wasteful of his employer's material, nor one who by unremitting attention to business and careful study of every detail of his work can save more time and material than the patternmaker. Years ago I was in charge of several departments of a large manufacturing plant which included a pattern shop, and I was so pressed for time that

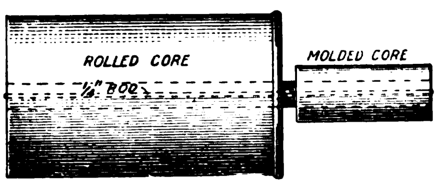
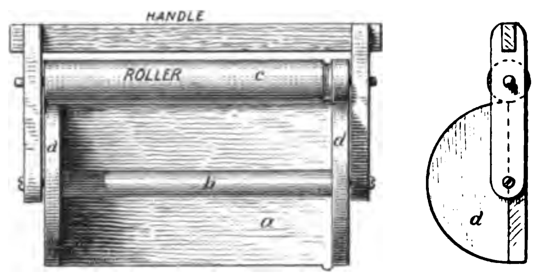


Fig. 83.—Core for Pump Cylinder.



Figs. 84 and 85.—Apparatus for Making Rolled Core.

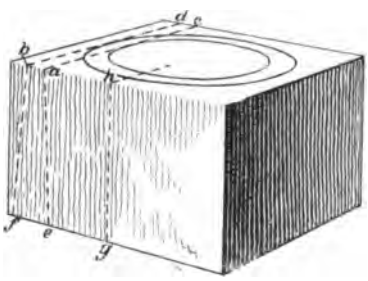


Fig. 86.—Block from Which the Pattern for a Rod Bushing Was Cut.

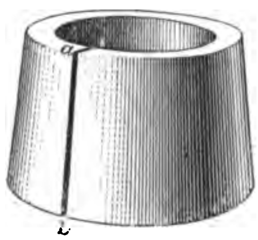


Fig. 87.—The Finished Pattern.

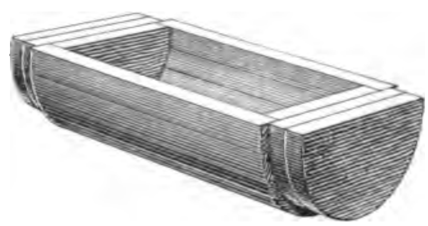


Fig. 88.—Badly Made Pattern for a Cylinder.

The Art of Wood Pattern Making.—VI.

I could look into the shop only once a day. It was necessary to have a locomotive cylinder bushed which required a plain cast iron cylinder ¾ in. thick, 20 in. in diameter and perhaps 30 in. long. I simply gave orders for the casting and left the patternmaker to work it out. A description of his method and one other will illustrate the point I am trying to make plain.

At this time we were paying $60 per 1000 for clear pattern stuff. The patternmaker got down four or five 1¾ wide clear plank, and began operations by cutting out four half circular pieces 16¾ in. in diameter. These he used as a frame or foundation for his work, around which he glued 1¾-in. staves, which it was his intention to put into the lathe and true up, turning off ¾ in. at each end for a core print. He did not allow, however, any material for the extra length of the core. He cut out eight more half circles 1¾ in. thick and 18¾ in. in diameter and glued these to the pattern for core prints, making the ends of his pattern of three thicknesses of 1¾-in. material and the shell of one thickness of the same, which he then trued up and finished. In making this pattern he had never given the core box a thought, so he took more new lumber 1¾ in. thick and cut out two more half circles 18½ in. in diameter, which he staved in the same manner. This having a tendency to roll around when being filled with sand he took two more pieces of 1¾-in. stuff about 12 in. wide and glued them to the ends of his box, making the ends two thicknesses and the shell one thickness of 1¾ clear stuff. On these patterns he worked three or four days. The results will be readily understood from an inspection of Figs. 88 and 89. Here is half a wagon load of costly material and a lot of unnecessary labor to secure one simple piece of casting, which is to be turned inside and out, so that a slight variation in the pattern will not impair its usefulness.

Now let us suppose as was the case in the pattern described that an engine was sold and a limited time only was allowed for repairs. With the beam compasses set at 7½ in. and 9½ in. lay out a pattern for a quarter circle as indicated in Fig. 90. Let us suppose that we want the core prints 3½ in. long, as was the case in the pattern mentioned. From any scrap pattern stuff or from new plank cut out enough of these pieces to build two rings 3½ or 4 in. deep, using glue and long brads to hold the pieces together. Now cut from 1 in. material or even lighter, four half circles of 9½ in. radius. Dowel these together to form a full circle and glue them to the rings mentioned, leaving exactly the width between the edges that the kerf of the band saw cuts away. Cut the rings apart at the joint taking care of course to miss the nails. Next slip the joint snugly together and with the beam compasses set at the exact radius at the inside of the required casting by the shrinkage rule lay out the end of the core print, which in this case is 18½ in. in diameter. This gives ¼ in. to cut away with the band saw. With the same compasses lay off two half circles of any dry material for a bridge in the center of the pattern. Take the two core prints described and sand them up carefully on the disk sander and strike a gauge mark 3½ in. from the ends as a guide for staving up. Cut a thick blank exactly square at both ends and exactly 30 in. long by the shrinkage rule and rip out on a fine circular saw enough staves slightly over 3¼ in. thick to sheet around the core prints, and with a round bottom plane of suitable radius dress one side to fit the curve of the coreprint.

Beginning at the joint in the core prints and the center bridge sheet around the circle, giving the proper bevel to the edge of the staves to make a glue joint, and when complete dress up the outside of the staves with plane and sandpaper, using very coarse paper across the joints first and finishing with 1½ flint paper fitted to a block of the radius desired. This pattern need never go near a lathe if care is used in building it.

Suppose that the foundry refuses to sweep a core and that a box must be made. We then proceed to cut from a plank 12 in. wide two pieces 24 in. long and joint one edge square. Clamping these together on the work bench we strike two circles, one 19¼-in. radius, the other 10-in. radius, by the shrinkage rule and cut away on the band saw the wood between the lines. Sandpaper the edges of the half circles and lay one handy for a guide in truing up the box. Cut out a third piece of 10-in. radius for a center bridge, and stave the inside of the box with material slightly over ¾ in. thick. When complete dress the inside of the box with a round bottom plane and sandpaper, using the end piece mentioned as a guide. When this has been done glue in the ends all as indicated in Figs. 91 and 92 of the illustrations.

Supposing, however, the molder is to be trusted and that "Barkis is willing," take a 1 x 12 in. plank and cut two pieces 24 in. long. Tack these together and cut out a half circle of 9¼ in. radius by the shrinkage rule. Get the tinsmith to cut a sheet of light iron 39 x 20 1-20 in. and roll it to a half circle. Tack this into the half circle ends and fasten the inside halves or ends proper in position. Put a stout strip along the sides to keep the box from springing. An idea of what is intended will be understood from an inspection of Fig. 93.

A little study of this matter will demonstrate that either of the latter methods save both time and material and fully two-thirds of the cost of the first method, not to mention the fact that holding an engine a single day longer than the stipulated time may mean a heavy damage to the employer.

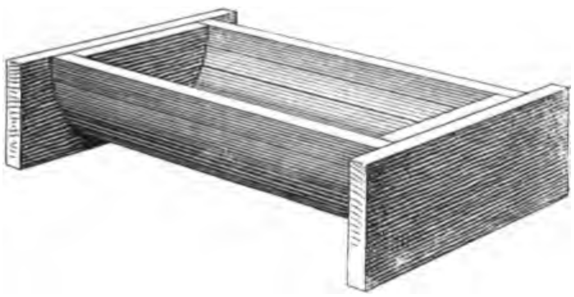


Fig. 89.—Badly Made Core Box for Cylinder in Fig. 88.

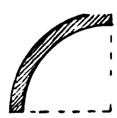


Fig. 90.—Pattern for a Quarter Circle.

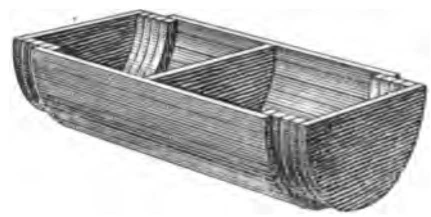


Fig. 91.—Half of Well Made Pattern.

Fig. 92.—Well Made Core Box.

Fig. 93.—Alternate Method of Making Core Box.

The Art of Wood Pattern Making.—VI.

WHAT BUILDERS ARE DOING.

THERE is very little change to note in the building situation, the figures available from leading cities showing a continuance of the contraction in operations which began in the closing months of last year. How long the tendency to curtail work will endure it is altogether impossible at the present time to indicate, but there is a general feeling among some of the larger builders that there will be no appreciable change for the better until there has been a readjustment of wages and a reduction in the prices of materials entering into building construction. In some sections the latter has occurred, to a very slight degree, but it has not been sufficient to stimulate operations to any extent. The reports from leading cities of the country, covering the month of April, indicate a decided decrease in the value of the building improvements for which permits were issued as compared with the same month last year, although the percentage of shrinkage in operations—about 35 per cent.—is somewhat less than in March, when it was 40 per cent. A careful study of the figures available shows that the number of buildings projected in April was only a little less than in the same month last year, a fact which indicates that the operations are of a less expensive character, consisting presumably of minor business structures and dwellings of all classes of which there is urgent need in some sections.

Atlanta, Ga.

The organization of the Builders' Exchange was completed at a meeting held the last week in April, when Charles W. Bradt was unanimously elected president; Danial A. Farrell, who was largely responsible for the organization of the exchange, was elected vice-president, and G. P. Dozier was selected to fill the office of treasurer.

The directors elected were as follows: For one year, A. R. Colcord, George Hinman, R. S. Wessells, H. M. Pearson and A. F. Bellingrath.

For two years, George H. Clayton, W. B. Disbro, Harry L. English, George Ittner and V. H. Kreigshaber.

E. E. Pomeroy of Moore & Pomeroy is the attorney.

Baltimore, Md.

The city still feels the depressing effects of the recent financial strain, and building operations for April are nearly 50 per cent. behind last year. There were 273 permits issued in April, for building costing $475,420, as against 370 permits costing $881,930 in April, a year ago.

The members of the Master Builders' Exchange attended the fifth anniversary dinner at the Hotel Carrollton on April 30. Plans and specifications as told in the unique *menu* in the form of a blue print were to be "full-size scale" and the details were to be furnished as the work progressed. The dinner proper was described as the "foundation," and it was specified that "the site was to be prepared and cleared to receive the foundational work." The "superstructure" consisted of speechmaking and an entertainment of a vaudeville nature. The names of the subcontractors were given as A. Y. Hambleton, Samuel H. Congdon and Robert S. Russell. The president of the association, J. Henry Miller, was named as the superintendent of construction, and Secretary J. M. Hering as his assistant.

The contractors were the members of the association and they combined business with pleasure by holding their quarterly meeting at that time and discussing topics of general trade interest. The Committee of Arrangements consisted of William H. Morrow, Frank G. Walsh and Harry H. MacLellan.

Buffalo, N. Y.

There is little if any improvement to be noted in the building line and operations are being conducted upon a scale only about one-half that of a year since. The figures for April show that 319 permits were issued for improvements costing $600,100, while in the same month in 1907 there were 351 permits taken out for buildings costing $1,086,700.

The members of the Builders' Exchange to the number of about 300 enjoyed a "smoker" and amateur vaudeville entertainment on the evening of April 21, which was a "screaming success." There was an opening chorus by 10 Chinese waiters, followed by solos from Bert Fisher, E. E. Tanner and John Welshoffer. The next feature was a travesty on "Romeo and Juliet," by F. N. Farrar and M. G. Farmer, which was received with screams of laughter. James McCreary as "Mlle. Besta Bigtorio," rendered "Will He Answer Goo Goo?" in such a realistic manner that one of the audience mounted the stage and accepted the invitation. Music was furnished by the "Builders' Bum Band," and the fact that they laid low until nearly time for everyone to go home, was all that prevented the breaking up of the show before it was fairly started. The committee of one having charge of the affair was Mr. Farrar, and he was heartily congratulated upon the success of his undertaking.

Chicago, Ill.

Contrary to what appears to be the condition of the building business in other leading cities of the country, Chicago for April shows an increase in the value of its building improvements as compared with the same month last year. While the gain is comparatively slight, yet it is significant in view of all the circumstances of the case. There was an appreciable gain in the number of building operations for which permits were issued, indicating activitiy in structures of somewhat less expensive character than last season. The figures available show that permits were taken out for 1229 buildings estimated to cost $6,130,850, whereas in April, last year, permits were issued for 1083 new buildings involving an estimated outlay of $5,906,400.

One of the important building projects is a new high grade hotel, which will require in its construction something over 8000 tons of structural steel.

The Illinois Chapter of the American Institute of Architects held a most interesting meeting on the evening of April 11, at which addresses were made by several guests of honor. There was a business meeting at 5.30 and a dinner at 6.30. After the dinner, P. D. McGregor, general manager of the Queen Insurance Company of America, gave a general talk on the subject of insurance, and W. D. Matthews, chief inspector of the Chicago Board of Underwriters, made some pertinent remarks on "Construction, with Particular Reference to Recent Fires."

Cleveland, Ohio.

The building outlook for the year shows no improvement; while the cost of construction has been reduced to some extent by cheaper material the decrease in the cost has not been sufficient to stimulate very much building activity in view of general industrial conditions and the difficulty to secure loans from banks. Contracts have been closed for only two building projects of any size during the month, one being for a large store and the other for a large factory.

During April the Building Inspector's office issued 823 permits, aggregating $1,442,667, and during the same month a year ago 1070 permits were issued, aggregating $1,435,212. That the total amount of the permits issued this year exceeded those of April, 1907, is due to the fact that one of the permits last month was for the Pope office and store building, costing slightly over $500,000, on which the substructure was started nearly a year ago. Of the total permits issued during April, 245 were for frame buildings to cost $377,240; 49 were for brick, stone and concrete buildings, to cost $939,525, and 529 were for additions and alterations, to cost $125,902.

Denver, Colo.

The building industry is one of the bright features of the general business situation just at present, and the amount of work projected in April was such as to command attention. Building materials have been reduced about 10 per cent. since last October, and there are projects for which permits have not yet been issued which it is expected will involve an outlay of many millions of dollars. Thus far the present year the city has shown a steady increase in its building operations, as compared with a year ago. As Building Inspector Willison puts it, "Denver is the one bright spot on the map to-day, and with the re-election of Robert W. Speer as mayor she promises to continue as such."

According to the authority above quoted there were 305 permits issued in April for building improvements estimated to cost $1,412,745, while in the same month last year 230 permits were issued by the Department of Buildings involving an outlay of $520,995. This is an increase over a year ago of nearly $900,000. For the first four months of the year 987 permits were issued for improvements estimated to cost $3,167,995, as against 894 permits for improvements costing $1,932,390 in the corresponding four months of last year. It must be borne in mind, however, that the improvements for the current year include the Auditorium, in which the Democratic convention will be held in July.

The large total for April was due to the permits for the North Denver High School, to cost $355,000; the St. John Cathedral, $160,000, and the Cheesman Hotel, $100,000.

Gary, Ind.

A number of well-known contractors in this place have just formed an organization to be known as the Builders' and Contractors' Exchange, with temporary officers as follows:

President, W. S. Gallagher.
Vice-President, W. L. Maxon.
Secretary, E. A. Schmidt.

At the initial meeting a committee was appointed to draft by-laws and constitution for the government of the organization. According to the plans of the moving spirits in the enterprise the present membership is only a nucleus for a strong organization, which it is expected will develop within a year or two. A special feature of the Builders' and Contractors' Exchange relates to the matter of arbitration. It is thought that by the establishment of an exchange the troubles which frequently arise between contractors and subcontractors can be taken before the organization and there adjusted without difficulty. The scope of the exchange not only includes in its membership building contractors in the strict sense of the term, but also mason contractors, plumbing contractors and, in fact, all contractors identified with the various branches of the building business.

Kansas City, Mo.

The value of the building improvements for which permits were issued in the month of April was in excess of any month since the office of Superintendent of Buildings was established 26 years ago. There were 54 permits taken out for brick buildings costing $1,024,250, and for 144 frame structures costing $548,265. There were miscellaneous structures projected having an estimated cost of $86,535, making a total for the month of $1,659,050, which is an increase over the same month of last year of $520,055.

The total value of the building improvements for which permits were issued during the first four months of the year was $3,525,095, the total frontage of the improvements being 20,285 ft.

Los Angeles, Cal.

Official figures show a decided falling off in building operations in April, as compared with the same month last year, there having been 599 permits issued by the Chief Inspector of Buildings representing a valuation of $664,950. In the same month last year 709 permits were taken out for buildings valued at $1,451,652. Of the total number of permits issued 292 were for Class D structures, one story in hight, valued at $275,579, and 35 were for Class D structures, two stories in hight, valued at $155,286.

New York City.

The notable feature of the local building situation the past month was the magnitude of the permits issued the first week in April, calling for an approximate outlay of $7,000,000. The total value of the improvements for which permits were issued in the Boroughs of Manhattan and the Bronx was $11,647,130, from which it will be seen that the bulk of the work was arranged early in the month. These figures compare with $14,000,000 in April, last year, from which it will be seen that the shrinkage as compared with a year ago has gradually been growing less. In the Borough of Brooklyn there has been an extraordinary let up in building operations as compared with this season last year, when operations were being conducted upon a most active scale. According to the figures at hand there were 339 permits issued in April for new buildings estimated to cost $1,899,490, as against 1363 buildings in April, last year, calling for an estimated outlay of $9,565,815, a decrease for the month of $7,666,325. Some of this shrinkage may be traceable to the difficulty of negotiating loans on real estate. Some time ago there were indications of an easier tendency in this respect and operations were projected on the idea that as the season advanced there would be no trouble in securing the necessary funds. Cases might be cited where property had actually been purchased but its transfer held in abeyance pending the financing of the building operation, which now seems likely will be put off until after the presidential election.

The annual meeting of the Building Trades Employers' Association was held on the afternoon of April 14, when the members practically bade goodby to their present quarters prior to removing into the Builders' Exchange Building on Thirty-third street. The meeting was probably one of the most interesting in the history of the organization and among the topics discussed was that of opening a permanent exhibition of building materials and of becoming associated with the recently organ'zed National Association of Builders' Exchanges.

The meeting opened with Isaac A. Hopper in the chair and the first report received was that of Secretary William J. Holmes, which showed the membership of the association to number 868, with 29 pending. The matter of joining the National Association of Buliders' Exchanges was referred to a committee of five for further consideration, the committee to report in October.

The election of officers resulted in the following choice:

President, Isaac A. Hopper.

First Vice-President, C. G. Norman.

Second Vice-President, Bond Thomas.

Treasurer, Albert N. Chambers.

The chairman of the Board of Governors is Ross F. Tucker, who made a most interesting address, in the course of which he referred especially to the work of the Arbitration Board and of the Executive Committee. He pointed out that there were something like 1100 cases handled, of which 700 came before the Executive Committee. Of this 700 there were 34 which went up on appeal, and out of the 34 the decision of the Executive Committee was reversed only 7 times, or an average of only one in 100 cases. It certainly speaks well for the workings of the General Arbitration Board when 12 men, sitting on an average of twice a week through the entire year, handle the work of the building industry in such a manner that their rulings are overthrown only once in 100 times. Mr. Tucker expressed the belief that there was a great work ahead of the Building Trades Employers' Association, and he expressed the belief that it was going to be more aggressive than ever and accomplish what will be expected of it.

New Orleans, La.

The members of the Contractors' and Dealers' Exchange had a house warming at their new quarters on Perdido street on the evening of April 14, the occasion being memorable in many ways. In the first place it marked the rejuvenation, so to speak, of one of the large commercial bodies of the city, and also marked the inauguration of a new feature in the exchange work and in the opening of a model exchange building equipped with every convenience for its members. Incidentally several very interesting speeches were made by prominent citizens among the invited guests. President James H. Aitken extended a hearty welcome to the members and briefly referred to the original Mechanics' and Dealers' Exchange, which was established in 1857 and later became the Mechanics' Dealers' and Lumbermen's Exchange, this in turn giving way to the present organization.

The president extended a hearty welcome to the members and friends in its new building, where he hoped the organization would meet with great success and prosperity. Mayor Behrman made some timely remarks, as did also City Engineer Hardee, Col. J. P. Sullivan, atttorney of the exchange; President Werlein of the Progressive Union, Paul Andry of the Architects' Association, and J. W. Porch, president pro tem of the Public Belt Commission.

The ground floor of the building is devoted to a permanent exhibit of building materials and the most effective feature of the display is the number of exhibits of home manufactured articles. The goods shown represent practically all lines of the building industry and the number of exhibits is expetced to increase rapidly now that the new building has been opened.

The second floor of the structure is devoted to meeting purposes, while the third floor is used for the exchange proper. Here are located the secretary's office, the lock boxes of the members, the bulletin boards and various other equipment necessary for the transaction of business.

The present officers of the exchange are as follows:

President, James H. Aitken.

Vice-President, W. W. VanMeter.

Treasurer, George Abry.

Secretary, Roy C. Moysten.

After the addresses had been completed all were invited to partake of the refreshments which the committee had provided, after which there was a programme of lighter entertainment. During the evening Professor O'Connell's orchestra rendered a number of popular selections.

Philadelphia, Pa.

The records of the Bureau of Building Inspection show that the volume of business in the building trades is still far behind that of last year, although the month of April indicates a gain over March. Permits issued by the bureau during April numbered 915, covering 1536 operations, estimated to cost $3,178,535, a gain in value of $689,595 as compared with March, but a falling off of $3,715,000, when compared with April, last year.

Records covering the first four months of the current year show 2572 permits granted for 3880 operations, at an estimated cost of $7,840,965, while during the same period a year ago 2722 permits were issued, for 5537 operations, at an estimated cost of $13,904,678, a decline in value for the period amounting to $6,063,713.

So far the spring months have not developed the activity in building that was generally anticipated, although improved conditions are expected to develop more activity in the near future, particularly in as much as financial conditions continue to show improvement. It is believed that there will be an increase in the building of the larger buildings, such as churches, libraries, municipal and others of a semipublic type—in fact, the city itself will expend a considerable sum for schoolhouses, fire houses and other public buildings.

The erection of dwelling houses will, it is believed, continue on a rather conservative basis. Builders vary, however, in their opinions regarding this class of work, and some express a belief that there will be a strong demand for the smaller class of dwellings, particularly in the outlying sections of the city. During the month of April the amount expended on two-story dwellings showed an increase of $453,865 over that for March, but even then the total was about $1,500,000 short of the amount spent in April, 1907. Records show about the same relative condition in three-story dwellings.

Generally speaking the trade is dull, and notwithstanding the lack in demand, prices of building show but little, if any, recession. Labor and materials are held at practically the same rate, and unless there is either a decline in costs or an improvement in the demand, no investment building of any size is anticipated. Financial matters are more satisfactory, but trust companies, which usually finance building operations, have become much more conservative, and building loans are much more difficult to negotiate.

Pittsburgh, Pa.

In discussing the building situation in Pittsburgh and vicinity a prominent contractor recently stated that the large number of permits issued during the past few weeks indicated steadily improved business and financial conditions, but they also showed how pronounced is the demand for more homes. The dwellings to be erected the coming summer and fall will include some expensive ones in the popular residential sections. A number of building contractors are preparing to put up many medium priced dwellings. Just at present there are very few vacant houses and as a result of existing conditions building contractors look forward to a good season of business. There should be no trouble the contractor stated in securing labor this summer as for some time past construction work has been low.

For the month of April, however, the figures show a falling off as compared with last year, which in view of all the circumstances is not surprising. The value of the new buildings projected was $1,038,256, as against $1,386,342 in April, 1907.

Rochester, N. Y.

The operations in the building line for the month of April show a very marked shrinkage, as compared with the same period last year, and the same applies for the first four months of the respective years. According to a report filed with the Commissioner of Public Safety the value of the building improvements for which permits were issued in April was $445,822, as against $786,045 in April a year ago. For the first four months of this year the value of the improvements was $1,000,895, while in the first four months of last year the total was $2,348,470, a falling off of $1,347,675.

San Francisco, Cal.

April made an excellent record for building operations in this city, the total valuation of permits exceeding $2,000,000. Rapid progress was made on buildings under construction and a number of new structures were started. There is a great deal of inquiry and architects' offices are busy with plans for new structures that will be erected as soon as sufficient money is available. The prospects for securing Eastern money to supplement the local supply in rebuilding the city are improving. According to the latest budget adopted by the San Francisco Board of Supervisors, a great amount of the city's money is to be expended in new schools and public buildings.

The question of either repairing or wrecking the very lofty dome of the San Francisco City Hall is still undecided. The steel framework is said to be perfectly sound, but City Architect N. J. Tharp has expressed himself in favor of destroying the old dome and building to make way for a new structure of more modern design.

The disposition of the local banks is to hoard their gold and make it more difficult for individuals to secure loans on real estate for the construction of new buildings.

There has been an increase in the number of reinforced concrete buildings after a falling off in the demand for such structures. Building materials are still very cheap compared with a year ago. Lumber does not seem to have improved of late and the market prices are lower than ever. Wages, however, have not come down, and labor in San Francisco is higher in nearly every line of employment in the building trades than in any other city of the United States.

Work is to be rushed on the new 10-story and basement structure being erected by the Doe estate in Kearny street near Sutter, for lease to the Wiley B. Allen Company. The building will be of Class A construction and will be fitted up with the most approved appliances for the big piano house. It will stand next to Sherman & Clay's building and will occupy a rectangular site, with a frontage in Sutter street as well as Kearny. With 85 ft. in Kearny street the edifice will have an imposing front and will reach to a depth of 107 ft. 11 in. The northern wing will occupy 41 ft. in Sutter street. The structure, which will be known as "the Doe Estate Company's Building," was designed by Havens & Toepke. The building is the first of a series to be erected by the Doe Estate Company, among which will be the St. Nicholas Hotel.

The Ibis Building, on the south side of Bush street, west of Kearny street, and the Fisher Building, which Fisher & Co. will construct on the south side of Market street, may be said to be typical of a growing class of buildings in the new San Francisco. Even now, two years after the destruction of the city by fire, San Francisco is quite well supplied with skyscrapers of modern office buildings, and the future will see a development in buildings of the medium hight for use as hotels, apartment houses, lodging houses and wholesale business. The Ibis Building, on the site of the old Norman café, is a six-story structure in the Louis XVI style. Its first story is faced with Roman stone and the upper stories with white enamel brick. The first and second floors have been leased for a French restaurant and the entire fifth floor is being fitted up for the Press Club. Agents are leasing the remainder of the building for offices. The building covers two large lots which have a depth of 137½ ft. and a width of 70 ft. The Fisher Building is intended to fill a demand for wholesale business blocks in the old wholesale district. It will have a high basement, stores on the first floor and five lofts, each having an area of 15,500 ft. through from Market street to Stevenson street. The estimated cost is $150,000. Frederick H. Meyer, the architect, has designed an ornate front, which sets a new standard for commercial buildings, in contrast with the severely plain, if not cheap, finish of recent business structures.

Seattle, Wash.

The building situation is improving, especially in the line of residences. An average of more than 20 building permits per day has been maintained for a long time. Several large structures are in plan, and with favorable weather work will be commenced on several as soon as the money is available. It is estimated that nearly $9,000,000 worth of new buildings are in prospect and the construction of many of these is assured.

The sum of $1,300,450 has been allowed to cover the cost of the Alaska Yukon Pacific Exposition buildings, including the three structures which are for the University of Washington.

The junior architects of the city have recently organized what is known as the Architectural Club of Seattle. The purpose of the organization is to provide a way whereby the architects may develop the art phase of architectural work which in ordinary work might be neglected. To this end rooms are being fitted up in the old university building, where lectures will be given by prominent architects and engineers, and where the members will gather to study and work.

The following officers have been elected:

President, John Stanley.
Vice-President, E. E. Ziegler.
Treasurer, George Gove.
Secretary, J. Gordon Turnbull.

Members of the Executive Committee are G. E. Conrad and Albert Wood.

Superior, Wis.

At the last meeting of the Builders' Exchange of this place it was decided to incorporate the organization, and on April 27 articles of incorporation were filed at the Register of Deeds' office. The incorporators were J. B. Maynard, Arthur Carlson, J. C. Ryan and Alex. McKenzie.

The articles recite that the incorporation has no capital stock and that it is formed for the purpose of securing legal business advantages.

Notes.

The Builders' Club of Oklahoma City, Okla., is a recent organization of architects, contractors and building material supply men, the purpose of which is to promote the building interests of Oklahoma. F. E. Harkness is secretary.

At a recent meeting of the Master Builders' Association, held at Paterson, N. J., and at which there was present a delegation from the Master Builders' Association of Bergen County, formal action was taken declaring for the "open shop."

Building operations in Des Moines, Iowa, fell off very heavily during April, when only 71 permits were issued for improvements valued at $90,760. In the same month last year 99 permits were issued for new buildings valued at $190,320.

The total of building operations in April in Tacoma, Wash., was less than any previous month this year, the number of permits issued being 194, calling for an estimated outlay of $225,214. The feature was the permits for new dwellings, of which 111 were recorded, calling for an expenditure of $147,715. This compares with $165,750 in March, $178,400 in February and $159,400 in January.

The building of concrete houses is one of the features of local architecture which has developed in Holyoke, Mass. With the present high price of lumber it seems probable that this style of construction will in the future become more and more common. The grade of gravel required for use in making the concrete blocks can be easily obtained in the city and already one firm has started in the business of erecting this style of dwelling.

For the first four months of the current year the value of new buildings in the city of Scranton, Pa., for which permits were issued was $399,489, while for the same period last year the valuation amounted to $685,847. The month of April was far below the standard so far as permits were concerned, although the valuation of the new work was little less than for April a year ago, the differences in favor of 1907 being only $9316.

The second quarterly meeting of the Association of American Portland Cement Manufacturers will be held at Atlantic City, N. J., on June 23 and 24.

Framing Roofs of Different Pitches with the Steel Square.

BY R. W. MCDOWELL.

THE steel square has been applied to roof framing for many years, and there are any number of methods in daily use for getting the lengths and cuts of various rafters on roofs having the same pitch throughout. It is very seldom, however, that the building journals contain rules for getting these lengths and cuts where there are different pitches in the same roof by the aid of the square alone, so I venture to offer a few suggestions. A roof of this kind can be framed as readily by the square as a common half pitch roof, as the length and bevels of any rafter can be obtained by making the rafter represent one side of a right angled triangle, and the square will do the rest.

By way of illustration, let A B D C in Fig. 1 represent one end of a hip roof having a rise of 10 ft. The building is 24 ft. wide, so the side rafter I D at the upper portion of the drawing will have a run of 12 ft. The common rafter at the end of the building, I L, has a run of 16 ft., with the same rise, so that the ends and sides of the roof have different pitches. The length and cuts of the common rafters are obtained in the ordinary way, as shown in Fig. 2, by taking 12 on the blade and 10 on the tongue of the square and measuring across, giving the length of the side rafter, from which one-half the thickness of the ridge, measured square back from the plumb cut, must be deducted. The blade gives the foot cut and the tongue the plumb cut. The length of the end rafter is obtained by taking 16 on the blade and 10 on the tongue, which will of course give the respective cuts also. The same results may be obtained by applying the square to a straight edge and marking along the blade and tongue, which will give a gauge line to which a bevel may be set. By taking 16 on the blade and 12 on the tongue, as shown in Fig. 3, the run of the hip rafters, 20, is obtained.

Referring back to Fig. 2, it will be seen that 20 on the blade and 10 on the tongue give the seat and plumb cuts of the hip, together with the length, after one-half the thickness of the ridge has been deducted from the side cut. The side cut is found in a slightly different way from that of a regular hip or valley on an ordinary roof. The common method is to take the length of the hip on blade and the run on tongue, but this will not work in this case, as the run of the hip does not lie at an angle of 45 degrees to the sides and ends of the building, as it does in an ordinary roof. The line B J in Fig. 1 must first be obtained, as shown in Fig. 4. Take a board, joint one edge and square up the line B L. Measure one-half the width of the building (in inches) on this line, 12 in this case, and with the heel of the square at the point B, move the square until 20 on the blade, which is the run of the hip, touches the edge of the board at the point E. The tongue will then give the point J 15 in., which is the length of the line required. Then take this line on the tongue and the length of the hip on the blade, Fig. 5, and the blade will give the bevel of the hip to lie against the ridge. A reference to Fig. 1 will show the reasons for this, the same letters being used on both diagrams. Just imagine the tongue of the square resting on B J and the blade raised up to the hight of the hip rafter at the ridge, when it is evident that as the blade and the line of the hip rafter correspond, and E J is the line of the ridge, a line drawn through E and J will give the required cut.

As a general thing, hip rafters are not often backed in this section, but if it is desired the lines for backing can be obtained by setting a bevel to the line S O in Fig. 3 and applying it to the foot cut of the hip rafter. Make O R square with S O and gauge back as shown in the diagram A. Do the same on the other side, using the distance T R instead of P S. The point O is of course at the center of the line T P.

There are several ways of finding the lengths of the jack rafters, but the following is probably the simplest. We will first consider the jacks on the end of the building. Supposing them to be set 2 ft. on centers, take a board and apply the square to it, as shown in Fig. 6, with the length of the end rafter on the blade and the run of the side rafter on tongue. Space off 2, 4, 6, 8 and 10 in. on the tongue after marking along both blade and tongue. The lines, A A, B B, C C, D D, E E, will give the lengths of the jacks, as well as the side cut to fit the side of the hip, the square being moved down along tongue line, while the run of the end rafter on blade and its rise on the tongue will give the seat and plumb cuts. For the side jacks, Fig. 7 gives the same method, only that the length of the side rafter is taken on the blade and the run of the end rafter on the tongue. If it is so desired, the length of the jack rafter A' A' may be deducted from the length of the common rafter, which will give the difference in the lengths of jacks.

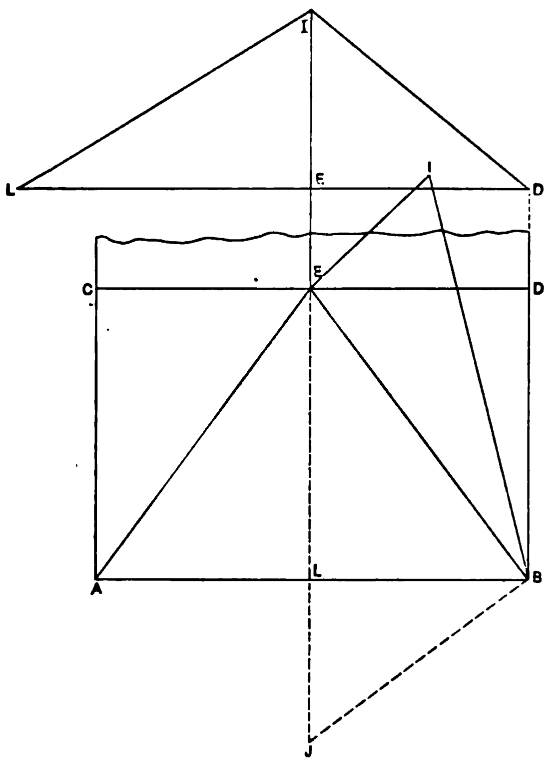


Fig. 1.—One End of a Hip Roof.

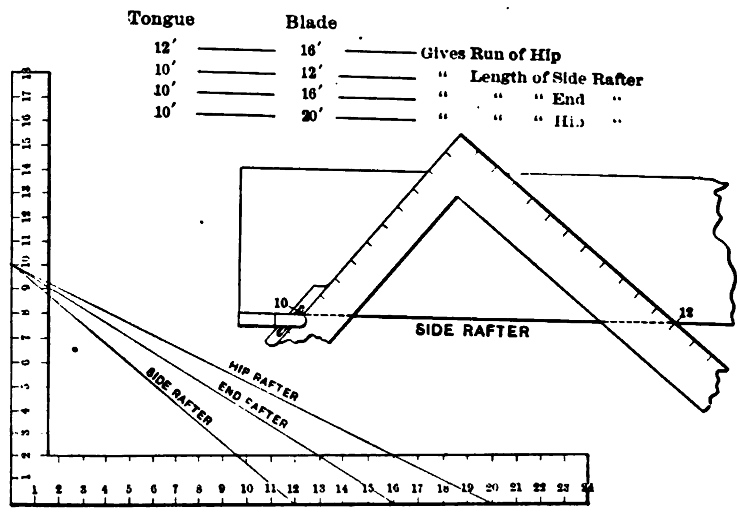


Fig. 2.—Finding Lengths and Cuts of Common Rafters.

Framing Roofs of Different Pitches with the Steel Square.

These rules will apply to a valley rafter in the same way as a hip, the latter being used so that the application of the square could be more easily understood. To sum these rules up in a small space the following is appended:

ON BLADE.	ON TONGUE.	GIVES.
Run of end or side rafter.	Rise.	Length. B. Seat cut. T. Plumb cut.
Run of end rafter.	Run of side rafter.	Run of hip rafter, also lines to set bevel for backing of hip.

Half width of building square up from straight edge, heel of square on this point.

ON BLADE.	ON TONGUE.	GIVES.
Run of hip.		Line B J on tongue.
Length of hip.	Line B J.	Blade gives side cut of hip, against ridge.
Length of end rafter.	Run of side rafter. Spaces between centers of jacks.	Lengths of end jacks on blade. Side bevels of end jacks on blade.
Run of end rafter.	Rise.	Seat cut on blade. Plumb cut on tongue.
Length of side rafter	Run of end rafter. Spaces between centers of jacks.	Lengths of side jacks on blade. Bevels of side jacks on blade. Seat cut of side jacks on blade.
Run of side rafter.	Rise.	Plumb cuts on tongue.

These rules can be applied to all roofs and are usually more simple and accurate than a complicated drawing.

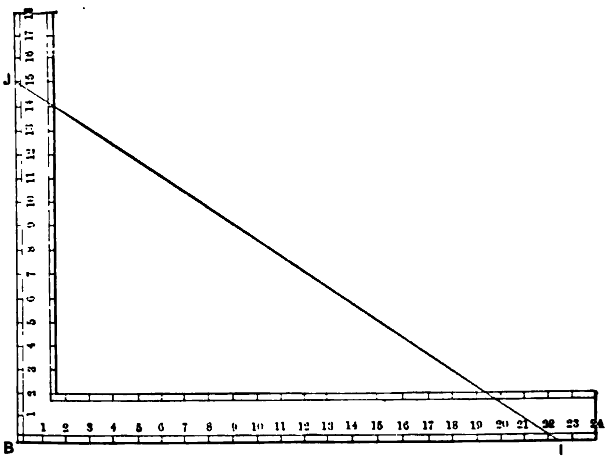


Fig. 5.—Bevel of Hip Against Ridge.

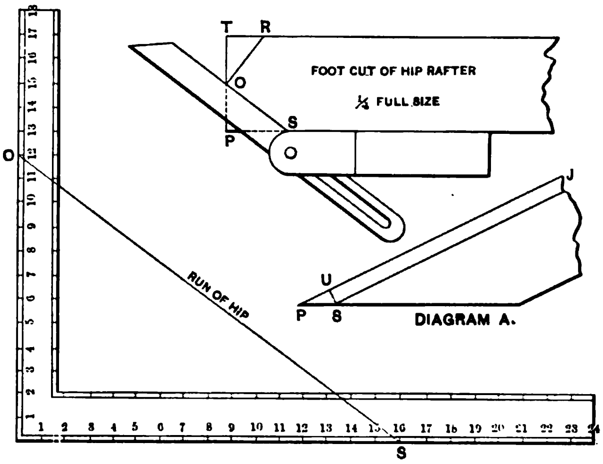


Fig. 3.—Backing Hip Rafters.

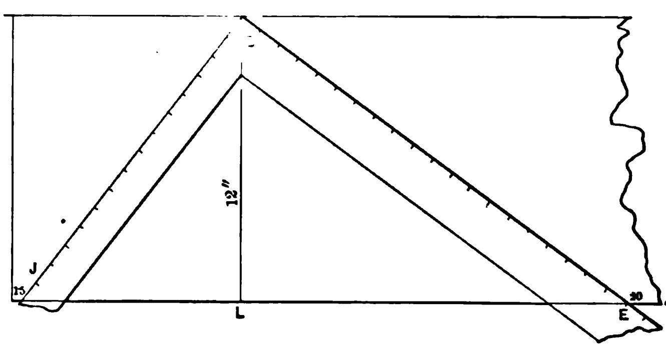


Fig. 4.—Finding Side Cut of Hip.

Framing Roofs of Different Pitches with the Steel Square.

Luxuries of the Skyscrapers.

Tenants of the newer office buildings in New York City have comforts and conveniences under their roofs that in a smaller place it would be necessary to go over the entire town to get. Everything virtually but sleeping quarters is provided, even to gymnasiums and musical entertainments. The latter may be enjoyed from the top of some lofty structure while the patron is eating an excellent meal and gazing over the picturesque harbor of the second greatest city in the world. A business man needn't be annoyed if late in the afternoon he hears from friends visiting the city and finds it necessary to entertain them on short notice, says a writer in the *Sun*. Of course, he is not dressed for the occasion, but that is a matter easily attended to. First of all, he steps into the elevator and descends to the ticket office in the building and secures tickets for a theatre. Then he steps into the tailor shop. If he hasn't taken the precaution to leave his evening clothes in one of the lockers there he is able to have his business suit pressed while he waits, or in a pinch he may rent some after dark wearing apparel. If his linen is a trifle soiled it takes but a minute to step into the haberdasher's on the same floor and replace it.

After a session with the barber and the manicure an attendant has a bath for him at the proper temperature. While he is having his hair trimmed a long distance telephone call comes in from Chicago. He has informed his office assistants of his whereabouts and the operator switches the connection to the barber shop. A portable telephone is brought to the business man, and without leaving his chair or even interfering with the barber he carries on a conversation over the wire.

That reminds him that it is not a bad idea to save time by having his friends meet him at dinner in the building. After calling up the caterer—upon the roof or wherever the restaurant happens to be, for maybe it's one of the rathskeller kind—to reserve a table, he wiggles the receiver hook, gets central again and notifies his friends uptown of the arrangement.

He's able to dictate a letter or so over the telephone to his stenographer while having his shoes polished, and after ordering some flowers and candy for the women of the party at the florists outside the barber shop, to be delivered at the resturant later, he goes back to his office after an absence of less than an hour, during which he has lost little if any time from business.

The friends arrive just as the business man is signing his letters. They have come by the elevated railroad, which has a special entrance into the building, and they will leave later through a tunnel from the bottom of the elevator shaft into a near-by subway station. But before they start for the theatre several hours may be comfortably spent at dinner in the building, made more enjoyable by a good orchestra.

There are several office buildings down town where, if a tenant knows just who to speak to, he may get sleeping quarters over night with the caretaker's family. For in nearly all of the larger office buildings the caretaker or custodian along with his family has quarters in the place. In most cases this is on the roof. Not long ago a lawyer downtown preparing an urgent case for court, found that it would be necessary for him to work the better part of the night. He lived in Jersey, making it out of the question for him to go home; also he was far from a hotel and didn't care about losing the valuable time during which he might be sleeping.

"I'll fix you up," said the janitor with a wink.

And he did in comfortable style. The lawyer commented afterward on the fact that the bed was as nice and cleanly as in any first-class hotel. The news of this man's find spread abroad, and now it is possible in many cases to get sleeping quarters in skyscrapers, though possibly it may not be with the approval of the building's owners. One of the large Broadway buildings besides sheltering a theater also boasts of the following luxuries that t nants there may have under one roof: A physical culture school, a fencing academy, tailor, dyer and cleanser, massage establishment, billiard and pool rooms, bowling alleys, restaurant, saloon, shoe shining stand, tobacco store, jewelry shop, where the balky timepiece may be looked after; telegraph and cable office, baths, barber shop, dentist, doctor, and for the comfort of the women a hairdresser's and a millinery establishment.

Several buildings which are used largely by lawyers and engineers contain splendidly equipped libraries, while in others, in the financial district, there are branches of banks, or the main establishment, so that customers who have large deposits to make regularly are assured of increased safety by moving into these quarters.

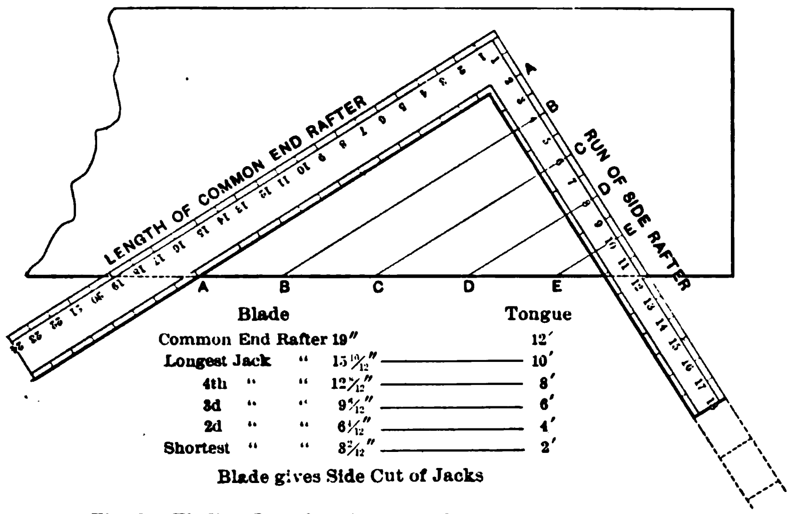


Fig. 6.—Finding Lengths of Jack Rafters.

One of the new buildings not far from the automobile belt up in the Forties has added a well appointed garage. This is a feature that is bound to come to many other buildings. And so one comfort innovation follows another. It is not beyond possibility that the time is not far hence when a man may sleep, carry on his vocation and live in the same building.

The modern skyscraper is coming to be a complete community in itself, and a mighty big one when measured by the standard of towns elsewhere, especially in the case of the new structure that is to house some 15,000 workers in its 5000 or so offices.

Concrete Chimneys.

Concrete is becoming extensively used in chimneys for mercantile buildings and dwellings as well as for factory stacks. Underwriters are not so directly concerned with the factory stacks, but the use of the material in ordinary chimneys for boilers, ovens, stoves, &c., raises new problems. An effort has been made to crystallize the facts for the use of our field men, says a writer in a recent issue of the *Record and Guide*, but some points are still in an unsettled state in the opinion of experts. The following seem definitely settled and should be borne in mind in passing business:

Good cement is not appreciably injured at temperatures of 700 deg. F. or less.

Boiler flue gases where they enter the stack vary from 400 to 700 deg. F. The temperature of the gases from stoves and other domestic heating devices is somewhat less.

In properly constructed and used chimneys, the flue has a much larger capacity than the stove pipe or breeching entering it. The gases, therefore, expand immediately on entering the flue and are consequently much less intensely hot per unit of volume. In proper size flues, then, disintegration of the flue walls, if of cement, will not occur and the only effect of the heat will possibly be to cause cracks. It must be remembered, however, that flues are sometimes forced beyond their capacity, in which event the temperature might rise high enough to injure the cement, especially if long maintained. It is well, therefore, to note whether more stove pipes or breechings enter a flue than are intended for it.

It is said by some authorities, and has been established in the case of factory stacks, that ordinary flue gases have no effect upon cement. We need not fear disintegration from this cause, therefore. It is also stated that soot does not accumulate on smooth cement flue walls. If true, we have little to fear from burn-outs. Even in brick chimneys, dangerous burn-outs do not occur with coal fuel. Objectionable soot is generally from wood fires, from poorly burned oil or from burning refuse in with the ordinary fuel. The above are matters for practical consideration. Ordinary heating stoves are not apt to be used for burning refuse, but it is not uncommon to find cook stoves and ranges used for that purpose.

In practice, concrete chimneys, other than factory stacks, are built solid or of blocks. Where solid they may or may not be reinforced. When of blocks they may be made of ordinary blocks laid as brick or of one piece blocks with holes through them to constitute the flue. Solid chimneys should preferably be built of wire netting and rod reinforcement, or the equivalent, and the one-piece blocks could also be reinforced to advantage.

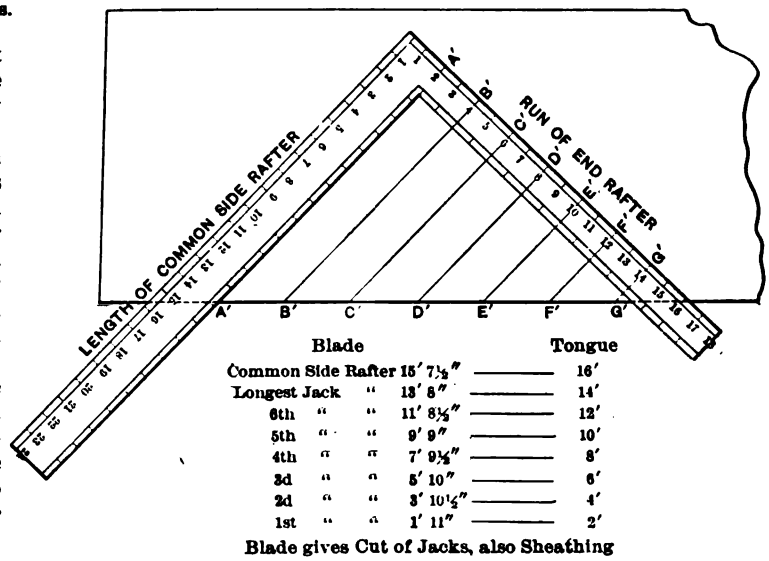


Fig. 8.—Finding the Lengths and Cuts of the Side Jacks.

Framing Roofs of Different Pitches with the Steel Square.

In all cases involving concrete chimneys, the attendant circumstances must be carefully considered—purposes to which they are put, kind of fuel, type of chimney, supports or framing, containing buildings, &c. In other words, we not only cannot afford to be arbitrary, but we cannot put forward an arbitrary standard at the present time for the acceptance of such chimneys. All we can do is to keep pushing for features of definitely established desirability.

Along this line, cement chimneys with walls 1½ or 2 inches in thickness, found in some sections, are to be condemned. In addition to their undesirability from the standpoint of cracking, they are too thin to be nonconducting and should not be regarded as chimneys but as unthimbled flues and poor ones at that. While we know that unequal expansion causes cracks in thicker chimney walls, matters such as mechanical strength to resist stresses and strains due to settling, swaying, &c., must be taken into consideration. It must be remembered, also, that cracks in thicker walls are not so likely to be opened up seriously, and even where opened up to the same extent, are less objectionable than cracks in thin walls. It would seem, then, that to secure nonconductivity, strength, &c., cement flue walls should be not less than 4 in. thick where they come in contact with woodwork, for any kind of heating device. Where subjected to severe usage and temperatures, to guard against careless mixing or workmanship this thickness should be exceeded.

Laboratory for Investigating the Structure of Woods.

It is doubtful if any of the laboratories maintained by the Government for scientific research are more unique in character, and yet bear promise of more important results than one which has just been established in Washington by the United States Forest Service for investigating the structure of commercially important woods. Laymen will not understand the significance of the proposed investigations carried on in this laboratory so quickly as architects, builders and other wood users, who in these days of growing scarcity of the more valuable woods are seriously perplexed in identifying substitutes. Mistakes of this kind in identification have in the last few years, in several instances, meant the loss of thousands of dollars and many embarrassing law suits.

Nearly any user of lumber can recognize and name off hand all the usual trees of the forest when he sees them growing, and not much difficulty is encountered in identifying the common kind of lumber in a mill yard because he knows the few trees from which the yard lumber comes. But common kinds are growing scarce, and woods not often cut heretofore are appearing in the markets. The most experienced men are sometimes puzzled when they try to identify them, and persons with less experience have still more trouble. Is a certain wood gum or elm? Is another cucumber, linn or poplar? Is a stick sugar maple or red maple? Doubts may arise whether a piece is hemlock or spruce, or whether it is lodgepole pine or fir, or whether a shingle is cypress or cedar. A dealer may buy red oak and suspect that he is getting something else. There are 30 or more important species of oak. The best lumber dealer might not know which is which in the lumber pile, or if he knows, he might not know how to prove it.

Many of these woods look alike, even to the trained eye of the mill man or the builder, and yet they are widely different in value for certain purposes, and it is of the greatest importance to be able to distinguish them quickly and certainly. Again, a new wood may come to a man's notice for the first time, and it may be necessary for him to decide what it is and what it is worth.

The Government has been helping individual lumber users for some time, but the facilities have not been near so complete as they are now. It is to meet such needs and answer such questions that the Forest Service has established the laboratory, and placed it in charge of a trained dendrologist. Architects, lumbermen, manufacturers and makers of woodware are already sending in samples of wood for identification, and asking if there are not some structural characters by means of which such woods may be conveniently separated for relative species having greater or less value for some specific purpose.

The laboratory will investigate in a practical way. The structure of the woods, sections lengthwise and crosswise, will be studied so as to separate by structure alone the various species of a genus. Analytical keys to the trees of each group will be worked out. These will be based on the arrangement and character of the pores discernible to the naked eye, or by a hand lens.

The results will be published from time to time with good illustrations, and placed at the disposal of lumber users. After all, the important groups of wood, such as oaks, pines and firs, have been studied, and the results published separately, the several monographs will be collected and published in one volume.

A work of this character has long been in demand by architects, builders and other users of lumber. It will, in most cases, enable even a nontechnically trained man to determine quite readily the wood he deals with by means of an ordinary hand lens and by comparing the wood in question with the photographs of cross and long sections given in these monographs.

Some Comments on the Composition Roof.

It will be recalled that some time ago the attention of the building inspector of Indianapolis, T. A. Winterowd, was specially directed to the fire resisting qualities of the tin roof, the explanation of the value of tin roofing being drawn up by the Indianapolis Association of Master Sheet Metal Workers. Now has appeared an answer or a counter argument, prepared by the National Association of Master Composition Roofers. As printed in a recent issue of the Indianapolis *Star*, the letter in question is as follows: Composition roofing, better known as coal-tar pitch, felt and slag or gravel, covers more of the first-class buildings and factories of this country than all other forms of roofing put together. The most prominent architects and mill engineers have used it for 50 years, and it has always been accorded the base rate of insurance and has the confidence of fire fighters everywhere. Its enviable position makes it the focus of the attacks of all special roofing promoters. This attack and agitation, however, does not prevent the metal roofers themselves from having on their own buildings what they know to be the best roof for all pudposes—a composition roof, and there is not a large city in the country but contains abundant evidence of this fact. Metal roofers certainly do not have composition roofs put on their own buildings if it adds to the fire risk or cost of insurance.

Few people unfamiliar with their uses, realize how really fireproof pitch and felt are when spread over a roof surface, and protected by the usual amount of slag or gravel, but our well-known fire fighters have had abundant proof of this fact. Roofs are called upon to resist fires from without the building, and fires from within. In the case of fires from without a composition room is, for all practical purposes, fireproof. It is covered with incombustible slag or gravel, and the insulating qualities of the layers of felt and pitch make it infinitely superior to thin metal in resisting fire. Long after metal has conveyed heat through, to the roofing boards and set the whole building afire within, the composition roof remains intact, smoking a little perhaps from the intense heat, but absolutely protecting the roof boards beneath. If the firemen have occasion to go upon the roof, they know they are in no danger of falling through a roof burning beneath them, as often occurs with a metal roof without any evidence of fire on the surface.

Firemen are also saved the trouble of continually watching for fire within a building, as they know no fire can be set inside from a fire upon a composition roof. The gravel or slag also tends to hold the water, and that in itself is a great advantage in keeping a roof cooled off so men can work on it. Recent experiments conducted in New York and Philadelphia have confirmed in a laboratory way all these well-known ideas about composition roofs. Tests made show that a gravel roof laid on ⅞-in. matched boards resisted a conflagration temperature of 1400 degrees Fahr., for 54 minutes before the boards burned through, while with a metal roof tested under the same conditions the boards burned through in just 22½ minutes.

With a fire inside the building, the composition roof again shows its superiority. It remains cool to work upon and lasts, as all firemen know, until all the supports have been turned away and it drops down, still intact, into the cellar below. A metal roof, on the other hand, becomes burning hot, unsolders and lets the draft through, and is a danger to the firemen, while he can work on a composition roof to the last, easily cutting holes through the felt and pitch to flood the interior.

Everything considered. there never has been so satisfactory a roof from the point of view of all concerned as the composition roof. The owner knows he is getting the best roof for his money, the architect and engineer know it is the best and most lasting roof, while the insurance man and the fire fighter know that a composition roof is the best fire register.

New Publications.

Bungalows, Camps and Mountain Houses.—Elaborately illustrated and accompanied by full descriptive text. Selected and compiled by the Editor of the *Architects' and Builders' Magazine.* 112 pages. Size, 8 x 10½ in. Bound in illuminated board covers. Published by William T. Comstock. Price, $2, postpaid.

This work, as its name indicates, consists of a variety of designs by a number of architects showing buildings that have been erected in different parts of the country, many being intended for summer use, while other examples are of structures erected in California and the Southern States for permanent residences. There are also included suggestions for vacation use in the woods and mountains, camps, hunters' lodges, log cabins, &c. The engravings, especially those representing interiors and the completed structures, are for the most part half-tones made directly from photographs, thus giving the reader an excellent idea of the appearance of the buildings as they actually exist. Within the covers of the book are 70 separate designs, of which there are 78 exterior views, 12 interior views and 69 floor plans. A feature of the arrangement is the placing of the descriptive text among the early pages, something like 26 being devoted to this purpose. The following pages are plates carrying floor plans, perspectives and interiors of many attractive buildings adapted to the purposes indicated above. The entire work is gotten up in a shape to be of especial interest and value to the architect and prospective builder, and especially to those people of even moderate means who of late years have taken renewed interest in providing for a short season's rest in the country, the woodside, at the lake or the seashore.

Safe Building Construction.—By Louis de Coppet Bergh. 436 pages. Size, 5½ x 8 in. Illustrated by 289 engravings and numerous folded plates of tables and diagrams. Bound in board covers. Published by the Macmillan Company. Price, $5.

This is a new edition, thoroughly revised throughout, of a treatise giving in the simplest forms possible practical and theoretical rules as well as formulæ used in the construction of buildings. The work is the logical sequence of the author's former book on "Safe Building," and has been brought out to meet the requirements induced by the radical changes in methods of construction and building materials. Much of the author's former work has been retained, although his object has been to condense while still following the original plan, which was "to furnish to any earnest student the opportunity to acquire, so far as books will teach, the knowledge necessary to erect safely any building." While the work is based strictly on the science of mechanics, all useless theory is avoided, the object being to make the articles simple yet practical. Special effort has been made in the book under review to introduce a general survey and fair knowledge of concrete construction, including concrete foundations, grillage, piers, piles and other subsoil as well as above soil constructions, such as floors, columns, girders, walls, &c.

The matter is comprised in 13 chapters, in the course of which are 50 tables and 132 formulæ. The opening chapters discuss the strength of materials, foundations, cellar and retaining walls, piers, arches, floor beams and girders. The author then takes up the graphical analysis of transverse strains, devotes a chapter to reinforced concrete construction, and then deals with rivets and riveting, plate and box girders, graphical analysis of strains in trusses, discusses wooden and iron trusses, and concludes with a consideration of the subject of columns.

Sanitation of Public Buildings. By Wm. Paul Gerhard; 262 pages. Size, 5¼ x 7¾ in. Bound in cloth. Published by John Wiley & Sons. Price, 1.50, postpaid.

The above work, by a well-known author, makes a strong plea for the sanitation of public buildings. Within its covers much valuable information is presented relative to the subject indicated, and it is of a character which will appeal especially to those closely identified with sanitary matters, although it should not be regarded as essentially a technical treatise. It gives the sort of data that the public spirited individual often seeks, while the forceful presentation of observations are such as to encourage and fortify the man working for better things. It possesses the pleasing characteristic of being easily readable, and discusses the subject under five main divisions: Hospitals, theatres, churches, schools and markets and abattoirs. The descriptions of the condition of things are in many cases staggering, like the statement that in at least one theatre in Greater New York a strong whiff of sewer air greets the audience each time the curtain rises, and in other cases develop an agreement on the part of the reader with views regarding present practices that are acknowledged wrong when once clearly explained, like the use for meetings of basement rooms in churches with more or less ventilation from uncleaned inaccessible air passages. No drawings or sketches are given, but rules of a general nature are laid down to cover building sanitation, and they carry weight in coming from an engineer who has been engaged for a considerable number of years in gas and water supply and wastes disposal of buildings and who is the author of numerous books on these related subjects.

For Rat Proof Buildings.

The ever present danger of bubonic plague to cities on the Pacific Coast has led to a number of proposals for changes in the building law of San Francisco, which will enable the authorities to require the erection of "rat-proof" buildings, it having been established that the plague is spread by means of rats. The San Francisco Board of Supervisors recently passed to print the amendment to the building law framed at the instance of the Federal health authorities, which requires that the ground space beneath all buildings hereafter erected in this city shall be concreted 1½ in. thick, and that side foundation walls of concrete shall also be provided, the object being to shut out rodents. All but one member of the board favored the bill, which has been modified considerably since first submitted. Supervisor Center opposed it. He said that no better plan could be devised for driving intending home builders away from San Francisco. He contended that if the bill were enforced it would make it virtually impossible for workmen and others of moderate means to build.

Supervisor Bancroft introduced at a recent meeting of the board the ordinance agreed upon at the late conference of the State Board of Health providing additional sanitary regulations "to prevent the propagation and spread of bubonic plague through the medium of rats." The bill provided for the "ratproofing" by means of screens, netting, cement or other materials approved by the health officer of the building and basement walls of all storehouses, warehouses, residences or other buildings within the city and county, also of all chicken yards, pens, coops or houses, barns and stables. It is also provided that all storerooms, warehouses, residence or other buildings shall be provided with one or more traps of a pattern approved by the health officer, such traps to be inspected daily and freshly baited at least twice a week.

THE new car house, which will occupy the site of the building at 146th street and Lenox avenue, Borough of Manhattan, New York City, which was burned some time ago, will cover an area 600 x 1000 ft. and be four stories in hight. The first floor will be structural steel fireproofed with concrete, while above the first floor the building will be reinforced concrete. The window casings, doors and furnishings are to be of steel, including steel lockers for the mortormen, conductors and other employees. Cars are to be stored on the first and second floors, while workshops and offices will occupy the upper floors. The contract for furnishing the steel for the building has been awarded the General Fireproofing Company, Youngstown, Ohio. It is stated that 2000 men will be employed on the work, and that the structure will be completed within four months after the beginning of operations.

Directory of Cement Manufacturers.

So many applications have been received by the Association of American Portland Cement Manufacturers for an authentic directory of cement makers in the United States that the association has at last decided to issue such a directory. It will contain the names of only such mills as are in active operation, and will, we understand, be the only directory ever issued bearing the official authorization of the association. Copies of this work will be obtained at the office of the association, 1232 Land Title Building, Philadelphia, Pa., on and after June 1 of the current year, at 75 cents each postpaid.

Bathtubs Scarce Abroad.

Americans traveling abroad are often puzzled on the subject of baths, say the June *Delineator*. We are so used at home to the luxury of a porcelain tub that we feel as if we had fallen among the heathen when after a dusty journey we find that there is no bath in the *pension*. There are always public baths in European cities, frequented by people of refinement. The baths are kept immaculately clean, and the prices charged are not high, say 25 cents for everything included—soap, towel and tip. If you like a bran bath, which is most refreshing, you can have a sack of bran to throw into the bath for about 10 cents. There are often swimming pools in connection with these places, and the attendants are usually very good chiropodists and manicurists, as well as hair dressers. You can order a bath brought to you if you like, and it might be amusing to do this once for a novelty. These come dearer, naturally but all these things are part of the varied experiences which make up the peculiar charm and novelty of a journey abroad.

A Series of Practical Handbooks.

A series of very interesting handbooks treating on various subjects has been issued by the Sampson Publishing Company, Boston, Mass. Among these mention may be made of "How to Grind and Set Edge Tools," by M. Cole; "Making and Fixing Electric Bells and Batteries," by the same author; "How to Make an Annunciator," by T. E. O'Donnell, and "A Small Electric Motor," to be built without castings, by William C. Houghton. These are of a practical nature, and will be found of interest and value to those who are seeking information along the lines indicated by the various titles. The booklets are 10 cents each postage paid.

Iron Buildings for Shanghai.

Consul-General Wilbur T. Gracey of Tsingtau furnishes the following: A gentleman owning some land in the Yangtszepoo District of Shanghai has at present on hand an interesting scheme. Some time ago the municipal council forbade the erection of wooden dwellings within the settlement, and having regard to the expense of erecting stone or brick dwellings, to say nothing of architects' fees, the land owner in question has entered into negotiations with the object of having iron bungalows erected on his property. They are to be composed of an iron surface, wooden casing inside, and between the two some nonconducting substances. These are said to be warm in winter and cool in summer, and should the scheme be carried through successfully Yantszepoo will shortly see a row of these erections.

THE commencement exercises of the graduating class at the Hebrew Technical Institute, 36 Stuyvesant street, New York City, were held in the large hall of Cooper Union on the evening of Wednesday, May 13. An exhibition of the work of the pupils during the past year was held at the institute on Monday and Tuesday, May 11 and 12.

THE exhibition of the National Sculpture Society, held in Baltimore, Md., closed on April 30, and was probably the most remarkable display in many ways ever held in that city. During the 28 days of its continuance over 60,000 persons visited the exhibition. The display was held in the Fifth Regiment Armory, the floor space of the drill hall of which is 200 x 300 ft. The use of the building was given to the society free of charge.

THE largest block of hewn granite of which there is record, outside of the wonderful monolithic structures of ancient Egypt, is that which supports the statue of Peter the Great in St. Petersburg. It weighs 1217 tons. The Russians are greatly given to massive stonework. The largest monolithic columns in the world are in one of the St. Petersburg cathedrals. They are of the rich red granite of Finland, finely polished, and are 57 ft. in hight.

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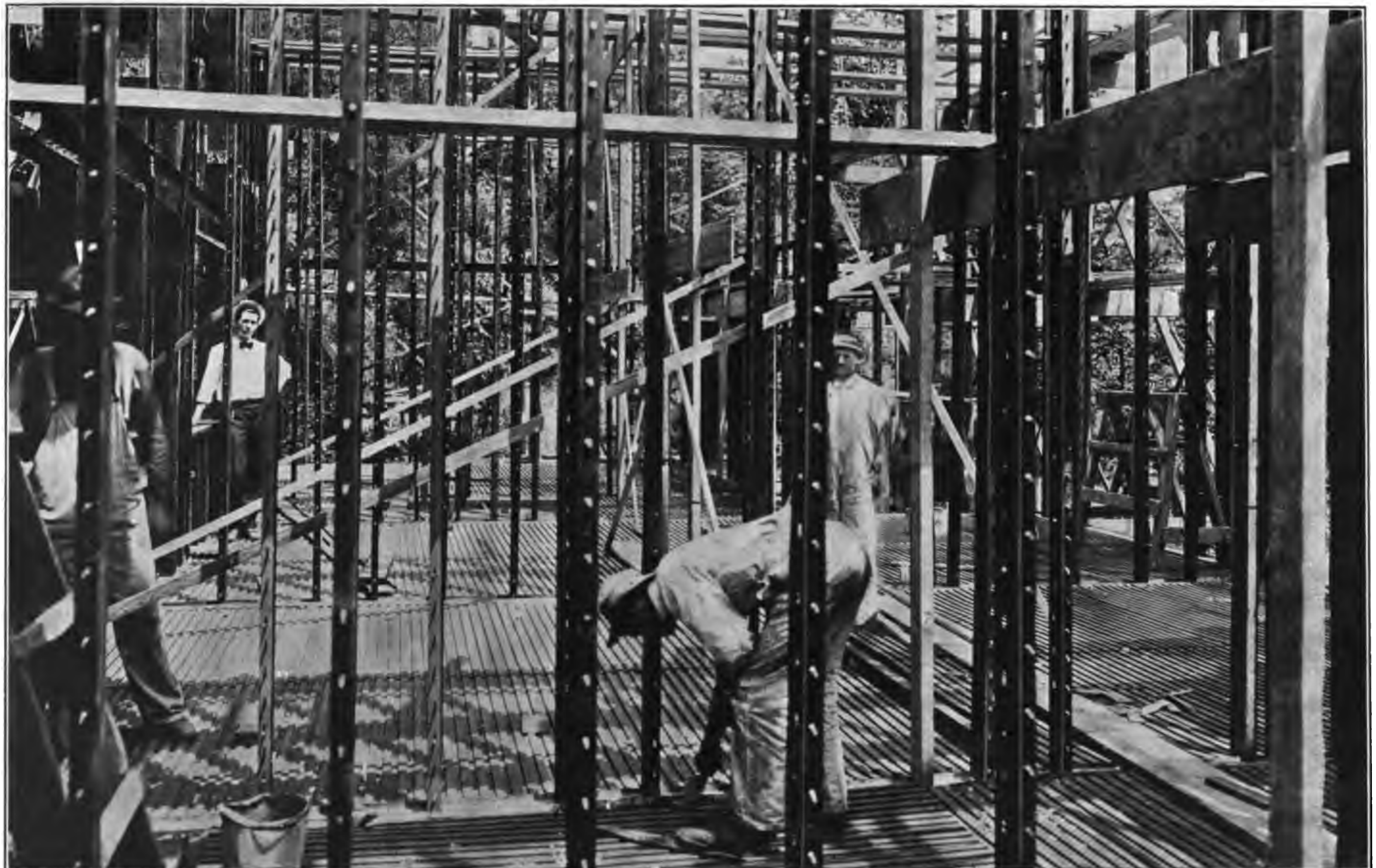
SHOWING CONSTRUCTION OF RAFTERS WITH FERRO-LITHIC PLATE AND SUPPORT AT RIDGE

H. M. NAUGLE, ARCHITECT THE TAFT-HOWELL CO., BUILDERS



DWELLING CONSTRUCTED OF "METAL LUMBER" AND CONCRETE AT TUXEDO PARK, NEW YORK

SHOWING FERRO-LITHIC PLATE FOR FIRST FLOOR BEFORE CONCRETE WAS APPLIED

H. M. NAUGLE, ARCHITECT THE TAFT-HOWELL CO., BUILDERS

Carpentry and Building

New York, July, 1908.

Plank Frame Barn for Michigan Agricultural College.

A VERY good illustration of the adaptability of the system of plank framing to large barns is found in the structure recently erected for the Michigan Agricultural College and a picture of which we present herewith. The photograph from which the half tone was made represents the workmen actively engaged on "raising day" in placing the purlin plates in position. The purlin posts are 32 ft. in hight, and in order to permit the men to readily climb to the top short pieces of boards were nailed across them as clearly indicated. These short pieces somewhat mar the appearance of the picture, but it was not intended that they should long remain as they were removed as soon as the framework of the barn was completed. Their use, however, obviated the necessity of numerous long ladders for the men to reach the high points. At the time the picture was taken none of the longitudinal braces had been placed in position.

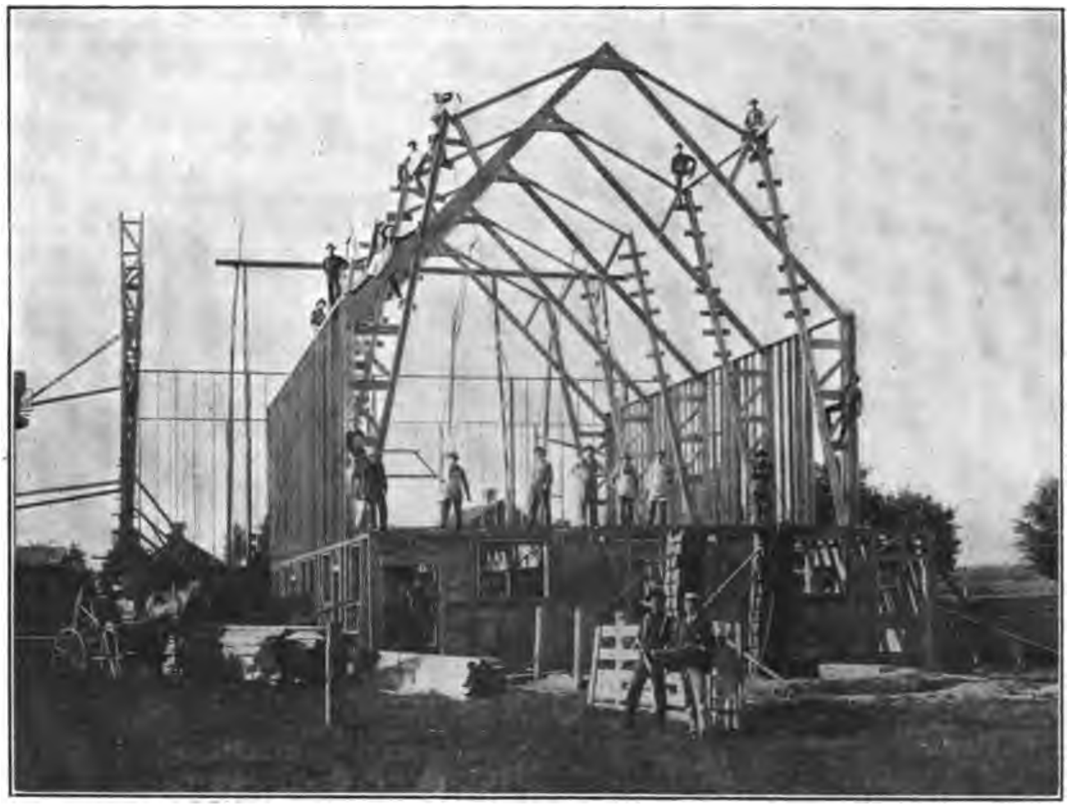
The main barn is 44 x 80 ft. in plan with a 9-ft. basement and 18-ft. superstructure and a curb roof. The wing as indicated by the plan of the barn, which appears upon the next page, is 40 x 68 ft. in area with a 9-ft. basement and 16-ft. superstructure and a curb roof. The basement of the main barn is devoted to horse stalls, 12 in number and each 5 ft. 6 in. wide with two harness rooms, conveniently located, all on the north side of the structure.

Along the opposite side are arranged large box stalls, three of them being designated as calf pens, two of which measure 16 x 18 ft. and the other 18 x 20 ft. There are also two bull pens, each measuring 10 x 18 ft. in size.

The basement of the wing is devoted to two rows of cow stalls, 18 to a row and each 3 ft. 6 in. wide. The manure gutters are slightly angled so as to accommodate cows of different size. There is a wide walk for the animals next to the walls and a wide feed alley extending between the two rows of stalls, all as clearly indicated on the plan.

One end of the main floor of the barn is occupied by grain and feed bins with hay bay above, while the other end is devoted to a grain bay measuring 32 x 44 ft. and without obstructive timbers of any kind.

The main floor of the wing is intended for the storage of alfalfa hay and straw for the bedding of the cattle.



View of Barn While Frame Was Being Raised.

Plank Frame Barn for Michigan Agricultural College.—Shawver Brothers, Builders, Bellefontaine, Ohio.

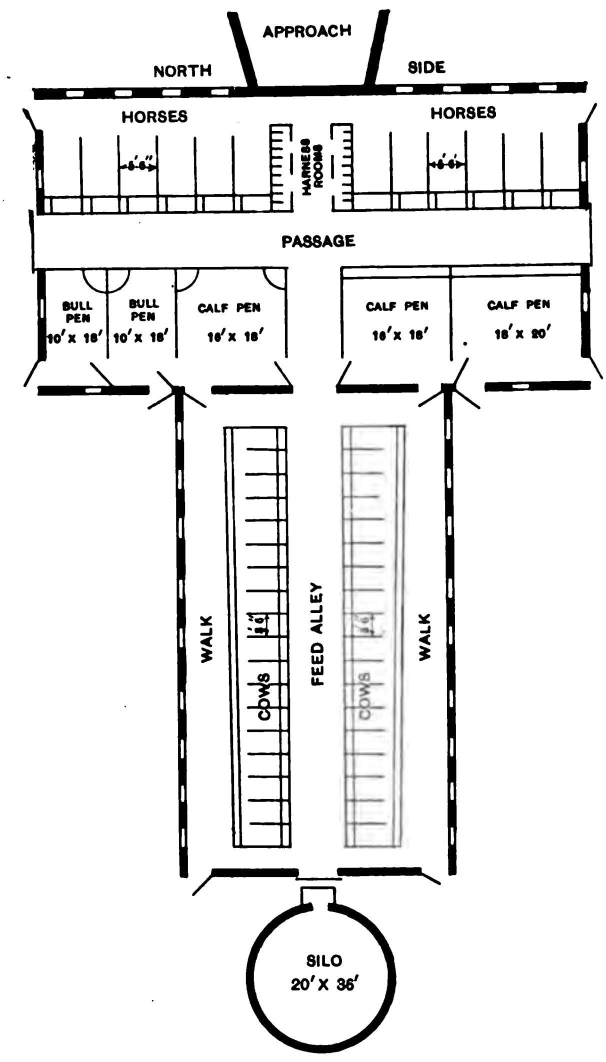
At the end of the barn is a silo 20 ft. in diameter by 36 ft. in hight for the storage of silage for the use of the cattle.

The barn here shown was erected in accordance with the Shawver system of plank frame construction by Shawver Brothers, Bellefontaine, Ohio.

Some years ago the United States Government sold its Custom House Building in Wall street, New York City, and erected a new and magnificent structure at Bowling Green, at the foot of Broadway. The purchaser of the old Custom House was the National City Bank, and recently plans were filed through Architects McKim, Mead & White for the reconstruction of the building so as to fit it for occupancy by the bank in question. The outer walls, with their colonnade and pilastered façades, are to be retained, and four new stories of granite of a harmonizing design erected, having on Wall street a loggia four stories high decorated with a Corinthian colonnade. The remodeled interior will retain the great rotunda as an architectural feature. The first four floors are to be refitted for the use of the bank and the new upper stories furnished and apportioned as offices. The work of enlarging and modernizing the building is to cost about $1,500,000. The remodeled edifice will be equipped with 11 elevators, five of which will be for the use of the bank officials and attaches.

Decay in Wood Prevented.

It is estimated that a fence post, which under ordinary circumstances will last for perhaps two years, will, if given preservative treatment costing about 10 cents, last 18 years. The service of other timbers, such as railroad ties, telephone poles, and mine props, can be doubled and often trebled by inexpensive preservative treatment. To-day, when the cost of wood is a big item to every farmer,



Plan of Basement of Barn and Silo.

Plank Frame Barn for Michigan Agricultural College.

every stockman, every railroad manager—to everyone, in fact, who must use timber where it is likely to decay—this is a fact which should be carefully considered.

It is easy to see that if the length of time timbers can be used is doubled, only half as much timber will be required as before and only one-half as much money will need to be spent in the purchase of timber. Moreover, many woods which were for a long time considered almost worthless can be treated and made to last as long as the scarcer and more expensive kinds.

Of the actual saving in dollars and cents through preservative treatment, a fence post such as was mentioned at the beginning might serve as one example. The post is of loblolly pine, and costs, untreated, about 8 cents, or, including the cost of setting, 14 cents. It lasts about two years. Compounding interest at 5 per cent., the annual charge of such a post is 7.53 cents; that is, it costs 7.53 cents a year to keep the post in service. Preservative treatment costing 10 cents will increase its length of life to about 18 years. In this case the total cost of the post, set, is 24 cents, which compounded at 5 per cent., gives an annual charge of 2.04 cents. Thus, the saving due to treatment is 5.49 cents a year. Assuming that there are 200 posts per mile, there is a saving each year for every mile of fence of a sum equivalent to the interest on $219.60.

In the same way preservative treatment will increase the length of life of a loblolly pine railroad tie from 5 years to 12 years, and will reduce the annual charge from 11.52 cents to 9.48 cents, which amounts to a saving of $58.75 per mile.

It is estimated that 150,000 acres are required each year to grow timber for the anthracite coal mines alone. The average life of an untreated mine prop is not more than three years. By proper preservative treatment it can be prolonged by many times this figure. Telephone and telegraph poles, which in 10 or 12 years, or even less, decay so badly at the ground line that they have to be removed, can, by a simple treatment of their butts, be made to last 20 or 25 years. Sap shingles, which are almost valueless in their natural state, can easily be treated and made to outlast even painted shingles of the most decay-resistant woods. Thousands of dollars are lost every year by the so-called "bluing" of freshly sawed sapwood lumber. This can be prevented by proper treatment, and at a cost so small as to put it within the reach of the smallest operator.

In the South the cheap and abundant loblolly pine, one of the easiest of all woods to treat, can by proper preparation be made to take the place of the high-grade longleaf pine for many purposes. Black and tupelo gums and other little-used woods have a new and increasing importance because of the possibility of preserving them from decay at small cost. In the Northeastern and Lake States are tamarack, hemlock, beech, birch, and maple, and the red and black oaks, all of which by proper treatment may help to replace the fast-diminishing white oak and cedar. In the States of the Mississippi Valley the pressing fence-post problem may be greatly relieved by treating such species as cottonwood, willow, and hackberry.

Circular 139 of the Forest Service, "A Primer of Wood Preservation," tells in simple terms what decay is and how it can be retarded, describes briefly certain preservatives and processes, gives examples of the saving in dollars and cents, and tells what wood preservation can do in the future. The circular can be had free upon application to the Forester, Forest Service, Washington, D. C.

Portland Cement Production in 1907.

The Portland cement producers of the United States have replied so promptly to the statistical inquiries addressed to them by the United States Geological Survey that it is now possible to make a very close estimate of the Portland cement production for the calendar year 1907. Edwin C. Eckel, who is in charge of the statistical work on cement for the Survey, has accordingly prepared the following statement:

Returns have been received from 87 plants, representing over 95 per cent. of the Portland cement production of the United States. As the 10 plants which have not yet replied include only two large producers, it is possible to make a fairly accurate estimate of the total cement production of 1907. The returns so far received indicate that the total output of Portland cement in the United States in the calendar year 1907 was approximately 48,000,000 barrels. This should be compared with an output of 46,463,424 barrels in 1906, and of 35,246,812 barrels in 1905.

Though the production of 1907 shows an increase over that of 1906, it is slight as compared with past annual gains in the cement industry, indicating that the Portland cement production of the United States has now reached a stage in its development where it is directly and promptly affected by general business depression.

COMPETITION IN TWO-FAMILY HOUSES.

THIRD PRIZE DESIGN.

IN accordance with the findings of the Committee of Award having charge of the competition in dwellings intended for occupancy by two families and published in the May issue of this journal, the third prize was given to the study submitted by Curtis Walton, 963 Rose Building, Cleveland, Ohio. This design with its accompanying specifications and estimate of cost are presented upon this and the pages which follow. In regard to this design the Committee of Award made the following comment:

The exterior is good. The building is well framed and each family has its own front porch. The effect at the entrance is pleasing and every part of the house is arranged so that the families are entirely separated from each other. The rooms are large, the living room being unusually attractive. The stairs are wide, which is a very necessary feature in apartments of this character. There is ample light in every room and the interior details are well worked out. There is plenty of good closet room, while the cupboards, drawers, &c., in the kitchen are of a character to meet all reasonable requirements. There is a good light cellar and well-lighted attics with ample storage room. While the bath room is perhaps a trifle small, it is comfortable in its arrangement and the medicine closet in the wall is an excellent feature.

The direct communication between kitchen and dining room is not as good practice as would be the case if communication was established through a butler's pantry, yet it is not seriously objectionable, as many families prefer the direct entrance from one room to the other. The color scheme of a house is largely one of individual taste or at least preference on the part of the owner, and a combination which might please one would not necessarily please another who perhaps was a stickler for harmony. The preference of the various members of the committee would be for some other combination than that provided.

Specifications.

The specifications furnished by the author of the third prize design for the various parts of the work are as follows:

Excavations.

Clear away all obstructions upon the site to be occupied by the building. Excavate for the cellar, areas and foundations according to foundation or basement plan and sections. All the excavated materials to be left on the lot. Excavate 1 ft. larger than foundation. After foundation is built, excavation to be filled in around outside of walls, and lot graded to established ground line.

Foundations.

Lay footings of concrete of flat formation, 8 in. thick, under all ash pits and chimneys, projecting 6 in. on all sides. Lay a footing of concrete 3 in. thick under all brick piers in basement.

Other footings as follows:

Concrete footings 6 in. thick by 24 in. wide under entire foundation wall.

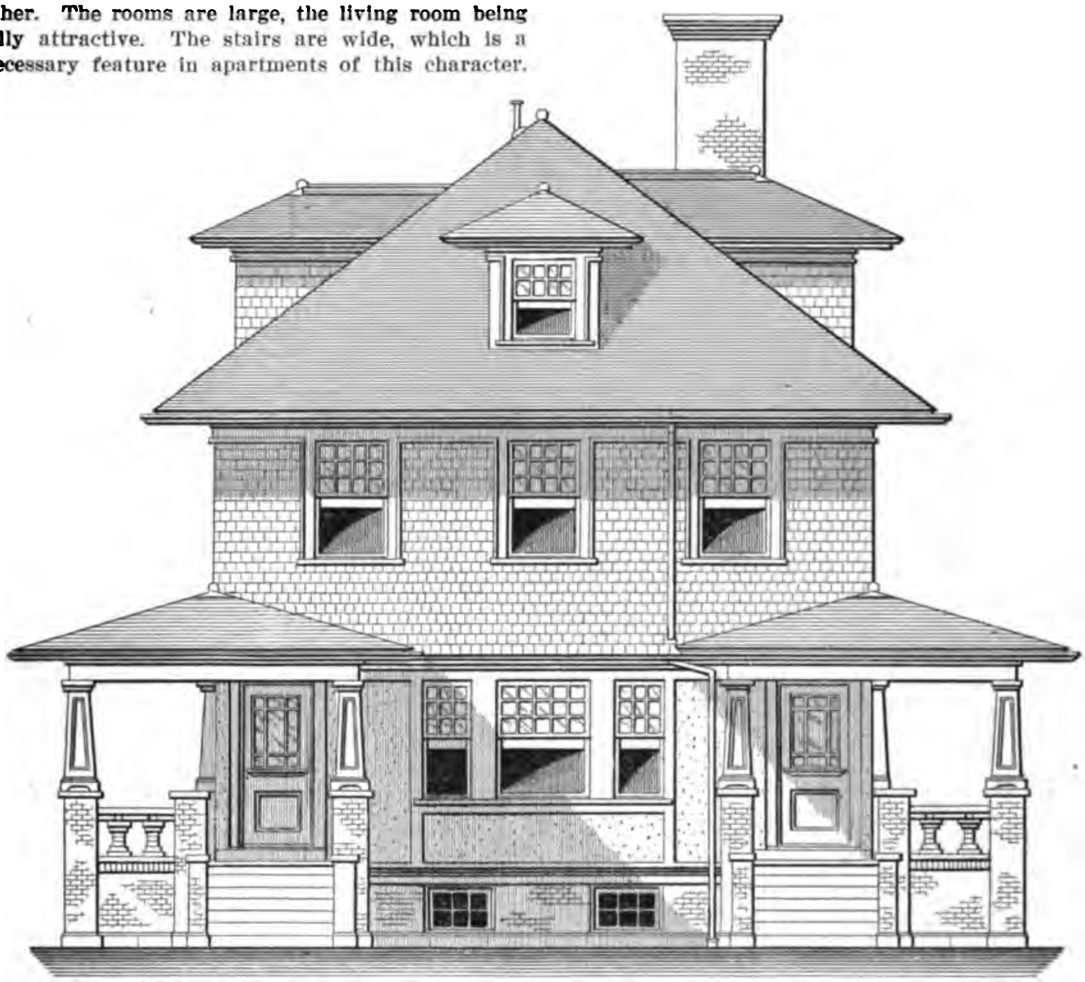
Concrete footing 4 in. thick by 18 in. wide under all porch walls and step stringers.

Concrete footing 8 in. thick and 28 in. wide under all porch piers.

Concrete for footing to be composed of one part Portland cement, two parts coarse sand and three parts broken stone. Cement and sand thoroughly mixed dry, water added and then the stone put in. Stone to pass through 2¼-in. mesh concrete well tamped into trenches prepared. The superstructure not built until 48 hr. have elapsed after concrete is laid.

Cement Block Work.—Foundation walls below grade line to be of six courses of 8 x 12 in. concrete blocks.

Concrete water-table with beveled drip and smooth face 8 in. high by 8 in. thick, with only 6 in. exposed above grade line, and projecting 2 in. beyond face of wall, backed with brick. This water-table to run around entire exposed outside of building and porches.



Front Elevation.—Scale, ⅛ In. to the Foot.

Competition in Two-Family Houses.—Third Prize Design.—Curtis Walton, 963 Rose Building, Cleveland, Ohio.

Two courses of 8 x 12 in. block under porch walls and step runners.

Three courses 16 x 16 in. concrete blocks under all porch piers.

The best quality of concrete block only to be used.

Mortar.—Mortar for cement block work to be composed of one part Portland cement to three parts of clean sharp sand, with sufficient lime to work smoothly.

Cut Stone.—Furnace air duct to be covered with 2¼-in. flagging, laid beneath concrete cellar floor.

Chimney Copings of 2¼-in. sawed stone, with tooled edges. Flue holes cut separate for each flue, all in one piece.

Wall Copings.—Copings for porch step approaches and piers to be 2¼ sawed sandstone, tooled edges.

Coping and Steps.—Steps to front porches 6 x 14 in. x 5 ft. 4 in. Steps to side porch 6 x 12 in. x 6 ft. Steps to rear entry 6 x 12 in. x 4 ft. 6 in. Hearth stones for fireplaces to be sawed sandstone 3 in. thick, 4 ft. 4 in. wide by 5 ft. 10 in. long, built into chimney, flues and ash ducts cut through stone. Stone to be ¼ in. above finished floors and rubbed to a smooth even surface.

Stone.—All of above cut stone to be sound, clear rock from local quarries, all free from shakes, stains or other defects and to be cut and put into the building in good order, and kept clean and whole.

All cut stone to be properly anchored together and to backing wherever necessary.

Walks.—Put down 2¼-in. sawed bluestone flagging where shown by the plan. Inside walks 2 ft. 6 in. wide. Walks to front porches 6-ft. wide.

All to be laid upon a bed of gravel or sand and settled to a solid bed. Edges to be tooled. Joints to be close and straight.

Note.—Laying and furnishing of sidewalks are not included in estimate.

Brickwork.

All parts colored red upon drawings to be built of good, hard burned, common bricks laid in mortar with plumb running bond, headers every fifth course. All to be laid up carefully, plumb and straight and with joints neatly struck on all exposed surfaces.

All brick to be wet before laying.

Where flues are not lined with terra cotta linings they are to be lined with brick on edge tied into the outer courses, and are to have joints thoroughly filled with mortar and carefully struck on the inside.

Set stovepipe thimbles wherever and of sizes as directed.

Flue Linings.—All smoke flues and ash ducts to be lined with terra cotta flue linings of sizes indicated; linings to start at tops of grate openings, and at pipe hole openings, and to extend to tops of chimneys.

Face Brick.—Foundation walls above grade line to be of brick faced with wire cut shale brick, the backing to be common hard burnt brick.

Porch piers, balustrade and step approaches of faced shale brick.

Shale brick to cost $11 per thousand.

Chimneys.—All parts of brick work of chimneys showing on the outside, below or above the roof, to be shale brick.

Ash Pits.—Ash pits as shown in basement; bottoms cemented and sloped to the front. Ash pits to be covered with inch flags perforated for ash grates and flues.

Arches, &c.—Turn arches over grate openings and for fireplace where needed. Set out a course of brick to form skew backs for these arches in floors.

Put cast iron doors and frames into ash pits and bottom of furnace flue.

Furnace.—Construct the brick work of furnace and fresh air chamber and cold air duct as indicated.

Brick Nogging, &c.—Brick up all around the building upon the top of the brick walls to the top of joists with 4 in. of wall.

The brick stringers for stone steps to be tied into brick step runners.

Mortar.

For Basement.—Mortar for brickwork in basement to be composed of one part lime, putty and cement in equal portions to three parts clean, sharp sand.

For Inside Work.—Mortar for brickwork on the inside of building above the basement to be composed of one part freshly burned lime and three parts clean, sharp sand; lime to be thoroughly slacked and all well mixed.

For Outside Face Work.—For topping out chimneys or any part exposed to the weather, the mortar to consist of freshly burned lime, good Portland cement and clean, sharp sand. One part lime and cement to three parts sand. All joints to be well filled with mortar.

Colored Mortar.—Black mortar for face brick.

Wood Lintels, &c.—Lay into the brickwork all necessary wood, lintels and strips for nailing furring to; all furnished by the contractor for carpenter's work.

Cement Floor.

Level the ground in cellar carefully and cover with 4 in. cinders, wet and tamped, then spread a layer of broken stone over the entire bottom 2 in. deep; grout thoroughly with thin cement and water; over this put a layer of cement and clean fine gravel and sand, one part cement to three of sand and gravel, 2 in. thick, floated or troweled to an even, level surface, and left smooth and hard when dry. Use Portland cement.

Slope cellar floor to drain toward floor traps.

Plastering.

Lath the ceiling in basement and all walls and ceilings in first and second stories, and the stairway walls to attic floor and dividing partition in attic with sound pine lath free from pitch, not less than ⅜ in. apart, securely nailed, and breaking joints every seventh lath. No lath to be put on vertically. All corners to be solid. No lath to run through from one room to another.

Lath to floor on all outside walls.

Behind wainscoting in kitchen and bathroom on outside walls lath between studs on single lath furring.

Expanded metal lath next to all furnace pipes.

Mortar.—Brown mortar to be the prepared standard grade of hard mortar for inside work.

Outside lathing expanded metal.

Galvanized iron metal lath in all panels between windows and doors below belt course.

Lath furring spaced 8 in. apart for the metal lath. Metal lath secured with galvanized staples.

White coat to be of the prepared standard grades of white coat finishing material and plaster of paris.

Plaster for outside work:

First coat to be composed of one-third Portland cement and two-thirds of standard hard mortar, with a small sprinkling of cattle hair. Scratched.

Second coat, one-third Portland cement, one-third hard mortar and one-third white lime mortar, thoroughly mixed.

The brown coat to be perfectly dry before the last, or putty coat, is put on. The brown coat to be thoroughly floated. Angles and corners to be square; all surfaces true and even. The white coat to be composed of lime putty, plaster and some fine, light colored lake sand, troweled to a hard, even, glossy surface. To be free from chip cracks, stains, blisters or breaks in the surface from the slacking of lumps of lime in the mortar. Should any of these defects occur the work will be condemned.

Grounds for inside plastering ⅝ x 1½ in.

Two Coat Work.—The following parts to be plastered with two coat work:

All interior work on first and second floors. All outside plastering.

Attic partition and basement ceiling single coat work.

Patch up and repair all breaks in the plastering and leave the whole in a perfect condition.

Cutting and Repairing.

Do all cutting and repairing of mason's work of all kinds necessary for the introduction of gas, heating, plumbing and waste pipes. All in a neat and perfect manner.

Build square well 12 in. inside around stop cock in main water pipe and up as high as cellar floor.

Mantle and tiling, with fire back installed by mantleman, also damper.

Iron Work.

Furnish iron grills in foundation of porches. All to be black wrought iron similar to design.

Furnish and put in two ash traps in hearthstone.

Furnish and put in one ash pot, door 8 x 12 in.

Carpenter Work.

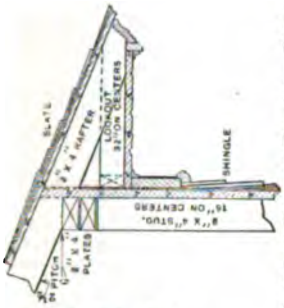
Sizes of Timbers, &c.—Beam, three pieces, built up of 2 x 8 in. Norway, sized; sills, 6 x 6 in. Norway, s 4 s; first floor joists 2 x 10 hemlock, sized 16 in. from centers; second floor joists 2 x 10 hemlock, sized 16 in. from centers; attic floor joists 2 x 8 hemlock, sized 16 in. from centers; porch floor joists 2 x 6 hemlock, sized 16 in. from centers; outside studding 2 x 4 x 20 hemlock, sized 16 in. from centers; partition studding 2 x 4 hemlock, sized 16 in. from centers; rafters 2 x 6 x 20 hemlock, sized 16 in. from centers; rafters, porches, 2 x 4 hemlock, sized 16 in. from centers; ceiling joists, porches, 2 x 4 hemlock, sized 16 in. from centers; collar beams and purlins 2 x 4 hemlock, sized 32 in. from centers; porch beams 6 x 10, of three-piece 2 x 10 hemlock, sized; plates 2 x 4.

Posts of sizes and where shown on plans.

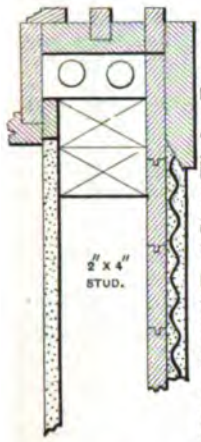
Sills to be carefully leveled on the walls and bedded solid with mortar furnished by mason.

Joists.—Joists to rest on to sill and spiked to same and to studs. Second floor joists to be notched on to a ⅞ x 6 in. ribbon let into studs and nailed. Inside partitions to have plates 2 in. thick to carry joists; where partitions continue up through second story the studs to rest upon this same 2-in. plate, and not upon a sill placed on top of the joists. Attic joists to be placed on the outside wall plate to the hight of stories.

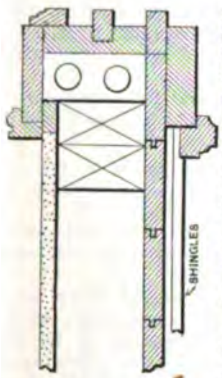
Trimmers.—Double header and trimmer joists framed around all dormer openings in floors, and around all chimneys and hearths; frame through one thickness only, and spike joists well together, double joists under all partitions carried by same. Leave 2 in. between brick work of chimneys and headers and trimmers. Where beams are shown in floors they will be placed level with joists, as shown in section. Where there are to be furnace pipes in partitions



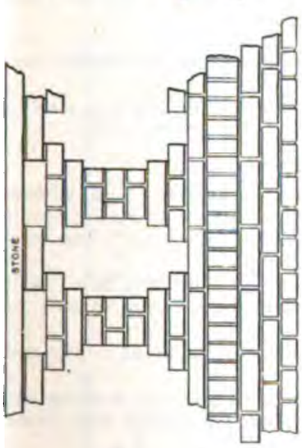
Detail of Dormer Cornice.—Scale, ½ In. to the Foot.



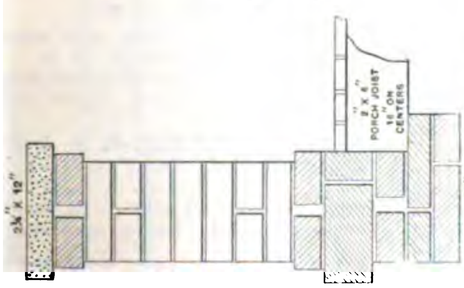
Section Through First-Story Window Frame.



Section Through Second-Story Window Frame.



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



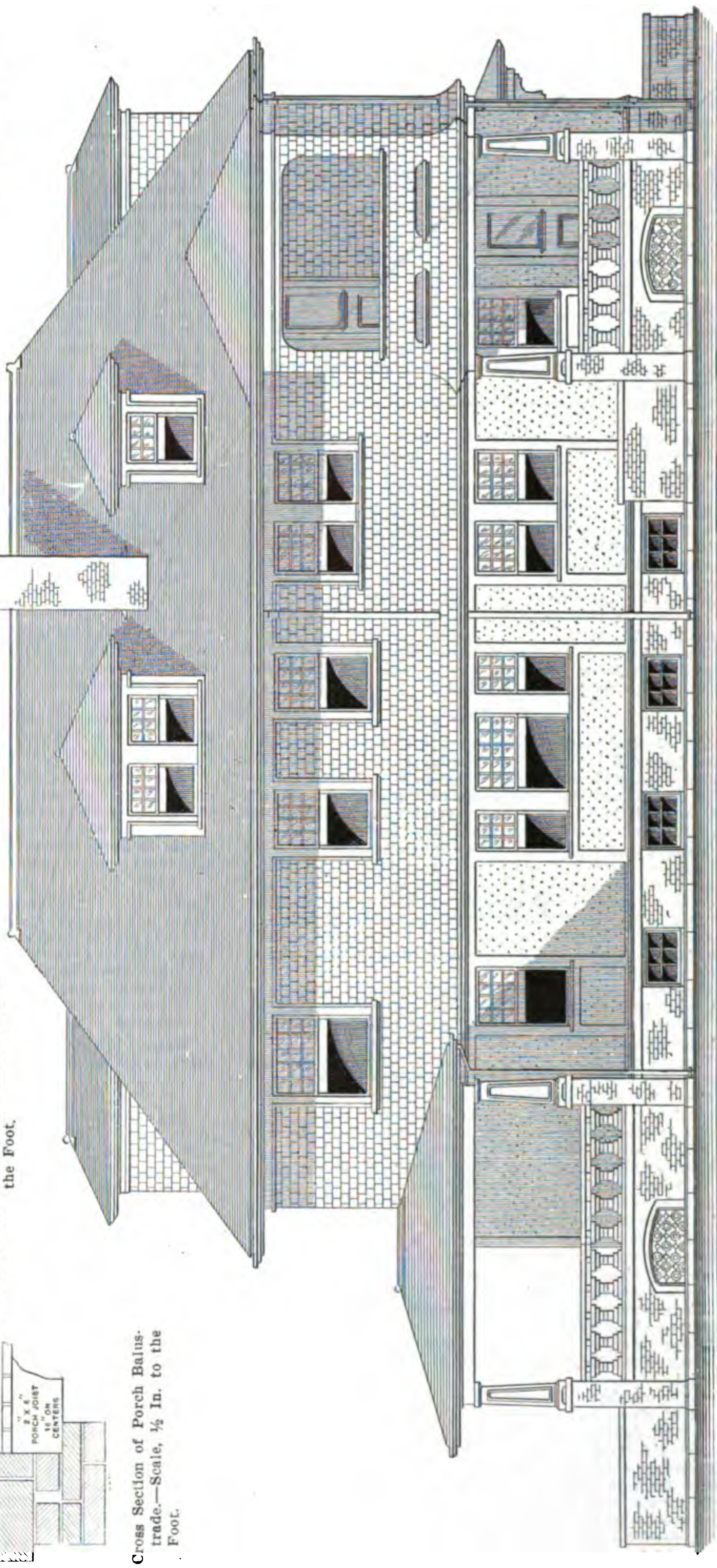
Cross Section of Porch Balustrade.—Scale, ½ In. to the Foot.

carried by joists, the double joists are to be placed 5 in. apart, with blocks between, 2 ft. apart, well spiked.

Lintels, &c.—Double rafters at sides of chimneys and all openings in roofs.

Furnish all the necessary wood lintels, wood bricks and strips necessary to lay into the brick work.

Centerings.—Build centerings for arches for fireplace



Competition in Two-Family Houses.—Third Prize Design.—Side (Right) Elevation.—Scale, ⅛ In. to the Foot.

openings. Knock out the same before the lathing is done and put in studs for the support of lath in such a way as to leave 1 in. or more between the same.

Studding.—Studs to be doubled at corners, and at all openings for doors and windows; studs to be well toenailed to sills. Double headers over single doors. Truss over sliding doors and cased openings, as directed. Studs to be nailed solid at corners of every room, and in no case left open for lath to pass through from one room to another.

Cut in blocks between studs where necessary for nailing wainscoting and finish.

Trussed Partitions.—Truss all outside walls of building at the corners on first and second floors with 2 x 4's spiked, same cut diagonally in between studs. Truss partition on first and second floors, separating living room from chamber.

Bridging Joists.—Each tier of joists 12. ft. long or under, to have one row of beveled cross bridging not less than 2 in. wide, with two 10-penny nails at each end of each piece, joists over 12 ft. between bearings to have two rows of bridging.

One tier of horizontal bridging between each floor on all partitions, inside and outside, of 2 x 4, spiked with two 10-penny nails to each stud. Mineral wool filling where shown on plans.

Porch.—Porch floors to pitch ⅛ in. in a foot, away from building, in all cases.

Porch joist to have one row of cross bridging, not less than 2 in. wide, spiked at both ends with two 10-penny nails.

Sizing.—All joists, studs and rafters, to be sized to uniform widths. Sills to be surfaced on all sides to uniform thickness.

Furring.—Where indicated by yellow color, the inside of brick walls to be furred with 1⅛ x 2 in. strips, 16 in. from centers, nailed to plugs or strips laid into walls every 2 ft.; face of furring to line up perfectly in all directions.

Sheathing.—The outside studding to be covered with ⅞ x 8 matched hemlock sheathing, laid horizontally and nailed with three 10-penny nails in each board at every bearing, and over this put 3 X Red Rope sheathing paper from belt course to rafters, and 3-ply tarred paper from belt course to sill, paper to cover all corners and angles, and to extend close up to openings, under casings, and to lap 3 in. where joined.

The rafters of porches, dormers and main roof to be covered with Norway pine ⅞ x 8 in., matched, thoroughly nailed to each rafter, with close joints.

Roofing.

The sloping roofs to be covered with heavy tarred felt paper lapped 3 in., and over this lay black Bangor ribbed roofing slate, with two galvanized nails to each slate. Slate to be of uniform size, not larger than 8 x 16 in., smooth and even, all laid in true and regular lines. Each course to overlap at least 3 in. over the second course below.

Valleys and Gutters.—Valley linings 14 in. wide, locked and soldered seams; all to be securely nailed. Flashing and counter flashing around chimneys; flashings where porch and other roofs intersect with sides of building, and at dormers, &c. All to be of I. C. Scott's extra coated tin, stamped, tin painted one coat with Venetian red and linseed oil on both sides before being laid. Cricket covered with same tin on upper side of chimney.

Gutters to be o* No. 24 galvanized iron 6 in. wide, 4 in. high, with back extending above outer edge not less than 1½ in. Gutter molding as shown on detail sheet. Gutters to be hung with slope or drop of ½ in. to 10 ft.

Toward conductor outlets gutters to be spiked at every other rafter with 30-penny nail and a metal thimble.

Cover the upper surfaces of horizontal cornices at gables, &c., and any wide projecting members over windows.

Tin to turn up on sides of inclosed balconies as high as the rail. Outlets from same as shown and directed.

Conductors.—Conductor pipes of galvanized iron 2¼ x 3½ in. where shown on drawing; elbows to be neatly turned, pipes to be carried plumb from elbows to ground. The pipes to be supported free from the surface of walls of building, instead of forming bends or angles in the pipe; all conductors to connect with sewer at ground, or have elbows at bottom; all pipes to be well secured with neat, wrought iron fasteners, spaced uniformly, about 4 ft. apart.

Where conductor pipes pass through swell at belt course the same to be flashed.

Ridge Molds, &c.—Ridge molds of sizes marked on drawings, carefully formed of No. 24 galvanized iron 14-in. material.

Finials as shown, formed of No. 24 in. galvanized iron.

All of above to be carefully and thoroughly secured in place, with tight joints, and so as to thoroughly protect the part covered from the action of the weather.

Painting.—All of said iron work to be thoroughly painted on both sides, one good coat of Venetian red or graphite paint and linseed oil, before leaving the shop, and where necessary, before being made up.

Guarantee.—All of above slete, tin and iron work to be guaranteed for five years.

Exterior Finish.

Over the sheathing paper above belt course lay 16 in. A * A cedar shingles dipped 5¼ in. to the weather, laid straight and uniform, and nailed with 6-penny galvanized nails.

The following parts to be of selected white pine, cypress, thoroughly seasoned, and free from knots, shakes or sap; all to be smoothed up by hand and put together carefully. Corner boards and casings 6 in. wide where shown; horizontal bands 8 in. wide, all 1⅛ in. thick. Sill casing 8 in. wide, 1⅛ in. thick.

Molded courses as shown, with rough brackets if necessary.

Main Cornice.—Gutter board, ⅞ x 8 in., No. 2 shelving s. 4 s.; planceer, ⅞ x 5¼, clear Phil. fencing; freize. 1⅛ x 8 in., No. 1 shelving s. 4 s.; moldings, ⅞ x 1¾ in. bed, 1⅛ x 1¾ back band, ⅝ x ⅞ cove.

Dormer Cornice.—Molding strip, ⅞ x 2 in., No. 1 shelving s. 4 s.; planceer, ⅞ x 5¼, clear Phil. fencing; freize, 1⅛ x 6 in., No. 1 shelving s. 4 s.; moldings, ⅞ x 4 in. crown mold, ⅝ x ⅞ cove, 1⅛ x 1¾ back band.

Porch Cornice.—Gutter board ⅞ x 8 in., No. 2 shelving s. 4 s.; planceer, ⅞ x 2¼ Y. P. R. cornered ceiling; porch ceiling, ⅞ x 2¼ Y. P. R. cornered ceiling; beam casings, ⅞ x 10 in. and ⅞ x 6 in., Cypress s. 4 s.; moldings, ⅝ x ⅞ cove, ⅞ x 1¾ bed. m.

Porch Columns.—Built up of cypress, as shown by detail sheet.

Belt Course.—Molding strip, ⅞ x 2 in., No. 1 shelving s. 4 s.; planceer, ⅞ x 8 in., No. 1 shelving s. 4 s.; frieze, 1⅛ x 8 in., cypress, lower edge beveled; moldings, ⅞ x 4 in. crown mo., ⅝ x ⅞ cove, ⅞ x 1¾ bed. mo.

Base or Water Table.—Drip board, ⅞ x 6 in., cypress. beveled edges; water casing, 1⅛ x 8, cypress s. 4 s.; moldings, ⅞ x 1¾, bed. mold.

First floor window frame casings, 1⅛ x 6 in. cypress, beveled edge; second floor window frame casings, 1⅛ x 4 white pine, 1¾ x 1⅛ in. back band molding.

All moldings of stock patterns.

Porch Floors.—Porch floors to be of clear, dry cypress, 1⅛ in. thick, and not over 3 in. wide; matched and laid close with white lead in joints for second floor porch and surfaced four sides and laid open joints 3-16 in. for first floor porches, nailed at every bearing; blindnailed at every bearing; nosing worked on edges; mold beneath; ⅞ in. façia.

Flooring.

Rough Floors.—Double floors on first and second stories. The under layer to be of ⅞ x 8 hemlock, matched, laid diagonally to joist, thoroughly nailed.

Deafening.—Cabot's deafening quilt between top and under layer of second floor. Sheathing paper between top and under layer of first floor.

The upper layer of double floors on first and second stories in living rooms, dining rooms, entry halls and vestibule to be of plain oak, ⅞ x 2¼, matched.

Other parts of the first and the second story to be floored with B yellow pine, free from black knots, shakes and sap, not over 3¼ in. wide. All flooring to be dry, matched, and laid close, and blindnailed at every bearing on joists. None of the floors of the upper layer of double floors to be laid until the plastering is dry.

Hardwood flooring to be kiln dried.

All floors of upper layer to be scraped and sanded ready for finishing.

Attic.—Attic floor single layer ⅞ x 5¼ Norway, matched. Blind nailed at each bearing.

Windows.

Basement.—Basement windows to have 1¾ in. rabbeted plank frames, 1⅜ sash hinged at top, with strong buttons and plates, and hooks and eyes to fasten shut and open; lower edges of sash to be rabbeted.

Attic.—Double sash windows to slide, and have 1⅜ in. sash and beveled check rail hung with cast iron weights and cord over iron pulleys.

Main Part.—Windows in all parts to have 1⅜ sash, beveled check rails.

Rear Part.—All to be hung with cast iron weights, with No. 7 Silver Lake sash cord, over iron pulleys with turned journals.

Pulley stiles 1⅛ in., with pockets; 1¾ in. sills.

Glazing.—Basement windows to be glazed with single American glass. Sash divided into six lights 10 x 8 in.

Attic windows to be glazed with single American glass. Upper sash 28 x 14, divided into eight lights. Lower sash 28 x 22.

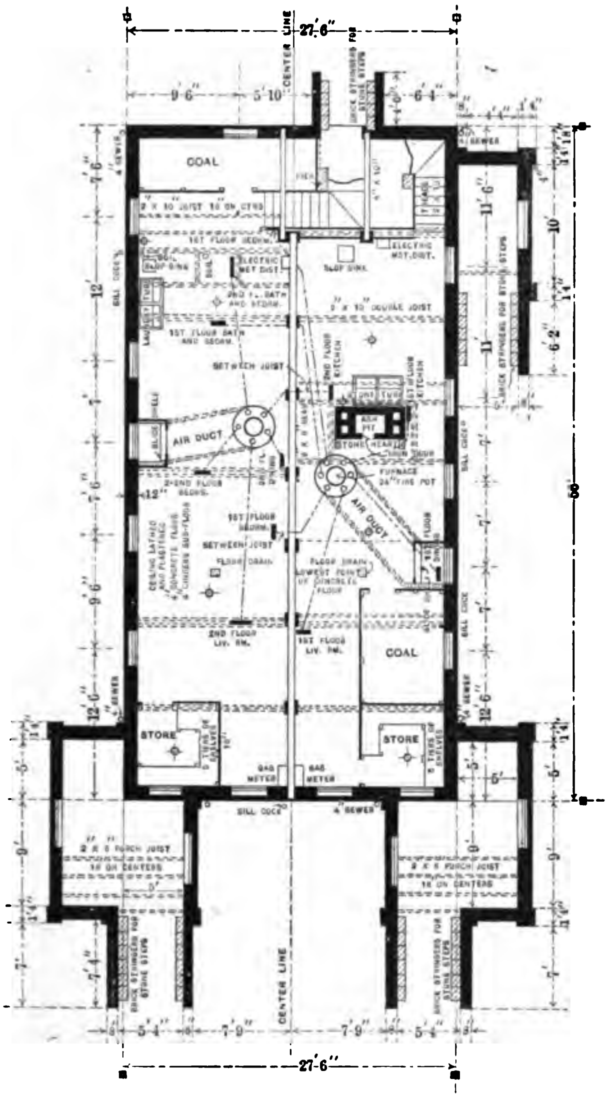
Windows on first floor to be glazed with A. A. double American glass. Upper sash divided. Lower sash single light. Glass selected.

Windows on second floor to be glazed with A. A. double American glass. Upper sash divided. Lower sash single light. Glass selected.

Other windows as follows:

Bathroom windows to be glazed with mazed glass.

Glass in Doors.—Front and vestibule doors glazed beveled plate. Rear doors (outside) glazed double American. Kitchen doors to rear hall glazed mazed glass.



Foundation.

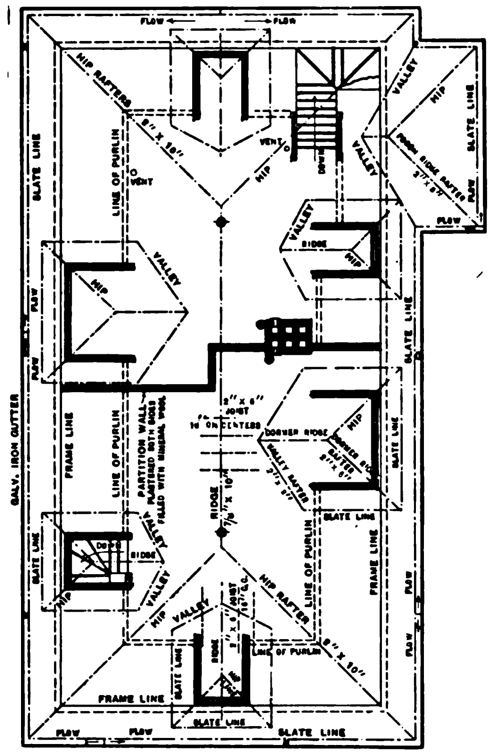
Doors,

Front and Vestibule.—Front and vestibule doors to be veneered quartered oak 1¾ x 7 x 3 ft.

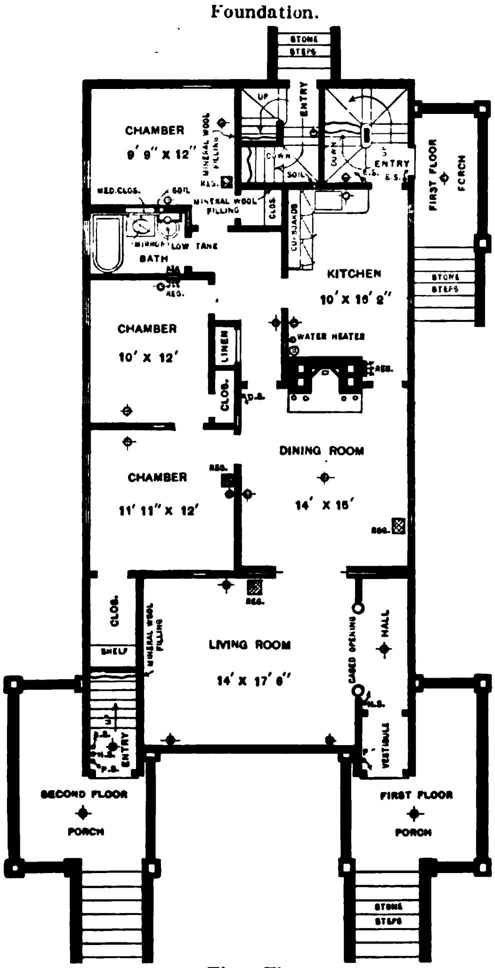
First Story.—Doors in first story to be veneered oak, two panels in dining room and living room.
Sliding doors 1¾ x 3 x 7 ft.
Dining room doors 1⅜ x 2' 8" x 7ft.

Second Story.—Doors in second story to be veneered oak, two panels in dining room and living room and hall.
Sliding doors 1¾ x 3 x 7.
Dining room doors 1⅜ x 2' 8" x 7.
Hall door to attic 1¾ x 3 x 7.

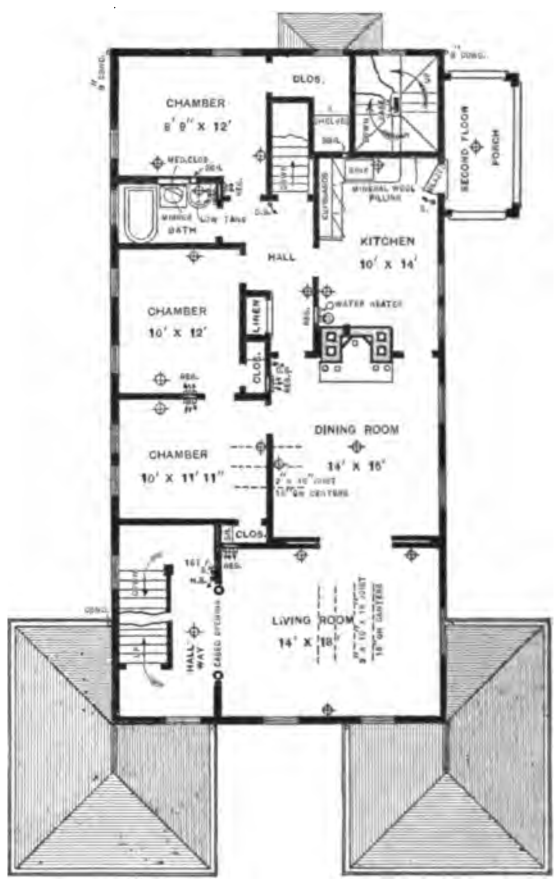
Rear Part.—Doors in rear part, both first and second



Attic and Roof Plans.



First Floor.



Second Floor.

Competition in Two-Family Houses.—Third Prize Design.—Floor Plans.—Scale, 1-16 In. to the Foot.

stories. Stock, 5 cross panels, Georgia pine, 1⅜ x 2' 8" x 7, 1⅜ x 3 x 7ft.

Rear outside doors 1¾ x 2' 8" x 7, white pine, glazed.

Kitchen doors 1¾ x 2' 8" x 7, glazed.

Basement and Attic.—Basement doors to be battoned from Ph. fencing 2 ft. 6 in. by 6 ft. 6 in.

Sliding Doors.—Sliding doors to be fitted for flat face locks; to have a flat ¼-in. strip around the edges of doors on both sides.

Sliding doors to be hung with Lane hangers.

Sliding door pockets to be lined with matched stuff and made tight against admission of air.

Hardware Trimmings.

Finishing hardware selected by owner and put on by carpenter, same to cost not more than $75.

Stairs.

Main stairs to have 1⅛ in. treads, ⅞ in. risers, housed into 1⅛ in. wall string, all of oak, blocked, wedged and glued; 8-in. risers, 9-in. run, 1-ft. nozing, rounded, cove mold beneath.

Newel on second floor of oak, stock 8-in. base, 6-in. shaft. Hand rail 2¾ x 3 in., shoe and filler, 1⅜ balusters turned, 24 in. long. Oak hand rail and metal hangers on right hand side of front stairway to second floor.

Rear stairs 1⅛ in. treads, ⅞ in. risers, housed into 1⅛ in. stringers, blocked, wedged and glued; all of yellow pine; 8-in. risers, 9-in. run, 1-ft. nozing, rounded, cove mold beneath.

Attic Stairs.—1⅛-in. treads, ⅞-in. risers, housed into 1⅛-in. wall stringers, blocked, wedged and glued. Winders, 1⅛ treads; 8-in. risers, 9-in. run., 1-in. nozing, with cove beneath.

Cellar Stairs.—Last run to basement to be 2 x 10, s. 4 s. Norway, with open risers. Stringers 2 x 10 Norway.

Inside Finish.

Set grounds for casings, base, wainscoting, &c., throughout, same to be of proper dimensions and put on straight and true, and so that the finish will cover at least ½ in. Grounds ⅝ x 1½ in.

Various parts to be finished as shown by details of same, in woods as follows:

Vestibule, entry hall, stairway hall, living rooms and dining rooms to be of plain oak.

All chambers, kitchens, closets, rear hall, rear entryway and stairways to attic to be Georgia pine.

Bathroom Georgia pine.

All casings, bases, etc., to lap ½ in. over the grounds and to fit perfectly to plastering.

Base to be put down in all rooms and closets except kitchen and bathroom after detail drawing.

Exposed corners of plastering to have beads after detail drawing.

Wainscoting.—The kitchen and bathroom to be wainscoted with narrow, matched and beaded Georgia pine boards 5 ft. high with ¾ in. molded cap; stuff to be kiln dried; not over 3¼ in. face.

Paneled wainscoting in dining rooms with plate shelf after detail, 5 ft. 6 in. high. Panel strips and casings in dining rooms ⅞ x 4 in., of oak. Base and panel moldings ⅞ x 1¾ in., back band 1¼ x 1¼. Plate shelf ⅞ x 6 in., molded edge and grooved; brackets ⅞ = 3 x 3 in. Baseboard ⅞ x 6 in., Ca. Carpet mold 1½ ft. x ½ in. Base moldings, ⅞ x 1¾ in. Picture moldings ⅞ x 1¾ in. Head moldings in rear part ⅞ x 1¾ in., yellow pine. Head casings in rear part 1⅛ x 6 in., yellow pine. Door and window casings in rear ⅞ x 4½ in., yellow pine; plinths 1⅛ x 3 in. Window stools 1⅜ x 3½ in. Aprons ⅞ x 3¾ in. Stops ½ x 1¾ in. Head casings in dining room ⅞ x 6 in., oak. Living room casings ⅞ x 4½ in., oak. Back band mold, 1¼ x 1¼ in., oak. Head casing, living room, 2¾ x 1¾ in., oak. Cornice of living rooms to be ⅞ x 4 in., crown mold, with ⅞ x 1¾ in. picture mold.

Closets, &c.—Linen closet, china closet, pantry, closets, &c., to be fitted up with drawers, shelves, cupboards, &c., all as indicated on drawings or according to directions; each closet to have at least one shelf, and cleat with hooks on all sides. Cupboards to have neatly finished Georgia pine doors, all to shut into a rabbett; all to be trimmed with neat and appropriate hardware.

Kitchen sink to have grooved drip board and cap, all of cypress, 1⅛ in. thick, with apron of Georgia pine 6 in. wide.

Put up planed boards upon which to secure plumbing pipes where same are exposed to view, and cover the pipes in all finished parts; boxes over stop cocks to have hinged lids; boards over pipes to be screwed on.

Basement Finish.—Partitions and cold air box in basement as shown of beaded matched material surfaced two sides, white pine and 2 x 4 in. studding surfaced four sides, put up as directed; doors of same material, unless otherwise specified or shown.

Shelf for gas meter if required.

All inside finish to be carefully smoothed up by hand and sandpapered; all wood to be thoroughly kiln dried; all work to be put up carefully; with close fitting joints, square angles, plumb vertical and level horizontal lines.

Porch ceilings to be scraped on bench before being laid and smoothed with sandpaper.

Painting, Etc.

All finished pine woodwork outside and inside to be cleaned, and where not otherwise specified, to have three good coats of pure white lead, and pure linseed oil and colors; turpentine and dryers as required; all tin and iron to have two good coats, the first coat on tin and iron to be pure Venetian red or graphite paint and linseed oil; additional coats mixed as directed. All outside work to be primed as fast as put up, and any there may be inside before plastering.

All work to be thoroughly puttied, and all inside work to be thoroughly sandpapered.

All colors for inside work to be carefully strained after mixing.

No paint to be put upon woodwork when the same is wet or frosty.

Staining.—All woodwork cypress or pine, including belt course to water table, to have one coat brown oil stain and two coats linseed oil.

All shingles to be dipped two-thirds their length in Cabot's shingle stain before being laid and after being laid given one brush coat.

Interior.

Oak finish in living rooms, entry halls, front stairway and vestibule, stained with paste filler golden oak, cleaned, then one coat shellac, sanded and two coats of Pratt & Lambert's No. 38 Preservative Varnish, wax mixed in last coat.

Dining rooms finished same as living room, except to be stained Flemish oak.

Hard Wood Finish.—All Georgia pine to have a coat of bleached shellac, then sandpapered, and two coats of No. 38 Preservative Varnish.

Chambers off of dining rooms to be stained then to have one coat of bleached shellac and two coats of good body varnish.

Bathroom woodwork and outside of bathtub to receive one coat shellac, two coats flat white and two coats of white enamel. All partitions in basement to receive two coats of paint. All sash in attic and basement to receive two coats of paint. All porch floors painted three coats paint, one coat on all sides before being laid. Porch ceiling to be shellacked and two coats varnish.

Color Scheme.

Concrete block water table stone gray.

Brick ashler dark claret red.

First floor trim, including porch col., belt and sill cas. all cypress. Stained mahogany brown, oiled.

Galvanized iron gutters, window trim and all cornice work above belt course white.

All shingles dipped in silver gray stain.

Plaster work on first floor left natural color, dark gray.

All roofs black slate. All sash painted black.

General scheme to work up. A redish brown under, from dark gray to light gray upper.

Any nail holes or other blemishes in the hard wood or Norway pine to be carefully filled with putty colored to match the finished wood; care to be taken not to stain the surface of the wood with putty.

Plumbing.

Basement.—There will be in the basement two slop sinks, 16 x 16 x 10 in., iron; two wash trays, two part stone; three sill cocks; two floor drains, 6 x 6 in.

First Story.—In the first story: One water closet, low down; one wash stand, porcelain enameled; one bathtub, porcelain enameled; one kitchen sink, porcelain enameled; one boiler, galvanized iron; one gas hot water heater.

Second Story.—In the second story: One water closet, low down; one wash stand, porcelain enameled; one bathtub, porcelain enameled; one kitchen sink, porcelain enameled; one boiler, galvanized iron; one gas hot water heater.

Water Closets.—The water closets in bathrooms to be the all earthenware wash out, down.

Standard. Edux Plate P825 complete.

To be secured to the floor with the aid of brass screws and washers.

To have ¾-in. galvanized iron connection to tank, and 2-in. finished brass flush pipe, the exposed supply pipes to be finished brass, nickel plated.

To have noiseless copper lined syphon tank, low down, with finish of golden oak.

To have noiseless ball valve with copper float complete. To be supported by brass finished brackets. To have plated chain and ornamental pull.

To have molded and finished paneled seat, lid and back of oak, with brass hinges and rubber stops complete.

To have 4-in. cast iron soil pipe and back vent connections complete.

Slop Sinks.—The slop sinks in basement where located on plans supplied with cold water only through nickel plated hose ends. Bid, Wolff's F434. To be 16 x 16 x 10 in. deep.

To have 4-in. vitrified salt glazed soil pipe and trap with hand hole made air tight, set well below ground.

Drain hoppers where shown laid flush with cement floor. To be 6 x 6 in. with Bell trap, Wolff's F1062.

pipe and Wolff's Fuller F443 brass finished cocks. To have 8 in. of air chamber above cocks.

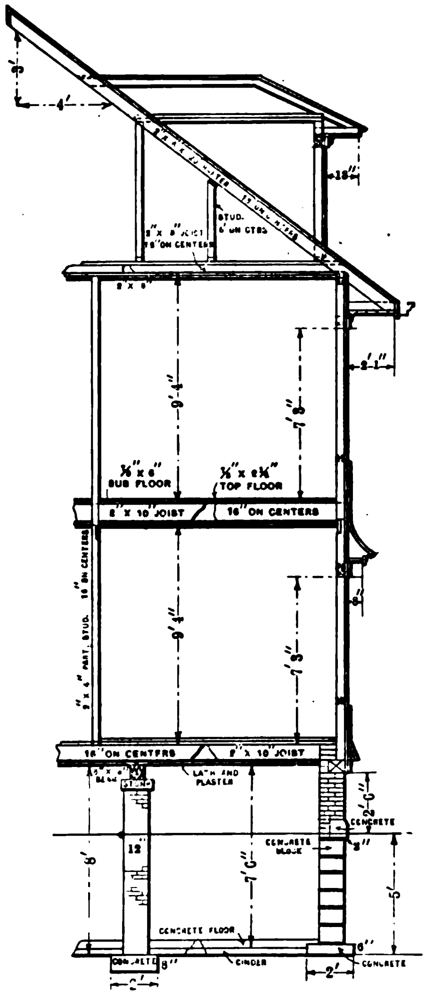
To have 1½ in. lead pipe waste, with back vent connections complete. P patent trap, 1½ in. inlet.

Wash Stands.—Bowls in bathrooms to be Standard Ophir Plate P513, porcelain enameled, 20 x 24 x 12 in. back concealed hangers.

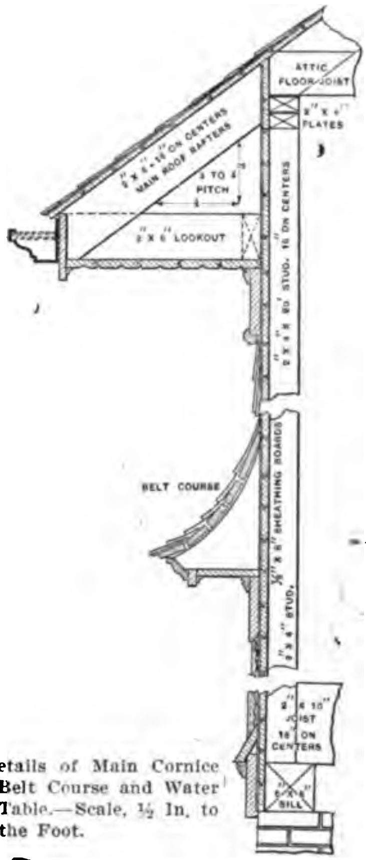
To have nickel plated cocks, P658, Fuller pattern faucets.

All to have nickel plated couplings, plugs, chains and stays.

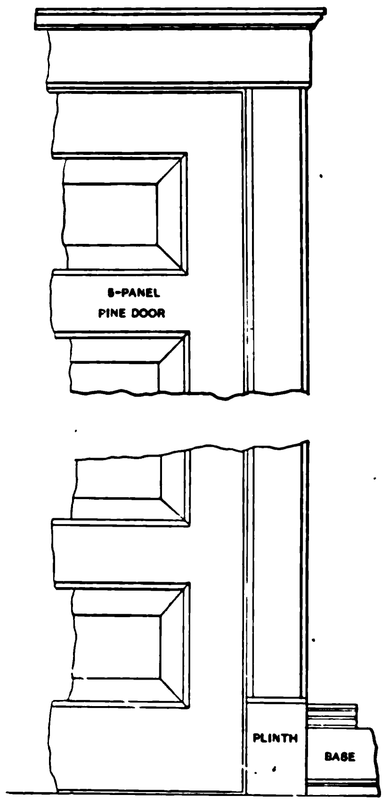
All to have ¾-in. galvanized iron supplies. Air chambers wherever necessary



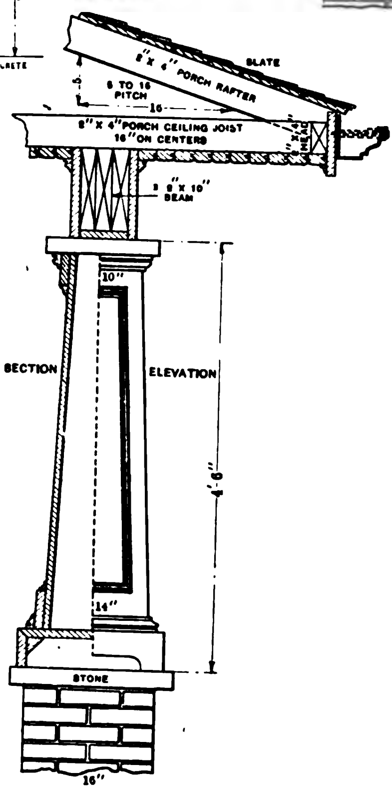
Framing Section.—Scale, ⅛ In. to the Foot.

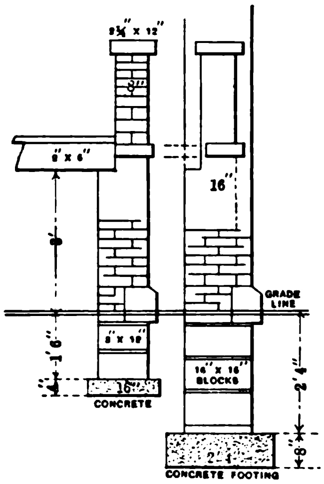


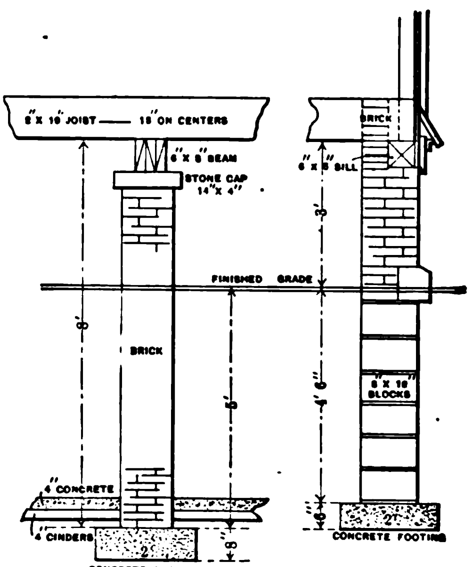
Details of Main Cornice Belt Course and Water Table.—Scale, ½ In. to the Foot.



Detail of Trim for Chambers.—Scale, ¾ In. to the Foot.







Details of Porch Wall and Pier.—Scale, ¼ In. to the Foot.

Details of Porch Column and Cornice.—Scale, ½ In. to the Foot.

Details of Basement Pier and Foundation Wall.—Scale, ¼ In. to the Foot.

Miscellaneous Constructive Details of Competition in Two-Family Houses.—Third Prize Design.

Soil pipe connection trapped.

Kitchen Sink.—The kitchen sink to be 20 x 30 in., by 6 in. deep.

To be of porcelain enameled with nickel plated strainer. To have hot and cold supplies of ¾-in. galvanized iron to prevent noise. The supply pipes if visible to be finished brass.

All properly set and secured in position with the aid of nickel plated screws and washers.

All to have 1¼-in. lead or iron pipe wastes and back vent connections complete, all exposed pipes and fittings to be finished brass, nickel plated.

Wash Trays.—Furnish set of wash trays.

Laundry tubs to be Wolff's Duro Stone F5350. Two-part wash tubs with legs. High backs.

To have four Wolff's F466 wash tray cocks, ⅝-in. brass finished with flanges. To have ¾-in. galvanized iron connections, with air chamber above cocks.

To have 1½-in. lead wastes, to be connected with brass couplings with strainers, and plugs and brass chains. Patent P trap with 1½-in. inlet.

Bathtubs.—Bathtubs to be Standard Occident P121 5-ft. tub.

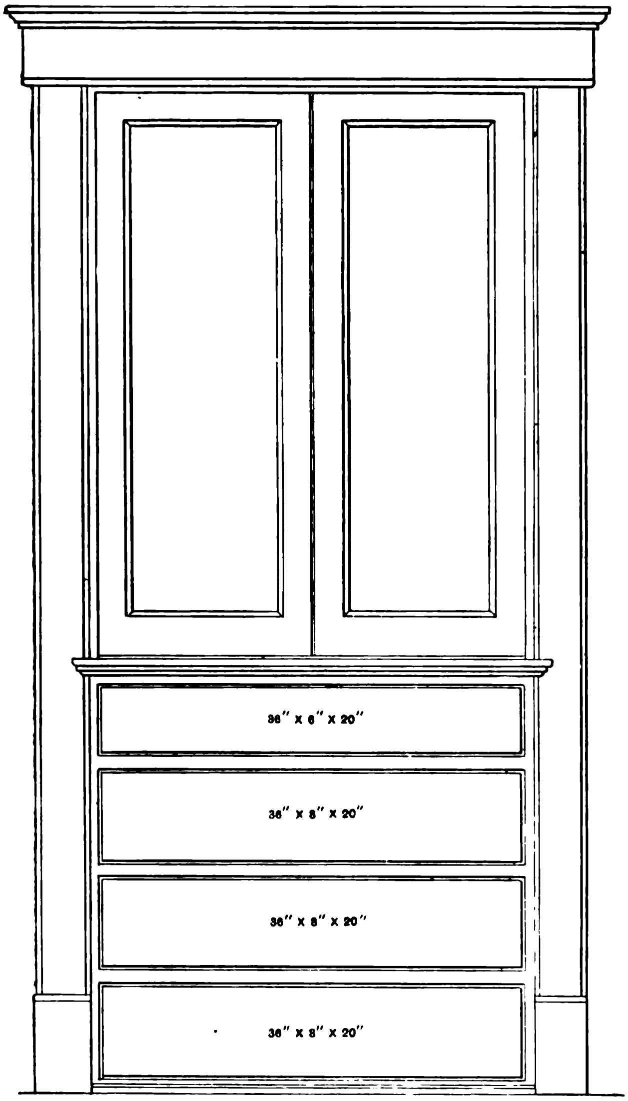
To have nickel plated double bath cock. And all exposed pipes and fittings to be finished brass, nickel plated; ¾-in. iron pipe connection. Air chamber if necessary.

Wall to be drilled neatly, and connection to be made with iron pipe inside of cellar.

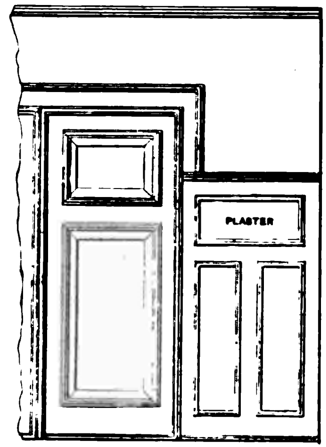
Connect with main at curb as large as the Water Works Department will allow. Put in stop cock, &c., as required by the ordinances. Put in 1-in. pipe beneath cellar floor to point below meters and ¾-in. branches to the various risers. Put in ¾-in. iron supplies for hot and cold water to as near to fixtures as practicable.

Horizontal cold water pipes to go about 12 in. under the cellar floor. Hot water pipes to go on the ceiling of cellar 2 in. below the joist. All to have proper pitch so as to drain. All iron pipe and fittings to be galvanized.

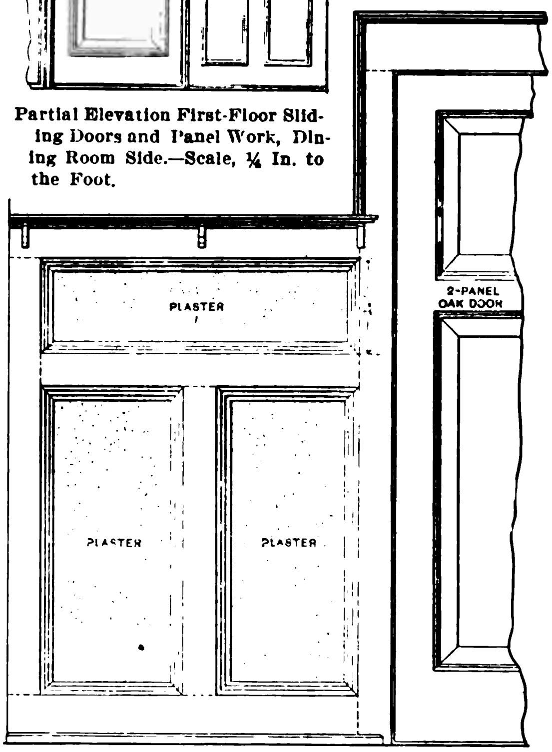
House piping to be on two separate systems from meter pits, with separate shut offs for first floor and second floor families.



Elevation of Linen Cupboard.—Scale, ¾ In. to the Foot.



Partial Elevation First-Floor Sliding Doors and Panel Work, Dining Room Side.—Scale, ¼ In. to the Foot.



Dining Room Trim and Panel Work of Oak.—Scale, ½ In. to the Foot.

Miscellaneous Constructive Details of Competition in Two-Family Houses.—Third Prize Design.

To have nickel plated coupling, safety chain and rubber plug.

To have 1½-in. lead or iron waste and back vent connections complete and lead body; patent trap, 1½-in. inlet.

Hand hole cover nickel plated, only showing through floor.

Boiler.—Boiler to be 30-gal.; galvanized iron.

To have cast iron boiler stand.

To have brass sediment cocks.

To have small brass air cock in top of boiler or in pipe above boiler.

To have all the necessary brass couplings for attaching pipes for supply, for hot water and for water back.

(The water back will be put in and connected to the boiler by the proprietor, and is not in this contract.)

Furnish Marvel gas hot water heater, connected up to the gas supply, to be placed in the kitchen.

Sill Cocks.—Sill cocks, Wolff's F290, where indicated on plan. One side and front cock connected to second floor system.

Connect cocks direct with iron pipe at the following named fixtures:

Hot and cold to laundry tubs; hot and cold to kitchen sinks; hot and cold to bathtubs; hot and cold to lavatories; cold to slop sinks; cold to sill cocks.

All to be secured in the most thorough manner, with hooks and straps, and screws where necessary. All hot water pipes so as to move freely in expanding and contracting.

Lead.—Put in lead connections as specified. All to be joined to iron with the aid of brass soldering nipples, and to fixtures in the most workmanlike manner.

All to be of strong lead pipe, ½ in., weighing 1¾ lb. to the foot; ⅝ in. weighing 2½ lb. to the foot; ¾ in. weighing 3 lb. to the foot.

All lead pipe to be properly supported with the aid of tacks and screws.

All exposed to view to be straight and plumb, and put up in the most workmanlike and secure manner.

Shut-off Cocks.—Put in 1-in. gate valve to shut off the whole house, and ½-in. compression cock and ½-in. wash tube to drain the system.

Sink a section of 8-in. sewer pipe below this cock and turn the waste tube into it.

Should this cock be over 12 in. below cellar bottom, put in 1-in. round way, stop and waste cock, with strong rod and handle to turn it.

Bring branch of hot water pipe to this point and provide ½-in. compression cock to drain it into the said section of sewer pipe.

Put in ¾-in. round way stop and waste cock with brass tubes to shut off.

Hot and cold supplies to bathrooms; hot and cold supplies to kitchens; hot and cold supplies to laundry tubs; cold supplies to slop sinks; cold supplies to sill cocks; cold supplies to hot water heater.

Stop and waste cocks to be placed 1 ft. above cellar floor, excepting where pipes are on the ceiling.

Wastes. Soil Pipe.—Put in 4-in. rising soil pipe, of cast iron, from sewer through the roof at ridge.

Provide all back vent pipe, junctions, bends, traps, &c., necessary, and all mentioned in connection with fixtures.

main supply and meters in basement for first and second floors.

Gas Pipes.—Put in gas pipes to supply all fixtures marked upon the plans.

All to be put up and tested in strict accordance with the requirements of the gas company, with whose mains the system is to be connected.

Pipe to be substantially secured in place by wrought iron hold fasts. Galvanized iron straps and screws at all outlets.

All pipes to project 1 in. beyond the plaster or center pieces. All to be perpendicular to the ceilings or walls, and all to be left properly capped.

Meter.—Put in ¾-in. pipe from meter to point marked or directed for gas stove and gas grate and for water heater.

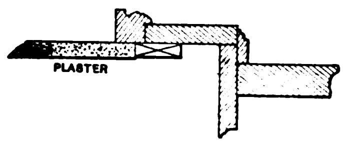
Gas stove and water heater in kitchen.

Gas grate in dining room. Gas stove in laundry.

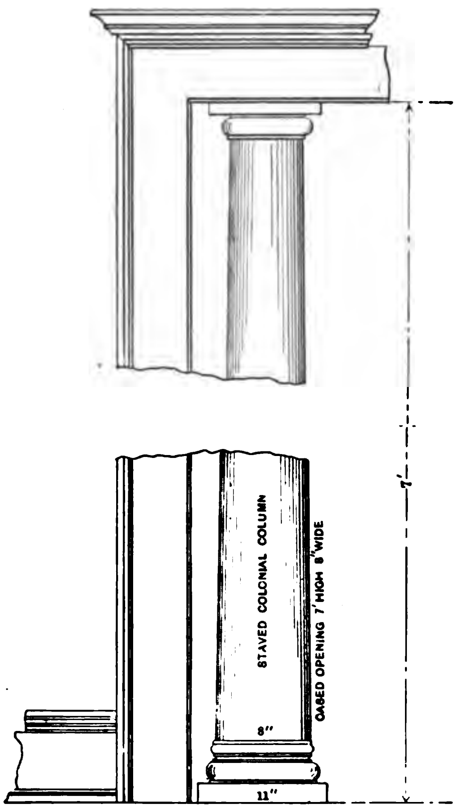
Start main riser at point marked for the meter, on basement plan or where directed.

Sewer.

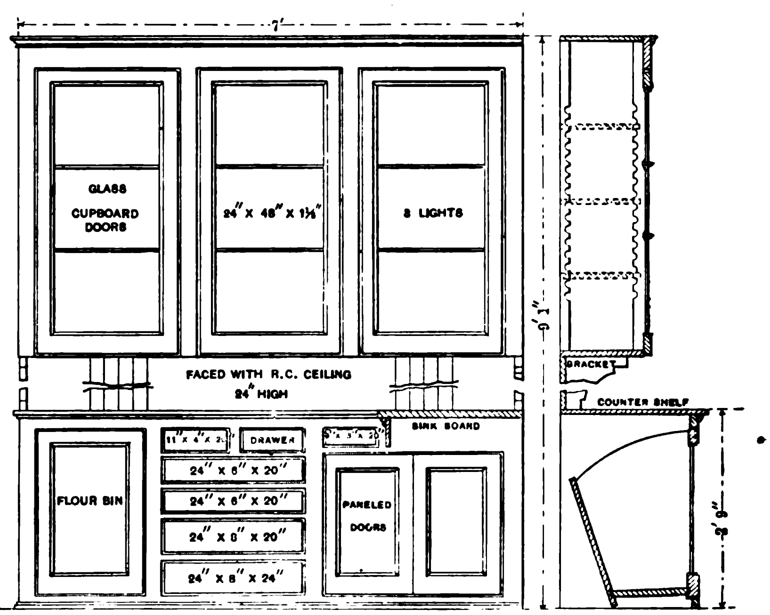
No. 1 socket, glazed sewer to be laid carefully in trenches upon solid earth, with regular and adequate fall throughout and to have carefully cemented and wiped joints. Lay all



Section of Door Casing.—Scale, 1½ In. to the Foot.



Detail of Living Room Trim in Oak.—Scale, ¾ In. to the Foot.



Elevation and Section of Kitchen Cupboard.—Scale, ⅜ In. to the Foot.

Miscellaneous Constructive Details of Competition in Two-Family Houses.—Third Prize Design.

All soil pipes to be properly supported in a substantial manner.

All connections with sewer to be cemented in an airtight manner.

All joints to be leaded and caulked in an airtight manner.

Rising soil pipes to extend through roof as far as directed, and to have cast or galvanized iron ventilating cap. Flash at roof, with 4-lb. sheet lead, in watertight manner.

All soil pipe and fittings to be thoroughly coated, inside and outside, with coal tar solution, or with a thick dipped coat of iron ore paint.

All soil pipe and fittings to be of extra heavy pattern; all to weigh per foot as follows: 2-in., 5½ lb.; 3-in., 9½ lb.; 4-in., 13 lb.; 5-in., 17 lb.; 6-in., 20 lb.

Junctions with lead pipes to be made with iron calking rings or brass nipples.

Lead.—Put in lead waste connections as specified in connection with fixtures. All to be of extra light lead pipe.

To be properly supported with tacks and screws.

To have adequate fall at all points. To be supported on strips of wood wherever necessary to prevent sagging.

All lead branches specified as being taken off above traps to be joined to upright pipes in a diagonal manner and to raise as fast as the space will permit.

All lead wastes to be smoothed at joints with particular care.

Furnish and set such water meter as the village or city ordinances may require, or, as the architect may direct.

House to be piped for gas on two separate systems from necessary elbows, junctions, &c., 4-in. P trap under slop sink and under porch connections if there are any.

Lay 6-in. trap in front with hand hole and pipe extended to within 6 in. of the surface of the ground and covered. Extend the roof water connections 2 in. above the ground.

Make connection with the sewer at curb. The building is located 30 ft. back of street line.

Cement the conductor pipes into the sewer in a neat and airtight manner.

Sewer to be laid and connected in accordance with the requirements of city ordinances and the pavement to be relaid without charge to the proprietor.

Hot Air Furnaces and Wall Pipes.

Registers to heat rooms and halls, as follows: Living room, dining room, kitchen, three chambers and bathroom on the first floor. Registers floor and wall as located on plans. Living room, dining room, kitchen, three chambers and bathroom on second floor. All wall registers as marked and located on plans.

Smoke pipe to be of galvanized iron, with end check damper, connected by chain to respective floors, in rear hall.

Draft door at ash pit to be also connected as smoke pipe check. Casing to be of galvanized iron outside and black iron inside, and have cone top filled with sand.

All wall pipes to be double tin with air space as per State and city laws. All floor register boxes to be double tin boxes and all right angle elbows to be round. All registers connected to the furnaces with bright tin pipes wrapped with asbestos paper.

Cold air to feed from outside, through air pits and ducts, which mason contractor is to build.

Carpenter contractor to do the cutting for pipes and registers and build the wood air boxes.

The furnaces to be guaranteed to heat rooms and all halls that have registers to 70 degrees F. in zero weather.

Electrical Wiring a Two Family Dwelling for Light and Call Bell.

All work specified, listed or shown in these specifications, and all work necessary to the complete finish of the work so described or shown is to be executed in a thoroughly substantial and workmanlike manner.

All material used and work done under these specifications must be in accordance with the approved rules and regulations of the National Electric Code.

The contractor is to give his personal superintendence and direction to the work, and he is to furnish all transportation, labor, material and utensils needful for performing his work in the best manner according to the true intent and meaning of these specifications.

The contractor shall give to the proper authorities all requisite notices relating to the work in his charge, and be responsible for any accidents resulting from either contract or extra work under his charge.

The contractor shall at all times cover and protect his work, and the materials to be used therein, from damage by weather or otherwise, and shall repair and make good any damage thus occurring.

Outlets or hardware not listed in the schedule will be installed by the contractor only on the written order of the purchaser, who agrees to pay for such extra work.

All wires must be concealed between the floors and walls.

The entire work must be done in accordance with the approved rules and regulations of the National Electric Code.

The contractor must pay the cost to the purchaser of a certificate of approval from the inspection bureau.

The contractor must provide and install hardware, as described under the schedule.

The contractor must provide and install all necessary cut outs. All cut outs to be located in a cabinet. Cabinets to be lined with asbestos and finished to match existing woodwork.

The contractor must provide and install all drop lights complete without lamps.

The contractor must run two wires from the point where the service enters the building to the center of distribution, and make all necessary provisions for the installation and connection of meter.

The purchaser must locate all outlets for fixtures, switches, receptacles and drop cords before wiring is started.

Schedule.

The house to be wired on two separate systems with meters and distributing boards located in basement.

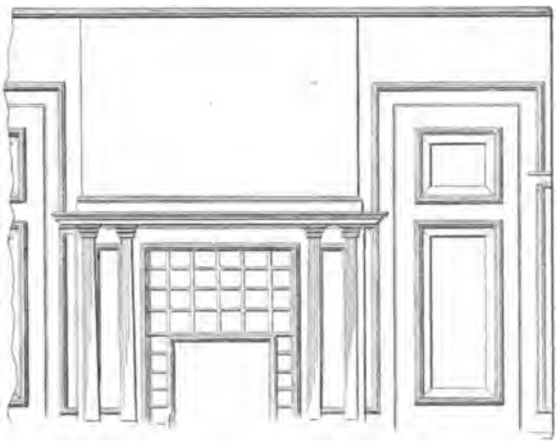
First Floor Apartments.

Three drop lights in basement, with rosettes, sockets and cord, one controlled by snap switch in rear entry way. Two porch ceiling lights. Front porch controled by flush switch in vestibule. Rear porch controlled by snap switch in rear hallway. One ceiling light in front entryway, controlled by flush switch in entry hall. Three side lights in living room and one base outlet with flush receptacle. One ceiling outlet in dining room for three lights, controlled by flush switch in dining room. One side light in dining room. Two side lights in kitchen. One side light in hall. One side light in bathroom. Three side lights, one in each of the chambers. Three ceiling outlets, one in each of the chambers. One side light in rear entryway. One drop light in attic.

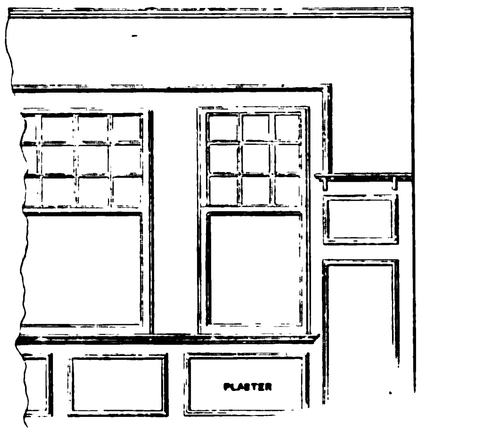
Second Floor Apartments.

Three drop lights in basement, with rosettes, sockets and cord. One controlled by snap switch in rear entryway. Two porch ceiling lights. Front porch light controlled by flush switch in front entryway. Side porch controlled by snap switch in kitchen. One ceiling light in front entryway controlled by three-way flush switch. One ceiling light, second floor front hall, controlled by one three-way flush switch. Three side lights in living room. One base outlet with flush receptacle in living room. One ceiling outlet, with three lights in dining room, controlled by flush switch. One side outlet in dining room. Two side outlets in kitchen. One side outlet in rear hall. One side outlet in bathroom. Three outlets, one in each of the chambers. Three ceiling outlets, one in each of the chambers. One side outlet in the hallway, rear first floor, controlled by flush switch in rear upper hall. One drop light in attic.

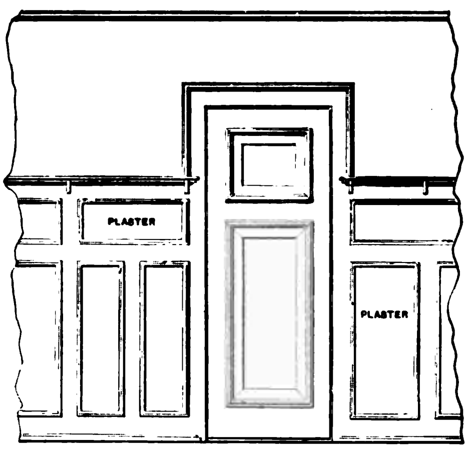
First and second floors to have door bells, both on front and rear doors, indicating on buzzer and bell located in



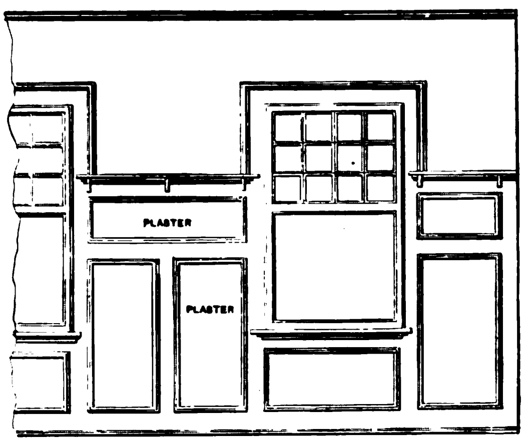
Mantel in Dining Rooms.—Scale, ¼ In. to the Foot.



Window and Panel Work in First-Floor Dining Room.—Scale, ¼ In. to the Foot.



First and Second Floor Chamber Doors and Panel Work.—Scale, ¼ In. to the Foot.



Second-Floor Dining Room Windows and Panel Work.—Scale, ¼ In. to the Foot.

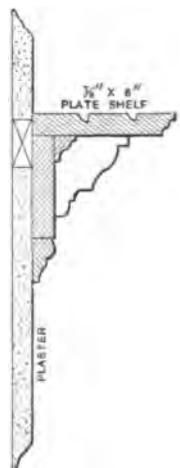


Plate Rail.—Scale, 1½ In. to the Foot.

Miscellaneous Constructive Details of Competition in Two-Family Houses.—Third Prize Design.

..tchens. Wired on two separate circuits with two dry cells located in basement.

Estimate of Cost.

The estimate of cost furnished by the author is as follows:

Excavations at 13 cents per yard sand $40.00

Mason work and material, brickwork and material, concrete work and material 1,020.00

Material—

Concrete blocks, 8 x 12 x 24, 18 cents each; common brick, $6.25 per 1000; shale wire cut face brick, $11 per 1000; sawered stone coping, 50 cents per cubic foot; Portland cement, $1.70 per barrel; sand, 60 cents per cubic yard.

Labor—

Mason, 40 cents per hour; helper, 20 cents per hour; stone cutter, 45 cents per hour; concrete cellar bottom, 6 cents per foot for labor and material.

Carpenter work and material, including doors, windows, inside and outside finish and floor scraping.. 2,860.00

Material—

Rough lumber, $22 per 1000; finishing lumber, $53 per 1000; flooring, yellow pine, $28 per 1000; flooring, oak, $44 per 1000; cypress, $48 per 1000; slate, $4.80 per square, unlaid.

Labor—

Carpenters, 35 cents per hour; slaters, 35 cents per hour; slater helpers, 20 cents per hour; estimate for doors, window and inside finish is $710, which is included in above $2,860.

Plastering work and material 380.00

Material—

Lath, $4.75 per 1000; mortar, $4.75 per ton; lime, 18 cents per bag of 40 lb.; plaster, per barrel, $1.70.

Labor and material in place, 22 cents yer yard.

Lathers, 40 cents per hour; plasterers, 40 cents per hour; plaster helpers, 25 cents per hour.

Painting, work and material 190.00

Material—

Varnish, $1.30 per gallon.

Labor—

Painters, 30 cents per hour; outside painting, 15 cents per yard; inside finishing, 20 cents per yard.

Plumbing, sewering and gas fitting 380.00

Labor, 55 cents per hour; helper, 22 cents per hour.

Iron and tinwork, labor and material 75.00

Material in place—

Galvanized iron gutters, 13 cents per foot; tin valleys, 9 cents per foot; galvanized iron ridge, 11 cents per foot; conductors, 10 cents per foot.

Heating furnaces, labor and material, installed 170.00

Electrical work, material and labor 85.00

Hardware, rough and finishing 125.00

Mantels and grates, two installed 60.00

Total $5,385.00

Recapitulation.

Excavations	$40.00
Mason work and material	1,020.00
Carpenter work and material	2,860.00
Plastering work and material	380.00
Painting work and material	190.00
Plumbing work and material	380.00
Iron and tinwork, work and material	75.00
Heating furnaces, work and material, installed	170.00
Electric work, installed	85.00
Hardware, rough and finishing	125.00
Two mantels, installed	60.00
Total	$5,385.00

The builder's certificate was signed by Edward C. Flanigan, 742 East Ninety-ninth street, Cleveland, Ohio.

EVIL EFFECTS OF COMPETITIVE BUILDING.

IN a paper read at the annual meeting of the Estimators' Club at Chicago, dealing with the subject indicated by the above title, George C. Nimmons, one of the leading architects of the city named, expressed the following views:

I do not know of anything more important in connection with the erection of a building than the contract. Our interests all center in this document and by its terms we assume obligations which bind us all together for the accomplishment of a common purpose. There is, perhaps, no one who has a better opportunity than an architect to observe how well a contract accomplishes the purpose for which it was made. I, therefore, propose to discuss briefly the modern building contract and the effect which competitive bidding has upon it.

We have seen in our time the greatest advancement in building construction in some respects that the world has ever known. With the advent of the new building material, structural steel, and its accessories, the invention of the elevator, and the various things that have made this great progress possible, the problem of erecting a building has become one of great magnitude and responsibility. Yet, with all this advance in the methods of construction, little or no improvement in the contract has come, or of the method of letting the contracts, notwithstanding the fact that a contract nowadays may involve immense sums of money and great difficulties and problems of construction. Some contracts not only involve the execution of work in a manner never done before, and with which no experience has been had, and again some not only require great feats of construction in an almost inconceivable short space of time, but they may also be accompanied by unusual danger and even loss of life. With all of this to contend with, we make use of an old system of letting our contracts, which in my opinion may be questioned and discussed with much profit.

Competitive Bid Contract.

Of the three kinds of building contracts, the percentage contract, the fixed profit contract and the competitive bid contract, I will discuss the competitive bid contract, because it is the one generally used. Nearly all of the discussion which follows applies as well to separate contracts as to a general contract, but, for the sake of brevity, the application is made only to a general contract.

In considering, then, this important subject, I desire to direct attention to several leading questions concerning our system of letting contracts.

1. Does our present system of letting contracts by competitive bids result in securing for the owner the lowest obtainable cost for a building, consistent with good workmanship?

On the surface of this proposition, it would appear that an owner always did get his building at the lowest possible cast, or sometimes below that, by competitive bids. I suppose that most of you can cite at least one instance where you have suffered loss on a building through unfortunate circumstances over which you had no control, or through some other cause. Each time, however, that a contractor loses money on a job, makes him more conservative on the next building and makes him realize how full of risk and hazard a contractor's bid is. Consequently, the amounts allowed in an estimate for contingencies are much larger than they would be if there were not so much risk of financial loss. It is undoubtedly also the case that the various profits of subcontractors and material men vary greatly in proportion and amount. It sometimes happens that the contractor will lose money and many of his subcontractors make more than the average profits on the same job, and if one contractor or general contractor loses money, it does not follow that the building was built for less than the real cost; that is, the actual cost, plus a reasonable profit for all contractors.

Compiling Sub-bids.

In compiling the subbids which a contractor is required to get before making up his own bid, I do not believe that it ever happens that any one contractor ever succeeds in getting all of the lowest subbids that may have been offered on a particular building, nor does he succeed in getting them even if he gets the contract. As a result of our present system of letting contracts, there is scarcely a contractor who has not at some time in his experience been obliged to exercise the most rigid and severe economy, to the great displeasure and disapproval of his subcontractors, who were in no way responsible for his signing a contract in which both he and they were subjected to loss. This has naturally brought about a condition in which most of the subcontractors and material men have their particular friends and favorites, to whom their lowest prices only are given.

The bidding on a large building involves the securing of prices on different products and materials from a great many sources. It may extend from the manufacturer down through the hands of many intermediate dealers, to the origin of the raw material. It may involve hundreds of people. All of these dealers and subcontractors are obliged to expend thousands of dollars yearly in taking off quantities and making figures on plans from which they do not get a dollar in return. The amount of useless work done yearly in this country in that way must be an astonishing amount, if it could be computed. The result of it all is, that the contractor and dealer add to their bids the expense of all this wasted labor and the owner pays for it. Here is a great waste going on constantly which increases the cost of building by reason of our system of competitive bids.

The amount added to bids for contingencies are very considerable. Contractors must of necessity safeguard themselves in their bids, not only against troubles which may not occur with materials, but also against labor troubles, which are sometimes very expensive. The uncertainty at times of prompt delivery of material by railroads, when time is the essence of the contract, often makes the purchase of expensive stock material a necessity. The lack of space to handle material in the congested part of a city is at times a matter entirely problematical as to cost, and here again a contingency item must be added.

The extensive builders' equipment, needed for a modern building, cannot sometimes be closely calculated as to cost, on account of new and complicated forms of construction, which often occur in the construction of a building. These, and other causes of uncertainty in the cost of building construction, are usually allowed for by the contractor in his bid, at a cost greater than what they actually do amount to in the construction of the building.

The taking of competitive bids is a complex and intricate process. The theory of a sealed proposal is beautiful and the practice of it originally may have been ideal. But now, a sealed proposal is based on prices and information that may come from a hundred different sources and the proposition is entirely different from what it must have been originally. The complications that may arise, the opportunities that may occur for loss for some and immodest profits for others, are very great. The very nature of our system nowadays invites and encourages the opposite of that for which it was intended, and I firmly believe that the result of competitive bidding, as a basis on which to let a contract, does not as a rule result in securing the lowest possible cost for a building.

Risks in Signing Contracts.

The undue financial risk and hazard connected with signing the average building contract are harmful influences which make themselves felt all through the operation of erecting a building. Of course, it is not denied that there is risk or chance in every business transaction. Risk cannot be done away with in building contracts, but it is very evident from the results of our method of letting contracts and from the great difference in the amounts of the bids, that an undue amount of risk is taken with the average building contract. The contractors themselves do not agree with any accuracy as to what the cost of a building is. The bids often vary several times the amount of the contractor's profit. They *know* that they do not know, and the minute a contractor signs a contract for an important building, he assumes a responsibility far greater than the merchant or manufacturer does in his business. I believe the risk of a contractor for financial loss is far greater than was ever intended by that genius who first said "competition is the life of trade."

Competition in building is not that kind of competition; it is really speculation, and sometimes on account of the complication and difficulties of our modern construction, it is far more hazardous than buying margins on the board of trade. It is a gamble, pure and simple. When you think of it, and when you consider that the building industry was the first made use of by man, to build his shelter and home, and when you think that the building industry is the most important one of civilization, it does seem to be a great wrong that we, by the use of an antiquated system of competition, should make of this noble calling a gamble and speculation. There is no calling on earth that better deserves its reward than the building industry.

Under our present system, a contractor, as a rule, is selected, first of all, on a basis of the lowest bid. Considerations of a man's integrity, his ability or character, have very little to do with it; if there is any great difference between the bids. With the architect present to sort of police the job and see that nothing is missed, the owner is usually willing to fight it out along these lines.

Outcome of the System.

It is greatly to be regretted that this state of affairs exists, but it seems to be the only natural outcome of our system. When a contractor secures a contract under these conditions, his responsibility is very great, and on this account, his anxiety naturally has the effect of shaping his methods of procedure, all to one purpose. This has an evil influence on the work and on all those connected with the construction of the building. The effect of this unhealthful condition of affairs tends to preclude any thought of the permanency and excellence of the work, beyond that required in the contract. It extends to all the workmen and discourages thoughts or ambitions of good craftsmanship on their part. Who among the tradesmen have time to consider that a brick skillfully bonded at some critical place, might add years of endurance to a wall, or that a nail driven on a slant might hold a piece of lumber far longer in place, or that a bit of paint added in some concealed place might make a piece of metal last twice as long? Why is it that the good, old fashioned ways of bonding brick, such as our forefathers learned in England, have given way to the modern way of throwing brick into a wall, which often goes with hollow spaces and weak places in it, in spite of the most rigid inspection? Why is it that the old-time method of mortising and doweling timber, which went to make up the strong and rigid framework of our houses, has given way to the modern system of so-called balloon framing, where there is hardly a mortise or tenon to be found? What is it that is influencing our methods of construction and in some respects making them far inferior to the old time ways? There is an influence from some pernicious cause doing this. It is not that our tradesmen are incapable; it is beyond question, traceable largely back to one cause, and that cause is competitive bidding. Competitive bidding allows no time under the contract for improvement in craftsmanship. All the skill and all the art of the workman are devoted to one and only one end, and that is speed. Speed at the expense of endurance or merit, or art in the work.

One of the effects of our present system to be considered is the effect which it has on the relation between architect and contractor. Under our uniform contract the architect acts as the agent of the owner and is supposed to furnish the contractor a complete guide in the plans and specifications from which to erect the building. The architect has conceived the building in his mind and drawn out this conception on paper, so that others might be able to translate this mental image into stone, or brick, or other material. The contractor and his workmen are supposed to be co-workers with the architect, working all together for the good of the building; first, to fortify it against time, its worst enemy; to build it economically, so as to make it best serve the purpose for which it was created, and to make it beautiful as a whole and in every part, so that it may take its proper place in the world as a welcome addition to the buildings of its time.

The architect, the contractor and all his men should naturally be drawn closely together in a sympathetic bond of common endeavor, just as they used to be in olden times, way long ago, when they made those beautiful carvings and did that exquisite workmanship which we have never since equaled.

(To be continued.)

ONE of the first of the concrete loft buildings erected on the Island of Manhattan, N. Y., has just been completed in West Fifty-second street for a firm of plaster contractors. The building covers an area 50 x 90½ ft., and was designed by William C. Lewis, architect, 13 Astor Place. The structure is 10 stories in hight and was erected in record time.

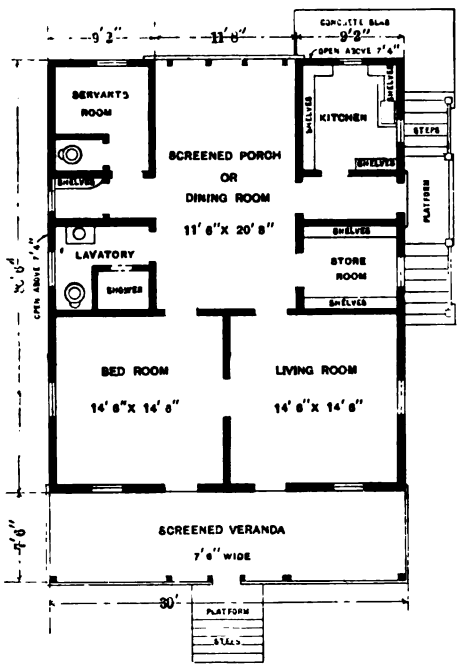
DWELLING HOUSES IN THE PANAMA CANAL ZONE.

(With double supplemental plate.)

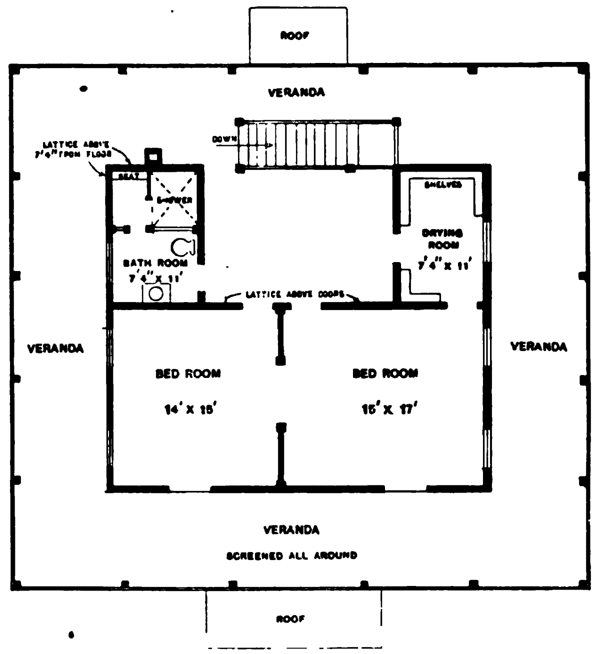
SO much of interest attaches at the present time to the work in connection with the construction of the Panama Canal that it may not be amiss to give our readers some idea of the character of the dwellings occupied by the officials and employees who are laboring for Uncle Sam in what may be described as the Canal Zone. It is probably safe to say that the skilled force now employed on the Isthmus is better housed, better paid and better fed than on any construction work ever before undertaken by the Government. The bachelors among the Americans live sometimes in separate houses and sometimes in large houses, the quarters being furnished free to all men both married and single. The quarters for the married people, however, are on the whole better than those for the single men.

By reference to the double half tone supplemental plate accompanying this issue a type of one-story one-family house will be seen in the upper left hand corner of the picture. It is known as Type No. 17, and according to the figures available cost about 15½ cents per cubic foot. In the picture immediately below is a view of the dining room in a house of this character. The screened porch or veranda is often used, as in the present instance, for a dining room, the screening being of brass or bronze wire placed on the outside so that the woodwork may be cleaned from the inside. An idea of the arrangement of the rooms of this type of house may be gained from an inspection of the floor plan presented herewith.

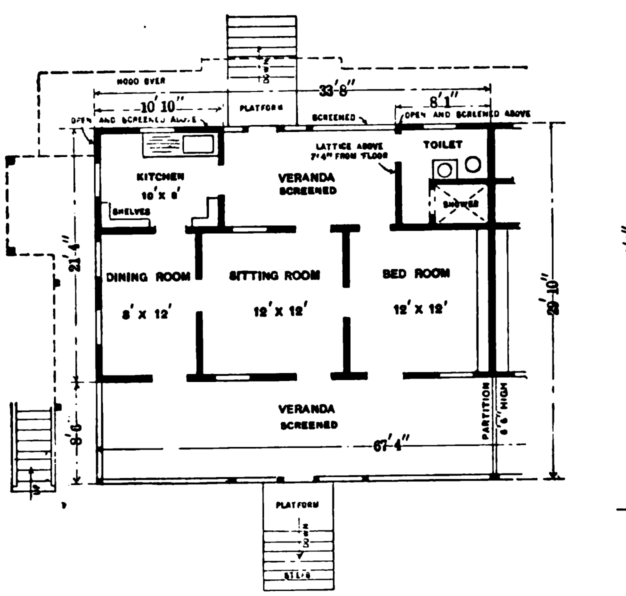
Another popular type is the two-story four-family house, known as Type No. 14, the plan of which is shown herewith and a general view in the lower central picture of the half tone supplemental plate. The plan



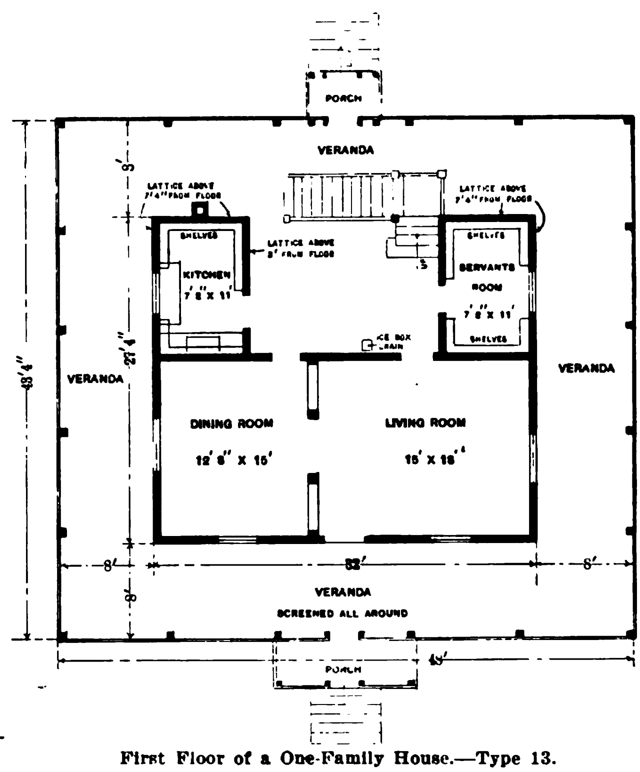
Floor Plan of a One-Story Single-Family House.—Type 17.



Second Floor of a One-Family House.—Type 13.



One-half of First Floor of a Two-Story Four-Family House.—Type 14.



First Floor of a One-Family House.—Type 13.

Dwelling Houses in the Panama Canal Zone.

shows simply one-half of the first floor, the second floor being similar. There have been over 140 of these houses erected at an average cost of something like 14 cents per cubic foot. The buildings are carried by 6 x 6 or 8 x 8-in. posts resting on a 12-in. concrete cube supported on footings usually about 2 ft. square and 1 ft. thick. All the foundation posts and sills resting on them are creosoted or tarred to keep out the ants. All doors are small and as few as possible, every precaution being taken to keep mosquitoes out of the houses.

The walls are covered on the outside with drop siding and inside they are made of matched and dressed ceiling boards placed vertically. The ceiling is finished the same as the side walls. Where it is practicable to do so, especially in kitchens and bath rooms, the upper part of the walls is left open for ventilation and protected from the rain by galvanized iron hoods. An examination of the floor plans will show several places where this form of construction is indicated. The roofs of the buildings are galvanized iron and the windows are of the casement type, opening in, while the blinds open out. Where a window is not protected by a veranda the blinds are omitted and fixed screens are used so as to prevent the screens being left open.

Another type of one-family house is the two-story structure shown in the upper right hand corner of the double supplemental plate, and known as Type No. 13, the plans being presented herewith.

Each family is supplied free of charge with a range, a double bed, two pillows, two kitchen chairs, six dining chairs, a chiffonier, two center tables, a mosquito bar, a refrigerator, a double mattress, a dining table, a sideboard, a dresser, a bedroom mat, and three wicker rocking chairs. The Commission also furnishes water, ice, fuel and light free.

The skilled men without families live in quarters such as are indicated in the lower left hand picture of the supplemental plate, where is also shown the Chief Engineer's residence and the Administration building.

Referring further to the half tone plate, the upper building in the central row is the Y. M. C. A. club house at Culebra. Immediately below it is the Isthmian Canal Commission hotel at Gorgona, while the bottom picture shows four-family houses, known as Type No. 14, located at Culebra, with the school house in the extreme background. As already stated the upper right hand picture on the plate represents dwellings of Type No. 13, while immediately below it a view of the mess hall for the European laborers at Gold Hill, and in the lower right hand corner is a view of typical family quarters for negro employees.

The hotels usually have two dining rooms, one where the employees are allowed to dine with their coats removed, while in the other they are obliged to keep them on. The rooms are clean, comfortable and airy, with mosquito screens around the outer piazza. Usually all hotels on every Saturday night are turned into club houses where the American officials, school teachers and various employees appear with their wives to enjoy the dancing and singing.

These buildings are provided with an equipment of sanitary fixtures equal to those used in this country instead of the make-shift methods formerly employed.

For recreation and amusement of the men the Commission has constructed four club houses. In each case there is a front building 133 x 45 ft. in area and two stories in height connected with a rear building of one story. The front or main structure contains a social parlor, a billiard and a reading room on the first floor, and on the second floor an assembly hall 67 x 27 ft. in plan, free from any columns to break the dancing space. The rear building having a ground area of 100 x 28 ft. contains double bowling alleys 100 ft. long, a gymnasium 52 ft. long, shower baths and over 100 single lockers.

The architect of the buildings here shown was P. O. Wright, Jr.; the master builder was W. M. Belding, and the plumbing was installed under the direction of C. L. Stockelberg, superintendent of plumbing in the Canal Zone.

ONE of the results of the reaction in general business and the gradual improvement in the mortgage loan situation has been an increasing tendency in New York City to build warehouses for the storage of goods which are being shipped to jobbers by out of town manufacturers, the cost of such buildings is inconsiderable, as practically no equipment is needed beyond freight elevators. The favored neighborhood for the new storage warehouses is the lower west side, which is convenient to transportation, and where land values are low.

A Residence of Unique Construction.

A palatial residence is at present in course of erection on Boulevard Lafayette, just north of 181st street, Borough of Manhattan, N. Y., which when completed is destined to be one of the features of attraction to visiting builders and others who may possibly be interested in unique construction. The boulevard at this point is about 125 ft. above the Hudson River, while from the curb line of the boulevard to the terrace at the first-floor level of the mansion will be an additional 80 ft., so that the structure will occupy a position considerably more than 200 ft. above the river. The mansion or "castle" as it is to be called owing to its general appearance to one of the castles of Feudal days, may be entered through an underground passage extending partially under the front of the structure. A rise of about 15 steps from the boulevard will bring one to a landing ornamented with a fountain and from this landing flights of steps to the right and left will lead to the first terrace from which a tunnel will strike directly into the side of the hill and extend to a point under the center of the house, a distance of about 75 ft. This tunnel or subterranean passageway will have a gradual ascent so that it will reach the basement of the building. Here in a sort of sub-basement will be a mushroom vault for propagating the succulent fungi and in the corresponding position on the other side of the underground passageway will be the wine cellar.

The greater portion of the basement, however, will be given over to a Turkish bath with dressing rooms, two hot rooms of different temperatures, rubbing rooms and a swimming pool 9 x 28 ft. in size, for which water will be pumped up from the Hudson River. A grill room and lounging room will also be provided on the basement level. In the center of what may properly be called the ground floor, although it is 80 ft. above the street level, will be the main hall, 20 ft. square. Opening off this will be the parlor, library, music room and the owner's den, in connection with which there is to be a chamber. Each one of these rooms is to be finished in distinctive style—the parlor in Louis XV; the dining room in Colonial; the library in Oriental and Japanese, and so on through the building.

In the gallery on the second floor of the castle will be a $7000 organ, which will operative automatically at certain hours by a large unique clock in the entrance hall. The clock will also be connected with a set of chimes in the castle tower, which will announce the hours and half hours.

On the second floor will be a main chamber, 18 x 20 ft. in size; two additional sleeping rooms; a nursery and a sewing room. An unusual feature in connection with the sleeping rooms will be that none of them will be reached directly from the hall, but through a vestibule. The third floor on the boulevard end of the structure will be devoted to an immense banquet hall and ball room, which with a lobby and salon will cover a space approximately 50 ft. square, and will have a ceiling hight of 20 ft. Opening out on two sides of the banquet hall will be balconies with a large billiard room at the northeasterly corner of the building on the same level.

Over the easterly half of the building the roof will be converted into a large garden, but it will be no ordinary roof garden. At one side will be an aviary, and nearby will be a solarium. A large space has been reserved for a conservatory. The space between Northern avenue and the castle, with the exception of a small plot to be occupied by a stable and garage, will be laid out as an Italian garden, about 80 x 150 ft. in size. Beneath the garden along the southerly edge of the plot will be an underground passage known as the service tunnel, reached by a short flight of steps from Northern avenue and leading directly into the kitchen and servants' quarters in the basement.

This new house is being built by Dr. Charles V. Paterno, president of the Paterno Construction Company, and has been designed by Architect John C. Watson. It will be called "Castle Paterno," and will occupy a site about 80 x 275 ft running through from Boulevard Lafayette or Riverside Drive, as it is now known, to Northern avenue. It will involve an outlay of at least $500,000, and the entire structure together with all of the necessary retaining walls and approaches will be of white marble. At every point it will be built up from the solid rock, which all over this westerly slope of the Fort Washington Ridge is only a few feet below the surface.

Construction of a Small Cold Storage Building.

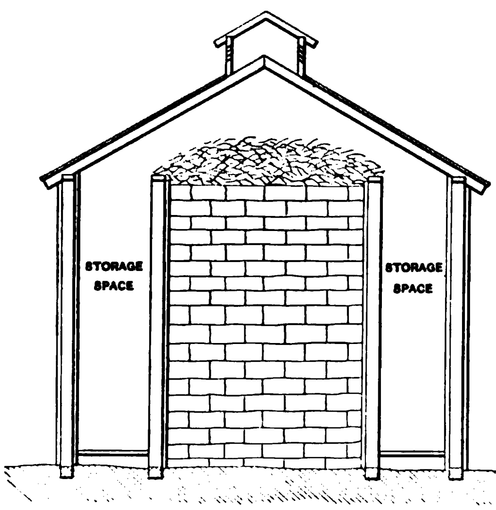
Questions are constantly arising as to the proper construction of buildings or rooms intended for cold storage purposes and with a view to obtaining exact data and designs relating to this subject the *American Poultry Journal* recently inaugurated a series of competitive articles which proved of unusual interest to its readers. The first prize was awarded to J. E. Bridgman and as it covers many points of general interest to those having occasion to make use of a structure of the character indicated we present it with the accompanying drawings herewith.

The only really satisfactory means for keeping eggs and poultry meat is cold storage. The system is working a revolution in the trade, tending to equalize prices and increase demand. In course of time the difference between spring and winter prices will no doubt be far less than at present. Meanwhile there is a good profit in holding stored eggs. A commission man and buyer lately remarked to the writer that farmers and poultrymen could secure this profit themselves by putting up small storage plants on the plan of co-operative creameries, and selling the product at the right season to the retail trade. This design for a storage plant has been successfully used, so it is not a theory, but a practical proposition. A town of 1000 or more people would furnish ample scope for an enterprise of this kind. And the crop of ice is often found at the farmer's very door. As with many other gifts of nature, however, its very abundance causes it to be disregarded.

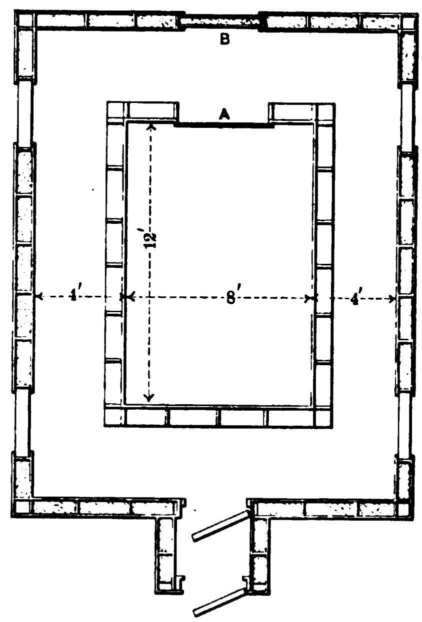
The plant here shown could be used a part of the time for fruit &c. The plan is for storage, which, of course, is not expensive and is now in successful operation. The ice room is 8 x 12 in the clear, being started with a 6 x 6-in. sill laid in a trench 3 in. deep. After sill is laid in the ground, dirt is pressed in solidly, so as to leave no opportunity for air to enter in at the bottom—a very important point.

The studding of the inner room is 2 x 8, 12 ft. long, set 24 in. from center to center, having a plate the same size spiked on top, the inside of the studs being sheathed with any rough lumber clear to the top, except at A, where one stud has been left out, leaving an opening through which ice is passed while filling the house. This opening is stopped with boards simply laid in as the house is filled. The top of the ice should be no higher than the plate and be covered at least 18 in. deep with hay, straw or sawdust well packed down. The outer wall is of 2 x 4 studding, 12 ft. long, set in the ground same as the inner room, but carefully sheathed on both sides with good, tight boards, and the space filled with sawdust clear to the plate.

The outside is finished with drop siding, having a thickness of heavy tar paper between siding and boards. At B the inner sheathing boards project 1½ in. beyond the studs, and other loose boards are cut to fit between the studs. When the ice is all in, these boards are laid up and the space between tightly filled with sawdust.



Cross Section.



Plan.

Construction of a Small Cold Storage Building.

This opening is used only to fill ice chamber. About 35 tons of ice can be put in this house, which will be sufficient to last until cutting time another year.

The entrance door is double; that is, a vestibule is built out so that door can be closed when coming out, thus avoiding warm currents of air in the cooling room. The 4-ft. space for storage should be floored over 6 in. above the ground sill. This provides ample room for meat, butter, eggs, fruit, &c. It is well to remember that eggs must not be held at a lower temperature than 40 degrees above zero.

The roof is hipped and provided with a ventilator with slats arranged to open or close at will, but should never be closed tight, as fresh air should always have more or less access to the top of the ice. The roof is covered with felt roofing and the entire building should be painted white two or three coats. The cornice is made with 8 x 8-in. holes in the soffit and provided with a board to close and open, thus perfecting the ventilating arrangement. Windows on both sides are tightly fitted with double sash and set so as to light the end passages.

A box drain is laid in the ground, made of 2 x 8-in. stuff and should project 4 ft. beyond the outside wall. At each end a pit should be dug and filled nearly to the top with small stone, then an armful of straw. Fill last 5 or 6 in. with dirt well rammed down.

Use no flooring in the ice chamber. Lay the ice on the ground.

Carpentry and Building

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(Entered at the New York Post-Office as Second-Class Mail Matter.)

JULY, 1908

The New Municipal Building.

The jury of architects selected to pass on the competitive designs for the new Municipal Building and Bridge Railroad Terminal, which is to be erected on the site bounded by Park Row, Duane and Centre streets, recommended the acceptance of the plans drawn by McKim, Mead & White, the well-known New York architects. The peculiar shape of the lot made the architectrual problem as well as the problem of light and air an unusual one, while for the first time in the history of building in the city a street will be arcaded for the distance of an entire block, Chambers street extending through the structure from east to west. The building will be 23 stories in hight, and the estimated cost is placed at about $7,000,000. The two lower stories and the basement will constitute a terminal station for the trains and trolley cars crossing Brooklyn Bridge. The greater portion of the city departments will be grouped in the new structure, 11 floors being occupied by them. The design for the building is after the French Renaissance style, which will be in keeping with that of the Hall of Records, the Court House and the City Hall, all of which are in close proximity to the new Municipal Building. The structure has been so designed that all the light is direct and no interior courts whatever occur. That part of the first floor devoted to the subway stations is accessible directly to a large number of entrances unincumbered with steps, the balance of the floor being coincident to that of the sidewalk. The corridors containing the staircases and elevators for the office floors are also directly accessible, both on the eastern and western sides, and form thoroughfares through the building. The frontage of the building, which will face on Centre street will be 448 ft.; on Park Row it will be 361½ ft.; on Duane street, 334¾ ft., and on Tryon Row, 71 ft. There will be sidewalks of 25 ft. on Park Row and Centre street, and 20 ft. on Duane street.

Industrial Schools and the Small Towns.

A law just enacted providing State aid for free industrial schools in Massachusetts establishes the right of a resident of any city or town in the State to attend an industrial school located in any other community and compels his residential city or town to pay his tuition fee. This wholly logical provision is designed to meet the wants of the young people of places so small as to be unable to support schools of this character. It is intended as a factor in the plan of dividing the State into districts, each with its industrial school supported in part by the State. With the fulfilment of the plan the new law should go far towards solving the problem of industrial training in communities where the children would otherwise be without its advantages. It is a just provision, for it would be manifestly unfair to use public money in extending privileges to residents of places important enough to bear part of the expense themselves, to the exclusion of those living elsewhere in the State. The only objectors, doubtless, will be towns so small and so poor as to grudge the tuition fees of their children. The principle of State aid for schools of this character is an excellent one. Their benefits are far from local to the places where they are situated. The students go out into the world to use the results of their training wherever it will reap them the most benefit. Not a few of the graduates enter the engineering schools and advance to higher work, which is generally more profitable to themselves and to the State and the country as well. Another important element in State aid lies in the encouragement which it gives to industrial education as a whole, helping to establish it as an accepted part of the school curriculum of every center of population, whether that center shall be a place of large size or a central point in a district from which the students will be recruited. In other words, the participation of the State gives impetus to a great movement the need of which is now being accepted generally as an essential part of the foundation of the country's future industrial welfare.

Industrial Colleges.

The idea seems to be strongly implanted that the industrial school proper should be developed to a point of complete efficiency and accessibility to students before the attempt is made to establish the so-called industrial colleges. The legislative bill in Massachusetts providing for the creation of a commission to investigate the subject has been vetoed by Acting Governor Draper, who states: "I do not think it is time for the Commonwealth to consider the erection of one or more of these colleges providing for a three or four years' course of extended training, before any industrial schools of similar character have been organized or started." In other words, the schools are considered the basis of the system of education. Once established, the industrial college, occupying an intermediate position between the industrial school and the polytechnic or engineering schools, would be a natural development of the system. Probably the idea is a correct one, that it is better to concentrate energies on the one branch of industrial education until it is perfected and established to cover the entire territory. The college would be an evolution from the school, and doubtless would be the better because of the experience gained in the interim before its actual foundation. The movement for this general branch of training is so strong, its acceptance has become so general, closing to a marked degree the old controversy between exponents of manual training and trade schools, combining in a sense the best ideas of each, that at no distant day the industrial schools of the United States will become as well recognized as an essential part of the general education system as the high school, college and polytechnic institution of to-day. Abroad the test has already been made, especially in Germany. We believe that few persons doubt the great direct benefits which have accrued to that country from this source.

New York's New Post Office Building.

The new post office building, which is about being erected in the Borough of Manhattan, N. Y., in accordance with the plans prepared by McKim, Mead & White, the architects, will be four stories high and the principal facade will consist of a row of Corinthian columns, terminated at the north and south ends by pavilions containing niches. This colonnade will correspond to the public corridor, which will extend the entire length of the facade. The facades on the 31st and 33d Street sides will be a continuation of the same motif, pilasters being used instead of columns, and they also will terminate in a pavilion at the west end. The entire floor space of the new post office building will be open and uninterrupted. Under the post office basement will be the tracks of the Pennsylvania Railroad, the site for the building having been purchased from this company. Arrangements will be made for the shooting of mail bags up and down to the train platforms below. This will result in a great saving of time and will enable most of the mail to be kept open considerably longer than at present is the case. By reason of its proximity to the mammoth station of the Pennsylvania Railroad Company, which will occupy the two blocks on the opposite side of Eighth Avenue, the design of the exterior has been carefully studied so that the two structures will in a measure harmonize, not only as regards style, but as regards material and scale as well. The site cost $1,660,000, and the bill introduced in Congress authorizing the Secretary of the Treasury to enter into contracts for the completion of the building limited the cost to $3,500,000.

Reinforced Concrete as a Fire Resisting Material.

A short time ago there occurred in the city of Dayton, Ohio, a fire which gave an opportunity to test the efficiency of reinforced concrete as a fireproof building material. It occurred in a factory where motor cars were made, and the main portion of the building was of mill construction and five stories and basement, adjoined by a reinforced concrete building, U-shaped in plan and six stories and basement in hight. The two buildings were practically made a continuous unit, as the walls of the brick building served as the boundary of the concrete building on the open side of the U, communication being afforded between the two buildings by doors on each floor. When the fire department arrived, the fire had extended over the entire fourth floor of the concrete building. The contents of this floor were destroyed, but the building escaped with slight damage. Through the absence of fire doors and the inability of the department to withstand the intense heat and smoke, the fire was communicated through an opening to the adjoining five-story brick building and was confined to the two upper floors. It was in this building that the greatest loss was sustained.

The report of the chief of the Dayton Fire Department brings out some suggestions as to proper reinforced concrete construction, from which the following is taken:

"The new building, being of concrete construction, aided us greatly in preventing the fire from wiping out the entire plant, as we were able to concentrate practically our entire force on the old building, it requiring but a small force to subdue the fire in the concrete building. In my opinion, there are a few points that the results of this fire have proved, namely:

"First: That the reinforcing steel should be covered with at least 2 in. of concrete, because the fire, having penetrated the lower inch of concrete, would have affected the strength of the structure had it not been for the rigidly attached diagonals.

"Second: That the finished cement surface should be put on when the floor is being laid, thereby forming a solid mass; because the finished surface was destroyed wherever the heat was intense, the slab underneath being uninjured.

"Third: We were hampered greatly in handling our ladders and several of our firemen had a very narrow escape from being injured or possibly killed by falling sashweights, and we were compelled to force into the building all window frames that had not already fallen before we could use our ladders to advantage. I would suggest that in the construction of a building an iron pipe be imbedded in the concrete for the weights to fall into, in case the window frames are destroyed by fire. If this plan were adopted in the construction of a building it would enable the firemen to reach the fire without endangering their lives and would assist greatly in reducing the fire loss."

Architectural Exposition.

The first annual National Architectural Exposition will be held during the week of September 14 to 19 at Madison Square Garden, New York City. By the combination and co-operation of all departments in architecture, engineering, painting, sculpture, the trades, manufacturing and craftsmanship pertaining to the construction, equipment and decoration of buildings as well as landscape and garden effects, this, it is stated, will be a radical departure from the usual form of exhibitions. The cement section will contain probably the largest collection of exhibits ever seen in New York City. Manufacturers of the newest and best in building construction and materials, in articles of equipment and decoration will be given an opportunity to present their products to the professions, the trade and the public by exhibition, demonstration and application. Raw material and manufactured goods entering into the construction of buildings, engineering effects, decoration, landscape and garden features will be shown. No space will be allotted to exhibits of ordinary character, which possess no special features of novelty, utility, originality or beauty.

Chicago's New Hotel.

Some of the more notable features in connection with the new La Salle Hotel, which is now being erected in the city of Chicago, and which are likely to interest builders especially are referred to in what here follows: It will occupy a frontage on La Salle street of 178 ft. and on Madison street of 162½ ft. It will be 21 stories in hight and will contain a volume of 7,000,000 cubic feet. which will make it when complete one of the largest hotels in this country, if not in the world.

It will be supported on 89 concrete caissons, ranging from 4 ft. to 10½ ft. in diameter, and extending down to bed rock, nearly 120 ft. below the level of the street. The load on top of the largest of these caissons will be approximately 4,000,000 lb. It will be of the modern steel skeleton frame fireproof construction, the weight of the steel work aggregating nearly 8000 tons. The steel truss over the lobby will have a span of 75 ft., will be two stories in hight and will support four column stacks, extending through 18 stories. The truss will weigh 105 tons. The material used in the facades will be red brick and limestone. The design of the building will be in the Louis XIV. style of architecture.

The main kitchen will be located in the basement and cover an area 100 x 186 ft. and be fitted with 16 separate ranges, steam tables and all other modern culinary appliances. It will be equipped with an ice machine capable of making 15 tons of ice at a time. A smaller kitchen, 40 x 75 ft. in size, will be located on the nineteenth floor, next to the large banquet floor. The hotel laundry will be located on the twenty-first floor and will occupy a floor area of 7000 sq. ft. In this story will also be separate sewing rooms, upholstery rooms and painting rooms, as well as a whole carpenter shop and a printing room for printing menu cards and other matter.

The plumbing contract will probably be the largest of its kind ever awarded in the city, as it will involve the equipment and connections of 662 private bathrooms besides large public toilet rooms for use of guests and others for use of employes. The building will contain 45 miles of electric light and power cables, 60 miles of conduit tubes, 20 miles of telephone wire and 20,000 electric lamps of 16 candle power each.

FRAMING DOMES, PENDENTIVES AND NICHES.—V.

By C. J. McCarthy.

As the elliptic curve figures conspicuously in the work described in this article, as do also the parabolic and hyperbolic curves, when a conical roof is cut by the plane of another roof or by a perpendicular wall, I do not feel that it would be out of place before closing the article to present a few practical hints on conic sections, the method of describing the curves and the rules for finding their lengths and areas, as the information may be of benefit to those workmen who are interested in the study of this very useful branch of practical geometry. The columns of *Carpentry and Building* constitute a channel through which a large number of workmen may be more easily reached than any other on account of its large circulation among mechanics engaged in the building industry, especially carpenters. The methods and rules herein set forth have not originated with the writer and have been acquired by him from the works of old reliable authors and master builders, and he has proved by experience that they are as nearly correct as general practice requires.

Conic sections are figures which are formed by the intersection of a cone with a plane, either perpendicular, horizontally or obliquely. Five different figures are produced according to the different positions of the cutting plane—namely, a triangle, a square, an ellipse, a parabola and a hyperbola. The term "conic sections," however, is properly applied only to the three last named figures. If the cone is cut by a plane passing through the vertex to any part of the base the section will be a triangle, as V H G in Fig. 42. If a cone is cut by a plane parallel to its base and making no angle with it the figure of the section will be a circle, as *h g*. If the cutting plane passes obliquely through the cone at any angle to the base less than the side of the cone the figure of the section will be an ellipse, as *i k* and *l m*.

If a cone is cut by a plane in a direction parallel to one of its sides, and standing at an angle with the base of the cone equal to that of its side, the section will be a parabola, as P *b* A *c* in Fig. 43. If the cutting plane makes a greater angle with the base than the sides of the cone the section is called a hyperbola, as A C D in Fig. 44, and if the plane be continued to cut an opposite cone the latter section is called the opposite hyperbola, as B E.

The vertices of a conic section are the points where the cutting plane meets the opposite sides of a cone or the sides of the vertical triangular section, as A and B. The ellipse and the opposite hyperbola therefore have two vertices, but the parabola has but one, unless the other be considered at an infinite distance.

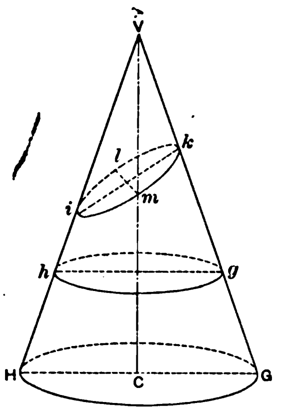


Fig. 42.—Cone Cut by Three Planes.

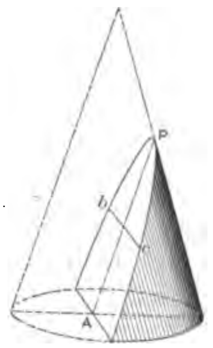


Fig. 43.—Cone Cut to Form a Parabola.

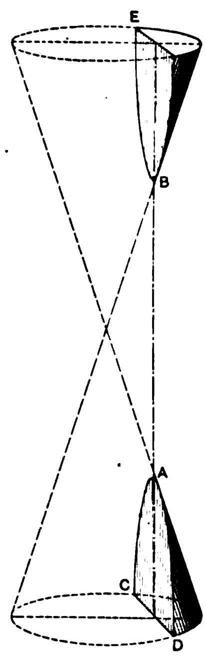


Fig. 44.—Cone Cut to Form a Hyperbola.

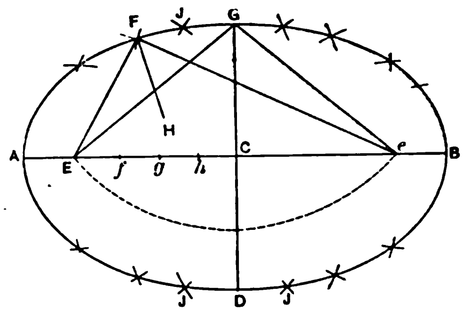


Fig. 46.—Method of Describing an Ellipse.

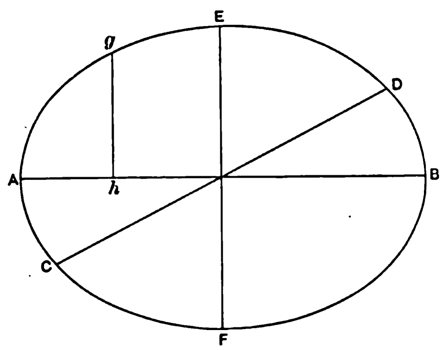


Fig. 45.—Diagram Showing Various Elements in Connection with an Ellipse.

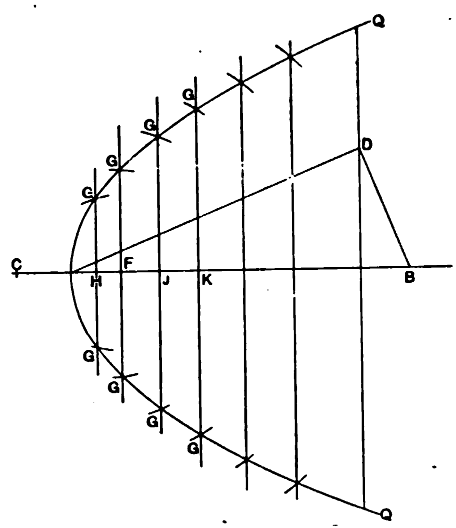


Fig. 47.—Diagram Showing Manner of Constructing a Parabola.

Framing Domes, Pendentives, and Niches.—V.

The major axis or transverse diameter of an ellipse is the line or distance A B, as in Fig. 45. Between the vertices and the middle point of the transverse diameter is the center of the conic section. A diameter is any right line drawn through the center and terminated on each side by the curve, while the meeting points of the extremities of the diameters with the curve are its vertices, as C and D. The transverse diameter of a hyperbola is that part of the axis intercepted between the vertices of the opposite sections.

The conjugate, or minor, axis is a line drawn through the center of the section perpendicular to the transvers, or major, axis, as E F.

An ordinate is a line perpendicular to the transverse axis, as *g h*.

An abscissa is that part of the axis A *h* between the ordinate and the vertex.

The parameter of any diameter is a third proportional to that diameter and its conjugate axis.

It will appear from these definitions that the conic sections are in themselves a system of curves naturally allied to each other, and that one is changed into another by increasing or diminishing it. Thus the curvature of a circle being increased or diminished ever so little passes into an ellipse; also, the center of an ellipse going off infinitely and the curvature being thereby diminished, it is changed into the parabola. And again, the curvature of the parabola being changed ever so little produces the first of the hyperbolas, the innumerable species of which will arise in graduation by a diminution of curvature until at length the last hyperbola will end in a right line. Whence it is manifest that every regular curvature like that of a circle from the circle itself to a right line is a conical curvature and distinguished with its peculiar name according to the degree of curvature. In short, a circle may change into an ellipse, the ellipse into a parabola, the parabola into a hyperbola and the hyperbola into a plane isosceles triangle. The center of the circle, which is its focus, divides itself into two foci as soon as the circle begins to degenerate into the ellipse; but when the ellipse changes into a parabola one end of it flies open and one of its foci vanishes, while the remaining focus goes along with the parabola until the latter degenerates into the hyperbola. When the hyperbola degenerates into a plane isosceles triangle this focus becomes the vertex of the triangle, or the apex of the cone, so that the center of the base of the cone may be said to pass gradually through all the sections until it arrives at the vertex.

A spheroid or ellipsoid is a solid generated by the revolution of an ellipse about one of its axes. It is a prolate spheroid when the revolution is made about the transverse, or major, axis, and an oblate spheroid when the revolution is made about the conjugate, or minor axis. A conoid is a solid formed by the revolution of a parabola or hyperbola about its axis. It is accordingly called a parabolic or hyperbolic conoid, its sides being formed by either figure. The former is also called a paraboloid and the latter a hyperboloid.

A segment of either of the conic solids is a portion

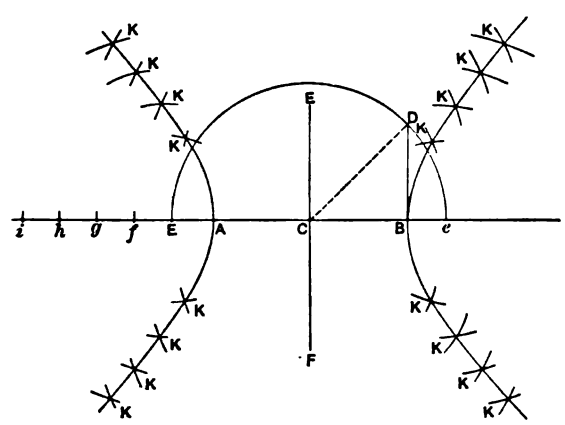


Fig. 48.—Diagram Showing Method of Constructing a Parabola.

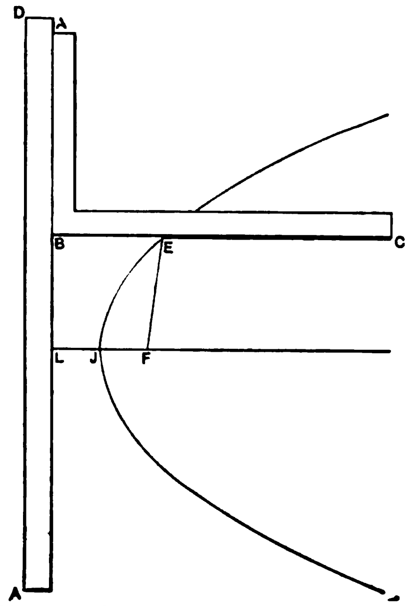


Fig. 49.—Manner of Describing a Parabola by Means of a String, a Square and a Straight Edge.

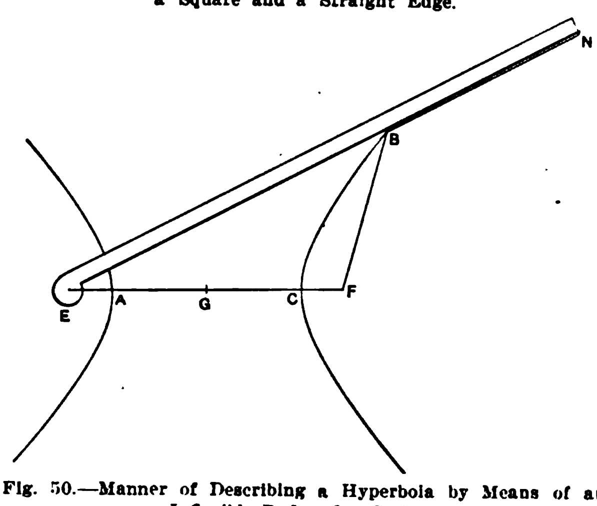


Fig. 50.—Manner of Describing a Hyperbola by Means of an Inflexible Rod and a String.

cut off at the top by a plane parallel to the base, and the frustrum is the part left next the base after the segment is cut off.

Let us describe an ellipse. Referring to Fig. 46, let A B represent the transverse diameter, G D the conjugate and C the center. Now, with G as a center and with the radius A C, describe an arc, cutting A B in the points E and *e*, which are the foci of the ellipse. Assume any point, as *g* in the transverse, and with the radii *g* A and *g* B and with E and *e* as centers, describe two arcs intersecting in F, which will be a point in the curve of the ellipse. Hence, it follows that by assuming any number of points, as *f* and *h*, in the transverse between the foci and the center, as many points may be found in the curve as are required. The nature of an ellipse is such that the sum of any two lines, as E F and *e* F, drawn from the foci and meeting in any point, as F, in the periphery is equal to the sum of any other two lines, as E G and *e* *G*, meeting in any other point, as G, and together equal to the transverse axis. A line bisecting the angles thus formed, as F H and G C, stands at right angles to the curve and forms the true joint of an ellipse.

We will next find the length of the elliptical curve. There can be no constant rule for finding the periphery of the ellipse, as there are so many variations of the figure and the periphery does not always bear the same proportion to the transverse and the conjugate axes. Steel in the "Shipwrights' *Vade-Mecum*" gives the following rule: "Multiply the sum of the transverse and conjugate diameters by 1.5708, and the product will be the circumference, very nearly."

Peter Nicholson in his "Encyclopedia of Architecture," after covering four pages of figures in a series of calculations, comes to the conclusion that they are too laborious for practice and that we must content ourselves with some easy method of approximation, after which he gives the following two rules: The first rule is "multiply the square root of one-half the sum of the squares of the two axes by 3.1416 and the product will be the circumference, nearly."

Then he says this rule is still too long for practical uses and falls back on the following, which is the same as that given by Steel, only stated in different terms—namely, "multiply half the sum of the two axes by 3.1416 and the product will be the periphery, nearly." And then he concludes by saying: "This rule is exceedingly easy and sufficiently near for all practical purposes, when the excentricity of the ellipse is not too great."

Although Trautwine in his "Civil Engineers' Handbook" says that the above rules are not worthy of the name, yet he gets no nearer to the establishment of a constant rule, but gives a table of multipliers to fit certain forms of the ellipse. After proving that the proportion of the periphery to the axes changes with each alteration of the curve, or as the excentricity is greater or less, he then gives the following formula and says it is sufficiently exact for ordinary purposes when the transverse is not more than five times the conjugate:

$$\text{Circumf} = \sqrt{\frac{D^2 + d^2}{2} - \frac{(D - d)^2}{8.8}},$$

which is useless to any one but a mathematician.

The practical way is the most reliable and for the average practical man it is the easiest understood, and that is to describe the figure to its full size, or to a good working scale, and then divide the periphery into a number of equal parts. Lay them off on a stretchout and measure with a rule.

In order to find the area of an ellipse multiply the transverse by the conjugate, and the product by 0.7854 for the area.

To construct a parabola the following method is suggested: Referring to Fig. 47, let A P represent the abscissa and P Q its given ordinate. Bisect P Q in D. Join D A and draw D B perpendicular to it. Then transfer P B to A F and A C in the axis produced, when F will be what is called the focus. Now draw several double ordinates, as G H G, G F G, &c., and from F as center and with radii C H, C F, C J, &c., describe arcs cutting the corresponding ordinates in G, G, G, &c. The line G F G is called the parameter.

To find the area of a parabola multiply the base by the hight and take two-thirds of the product for the area, every parabola being equal to two-thirds of the circumscribing parallelogram.

To construct a hyperbola proceed as folows: Let C of Fig. 44 be the center of the hyperbola, or middle of the transverse A B, and draw B D perpendicular to A B and equal to half the conjugate. From C as center describe an arc, with the radius C D meeting A B produced in E and *e*, which are the two foci of the hyperbola. Then assume several points, as *f*, *g*, *h*, *i* in the transverse produced. Now, with the radii A *f*, B *f*, A *g*, B *g*, &c., and with E and *e* as centers, describe arcs intersecting the several points K, K, K, through which a hyperbolic curve is to be drawn.

To describe a parabola by means of a string and square and a straightedge proceed as follows: Referring to Fig. 49, place the straightedge A D in position, fixing it rigidly on a level floor or drawing board; then having procured a square, A B C, of proper dimensions and a piece of unstretchable string or fine wire equal in length to B C, fasten one end at the point F and the other end to the square at C. Then placing the point of a pencil in the loop of the string, as at E, moving the square along the straightedge, keeping the string stretched and the point of the pencil close to the square, the curve traced by the pencil will be a parabola.

If the end of a straight inflexible rod of greater length than the distance E F of Fig. 50 be fixed to one end of the line E F, as at E, and one end of a string of greater length than the difference between the line E F and the length of the rod be fixed at F and the other end to the end of the rod, as at N, then if any point, as B, be taken in the string and the rod moved around the point E so as to keep the parts N B and B F always stretched, the point B will trace a curve which will be a hyperbola.

In order to draw the opposite hyperbola reverse the fixed ends E and F of the rod and string.

ESTIMATING THE COST OF BUILDING ALTERATIONS.*

BY ARTHUR W. JOSLIN.

IN alteration work that is not too extensive I should make one item of frames, boards and furring, entering on estimate sheet the quantities of each item as demonstrated in my original article (*Carpentry and Building*, June, 1907, pages 206-208), care being taken to extend your measurements sufficiently to care for all razing of existing parts thought probable or possible. Compute into feet, B. M., and add for a total and determine upon a price for labor of installation. Having settled this latter, compute total price per "unit" (1000 ft., B. M.) labor and stock and carry out a price.

Materials resulting from the razing of parts of the work and stock bought and used for staging, temporary partitions, may frequently be used, but old and second-hand materials always involve more labor, and to hold same on premises and care for them until such times as they can be used costs money. In nine cases out of ten it is wiser to make no allowance for such materials. My advice would be to consider carefully before allowing anything for salvage on old materials of any kind resulting from the work of alteration.

Outside and Inside Finish.

The method of obtaining quantities, also the classification for all work coming under the above head, would be practically the same as for new work. The principal point to keep constantly in mind is to make ample allowance in measurements where old and new parts join. It must also be borne in mind that it usually costs more both in labor and stock per unit to match old work than to carry it out entirely new.

The above remarks regarding "outside finish" apply fully to all inside finish. Refer to the several items coming under this head in my article of 1907 (*Carpentry and Building*, September, 1907, pages 290, 291).

Plastering.

If an alteration is at all extensive there will be very little plastering left, except in parts of the building that are practically unchanged. There is hardly an item in the building where the increase in cost per unit is as great on diminishing quantities. For instance, in an ordinary case of new work of reasonable extent, we would figure 40 cents per yard for two-coat work on wood laths. If we were going to put a new ceiling on a room of ordinary size in an unoccupied house, say, 25 sq. yd. area, the actual cost would surely be in the vicinity of $25, of $1 per square yard. If we were to go into an occupied house or place of business to put on a patch of a couple of square yards the cost would probably be about $5, or $2.50 per square yard. If there was but a single square yard under the last stated circumstances the cost would not be affected enough to take notice of. In the light of these facts, you can see that in alterations where the work is in detached areas, frequently joining existing work, that the plastering operation almost becomes patching. Many times it will be cheaper not to try to save much plastering.

In surveying for plastering, if a ceiling or side wall had about half its area of old plastering left, thus leaving about one-half new, I would either measure as though the entire space was new and use 40 cents per yard as the cost (two coat on wood laths), or take as near as possible the actual area to cover and double the price. Such a rule as above would apply to an average case of alteration work, but as each case presents differing circumstances it must not be applied inflexibly, but varied as the dictates of your judgment suggest. The question of drying plaster on work of this character is seldom much of an item, as there is usually an existing heating plant in operation, and the principal items of cost against drying would be setting radiators temporarily. The item must not be lost sight of, however, as in all cases it costs something and under some conditions would closely approximate new work.

Painting

In surveying quantities for painting in remodeling work, provision must always be made to cover the entire

* Concluded from page 186, June issue.

walls or wood work of a room with the last coat if a good job is desired. It is practically impossible to paint a part of a room and have it match or look like the part that was left undone, no matter how good the undone part may be. Thus the principal point to remember in measuring painting on an alteration job, is to consider the last coat as covering practically everything usually painted. The price per coat on the several coats preceding the final one will also cost more than would be the case in new work, but how much will be wholly a matter of judgment. I should say that increase in cost under average cases would be about 30 per cent.

Plumbing, Heating, Electric Work, Etc.

Plumbing, heating, and electric work, &c., would be either figured by men of the respective trades or must be "sized up" as outlined in my article of last year (*Carpentry and Building*, November, 1907, page 348). This "sizing up" must be on a liberal basis, as considerable of the existing work will be damaged or absolutely destroyed in the performance of the other parts of the work. The above, coupled with the fact that the work usually has to be done in cramped quarters and possibly overtime, makes necessary the careful consideration of the matter before forming an opinion as to the probable cost.

Now, having treated practically all of the items entering into an ordinary alteration job that differ enough from new work to make necessary special treatment, we come to the items of "expense," such as watchmen, telephone, lockers, and sheds, insurance and bond, carting debris, &c. All of these should be considered separately, and the estimated cost entered on the estimate sheet.

Having thus determined the probable cost, looking at matters from the safe side, which, by the way, is the only way on remodeling if you wish to make money, add what you think you should have for profit, not forgetting in doing this, the fixed office expenses connected with your particular business.

From my own point of view, an alteration, if of any extent or in any way complicated, will require double the personal supervision, involve one in more chances for accidents to workmen and the public, and develop more expenditures for unforeseen conditions than a new operation of twice the size, considered in dollars and cents. I would, therefore, recommend that the margin of profit be figured as large as from 10 to 20 per cent. If you cannot get the work on about this basis let your competitor have it, and put your feet up on the desk and smoke.

An Interesting Example of Alteration Work.

I have purposely left until the last the consideration of a phase of figuring the above described class of work, and now will try to show you how to arrive at the probable cost of some operations that can hardly be figured on a "stock unit" basis. I do not know of a better way to explain than to cite an instance that came to me several days ago. A man owning a five-story building in a part of Boston where land is worth about $60 per square foot and rents are in proportion, has a first floor occupied as a store, about 18 ft. 6 in. high, and a second story occupied as offices, 12 ft. high. The extreme hight of the first story was brought about by lowering the first floor about 6 ft. in the course of remodeling the structure from a dwelling to a store and office building some 10 years ago. Now a store of 10 ft. to 11 ft. in hight and offices of 9 ft. to 9 ft. 6 in. will bring about as much rent and some times more than the higher ones, and he is considering the possibility of working another floor into the space between the street or first and the third floors. thus gaining space to divide into offices that would bring in about $4000 more rent per year. The question he asked me was, "What will it cost to put another floor into the building, moving the present second floor up or down, so as to leave an 11-ft. high store, and cut up the new story gained into offices, practically like the present second story?" Now right here was a matter that could not be figured on a "stock unit" basis or guessed at with any degree of accuracy, namely, the raising or lowering of the present second story. By telling you how I arrived at what I thought would be about the cost you can see how to handle such out of the ordinary operations.

Lowering the Floor.

The first question to decide was, whether to raise or lower the existing second floor, and after a half hour's examination of the premises I concluded that it would be more economical to lower the floor than to raise it, as there were no partitions in the store, and the existing second floor had considerable steel and heavy frame in it to take care of the 24-ft. span between party walls and support the partition loads coming over it the rest of the way up in the building. The new floor to be put in could be much lighter on account of the spans being cut in half by the partitions. I then proceeded to analyze as follows: Razing all finish, doors, plumbing and heating, &c., in second story and storing for the time being on the first floor, I pictured myself there with two carpenters and four laborers, and concluded that in one week I could accomplish the above work. This would represent an expenditure of $129.60, made up as follows:

Two carpenters, one week	$42.00
Four laborers, one week	57.60
Foreman, one week	30.00
Total	$129.60

I called that "Razing" $130.

The next thing was to shore the present third floor, doing it in such a way as to support the second story bearing partitions and not have shores interfere with the lowering of the second floor. This, I assumed, could be accomplished by putting a 6 x 6 in. strut in the main partitions about every 8 or 10 ft., same running from street floor to the partition cap under third floor joists. As these could not be inserted in one length, I assumed that the most logical way to install shores was to use pieces about 20 ft. long, which could be shoved through a hole cut in the second floor between two joists, the top being placed under the partition cap (the lath and plaster between two studs on one side of partition having been removed to make room for it), and the bottom to rest upon a piece of oak plank with two jack screws under it, and the distance from here to the first floor to be taken up by cribbing. When these shores are all in place I would then turn the jacks all up together, until the weight on the studs nearest the shores had been relieved. There would then remain to be relieved of weight the four or five studs between shores in the middle of the space. I am assuming, as is usual in our construction, that the partiton cap is either 2 or 3 ft. thick, and, this being the case, you can readily see that, while the shores would relieve the weight on possibly two studs on either side, the center of the partition between shores would surely settle some if not taken care of in some way.

Laying Out Main Partition.

I should now lay out on the existing main or supporting partition the exact location of the new floor, which is to be inserted when the present second floor is lowered. The top of the joists of this new floor would be about 9 ft. 5 in. from the ceiling. Now I would relieve the weight on the partition from shore to shore (the large ones already in place) by a little temporary shoring of the third floor by a plank on the ceiling and several studs driven in under it, and cut off the studs 3 in. higher than the top of the joists of the proposed new floor. Now I would slip a piece of hard pine 3 in. thick by the width of the studding under the ends of the studs (previously removing the bottom of partition, which was cut loose), letting this piece run tight to each shore. Next I would nail the bottom of all studs to the shoe piece, putting a chunk of studding under where it intersects the main shores, spiking it securely, and then run braces of studding from the shores to the center of the shoe piece in a manner similar to that in which you would truss the space over a large door opening in a partition.

When all of this work is done the weight in the center of the building from the third floor up is all transferred to the first floor, which, if not strong enough in itself, can be shored from the cellar bottom, and we are free to lower the present second floor the required 6 or 7 ft. Now figure up the stock and labor that would probably be necessary to have accomplished the above result. The building is 90 ft. deep.

I assumed 10 large shores, 6 x 6 in. x 20 ft., = 600 ft. B. M., at $0.02½ =	$21.00
90 ft. 3 x 4 H. P., = 90 ft. B. M., at $0.03½ =	3.15
200 ft. 2 x 4 Sp., = 125 ft. B. M., at $0.02½ =	6.25
Nails	3.00
Teaming, jacks and cribbing stock from locker	10.00
Labor, two carpenters, nine days	63.00
Four laborers, nine days	86.40
One foreman, nine days	45.00
Total	$237.80

Now the next operation to consider is the lowering of the existing second floor about 7 ft. 6 in.

I found upon examination that the second floor had steel girders composed of two beams about every 9 ft., and that the joists between them ran in the same direction. It was fair to assume that the girders entered the party walls 8 in., and the joists 4 in. After consideration, I made up my mind that the easiest way to cut this floor loose for lowering was to slot the walls under the girders down to the new level and to cut the joists off about 6 in. from the wall and to put in a 5 in. trimmer from girder to girder, using hangers to carry the trimmer from the girders and also hanging each joist to the trimmer. Before doing this however, the floor must be prepared for lowering by running a 3 or 4 in. plank along the ceiling about 3 ft. from the wall and parallel to the party walls, and erecting cribbing at intervals of 8 or 9 ft. from the first floor to within the length of an extended jack screw of the plank stringer. Then place the extended jacks and take the weight with them. Now by taking up a strip of flooring and ripping off a foot of ceiling parallel with the party walls, the framework is exposed and ready for cutting off.

I then proceeded to make the price on this work as follows:

Teaming cribbing and jacks	$25.00
Cutting away floor and ceiling, two carpenters, two days	14.00
Erecting cribbing and placing jacks:	
Two carpenters, four days	28.00
Two laborers, four days	19.20
About 180 hangers	126.00
Slotting wall under girders, 18 days, laborer	43.20
Cutting joists and putting in trimmer, 18 days, carpenters	63.00
950 ft. B. M. H. P. for trimmers	33.25
Labor lowering floor:	
Two carpenters, two days	14.00
Four laborers, two days	19.20
Total	$384.85

Now having in my mind's eye got this floor down to the new level there remains to be done when the new third floor has been put in and the new second floor studded out, the removal and teaming to the locker of the jacks, crib stock, shores, &c., and this I assumed could be done for about $75. Thus I had costs as follows:

Razing second floor	$129.60
Shoring main partition and work incident thereto	237.80
Loosening and lowering second floor and work incident thereto	384.85
Removal and teaming away of cribbing, jacks, &c	75.00
Total	$827.25

The new floor and partitions, the repairs to the floor that is lowered and the necessary changes in openings of front and rear walls are readily figured in the usual way on a "stock unit" basis and the cost thus worked out, added to the $827.25, is the supposed cost of the whole operation, to which should be added profit. On a job of this character 25 per cent. would be little enough, as there are many hazards, and from its being so different from the ordinary operations there is a liability to underestimate in spots.

Thus by dividing a large operation into a number of smaller ones and considering each division separately, a pretty accurate analysis of the cost can be made, when considering the operation as a whole, one would be wholly at sea. In actual practice a number of these minor operations would be carried on simultaneously, thus entailing less time than would appear from the analysis of parts.

I have assumed that the person figuring work of this character is capable of taking a crew of men and superintending the operations, for if he cannot do this it is improbable that he will ever be able to estimate with any accuracy upon such work. I think I may safely say, however, that it is possible for a man to become fairly expert in estimating new work, even if he could not take help and perform it, if he thoroughly understands plans and has access to tabulations of costs that have been worked out by others. Such men should never let opportunities go by to get right onto the work and see it performed, making notes of the time required, methods pursued and order adopted, in the various parts of the work, as information so gained is of vastly more help in analyzing the questions that come up than copious writings such as this.

In conclusion I will say that I trust a careful reading of the preceding pages may not be without benefit to the readers of *Carpentry and Building*.

Preparing Flexible Molds for Stucco Work.

The best material for molds for stucco ornaments is potter's clay, which is finely ground in the dry state, put through a fine wire sieve and then mixed with strong glue size to a thick batter. This is allowed to stand in a vessel until it has attained the consistency of putty; in other words, it is allowed to sweat, so that on handling it will not adhere to the fingers. This mass, says a writer in the Painters' Magazine, is then pressed into a wooden box, which, however, should be 1 in. longer, 1 in. wider and ½ in. deeper than the pattern or model that is about to be cast, and which serves the purpose of confining the mass when the model is pressed into the molding clay. The figure, before pressing it into the mass, must be moistened well with water, so that none of the clay will adhere to it. As the latter is rather resistant, the pressing must be done repeatedly, until the base of the relief is on a level with the surface of the mass. At every fresh pressing the figure is moistened anew. When the mold required has assumed its form, it is dried in the air, but not exposed to direct sunlight; then it is washed with clear water and coated several times with strong glue size. The glue size used with the clay has the function of keeping the form or mold unshrinkable and from cracking, and for this reason potter's clay is used, instead of the pure floated clay.

The mass used in coating stucco ornaments and reliefs is calcined plaster (plaster of paris), that has been put through a fine sieve and is again calcined in a suitable kettle, mixed with a small portion of bolted Paris white and glue size to a thick batter. The glue size should be made with best white glue and the mass stirred until there are no signs of lumps and until it begins to become tough. Then it is firmly pressed into the form by means of a trowel and the top leveled off. When the mass has become hard, which will take about 24 hr., it will fall out by turning the box on its side, giving it a light tap. The resulting ornament may then be cleaned with scraping tools of proper form, and should there be any defects they may be corrected with a similar mass, applying with a brush. When all this is done and the figure dry, it is brushed over several times with a thin coating of whiting, mixed with water.

Comparative Cost of Building Construction.

So much has been said about the relative cost of frame, brick and hollow block houses that a builder in Wilkes-Barre, Pa., recently decided to practically determine the question, and to that end he erected in the same locality three houses of the same size and arrangement. One house was built entirely of wood, the second was of concrete, with wooden floors, and the third was of hollow tile blocks and concrete. When the experiment had been completed it was found that the cost of the wooden structure was $6000, the one of tile and concrete was $6500 and the one of concrete $8900. The builder regarded the tile and concrete house as the cheapest, so far as durability was concerned. He also regarded it as likely to be warmer in winter and cooler in summer by reason of the air spaces in the hollow blocks being poor conductors of heat and cold.

CORRESPONDENCE.

Criticism of First Prize Design in Two-Family House Competition.

From X. Y. Z., Springfield, Ill.—In the language of this section of the country *Carpentry and Building* has again "been, gone and done it," but what it has done this time has been the completing of the Forty-first Competition. There was a time when this sort of competition would probably not have been undertaken because the contest related to two-family houses, and in the early days of *Carpentry and Building* there existed no special demand for dwellings of this nature. I have looked over the June issue expecting to see criticisms of the first prize design, but not finding them I now ask what has become of the long line of critics *Carpentry and Building* used to have? Is it possible that they are like the deacon who always went to sleep when his pastor was preaching, but invariably kept awake if the pulpit was occupied by a stranger? His explanation was that he knew the subject was safe in the hands of his pastor, but he did not know what a stranger might say. The inference is that those who might naturally be expected to criticise prize designs are perfectly satisfied with the conduct of the paper, and hence their apparent indifference.

My last criticism had considerable to do with the location of ice boxes; may be some of the readers thought that I had ice on the brain. They may now think that I have been kept in cold storage, but if so I have thawed out long enough to say something about getting the ice into the box.

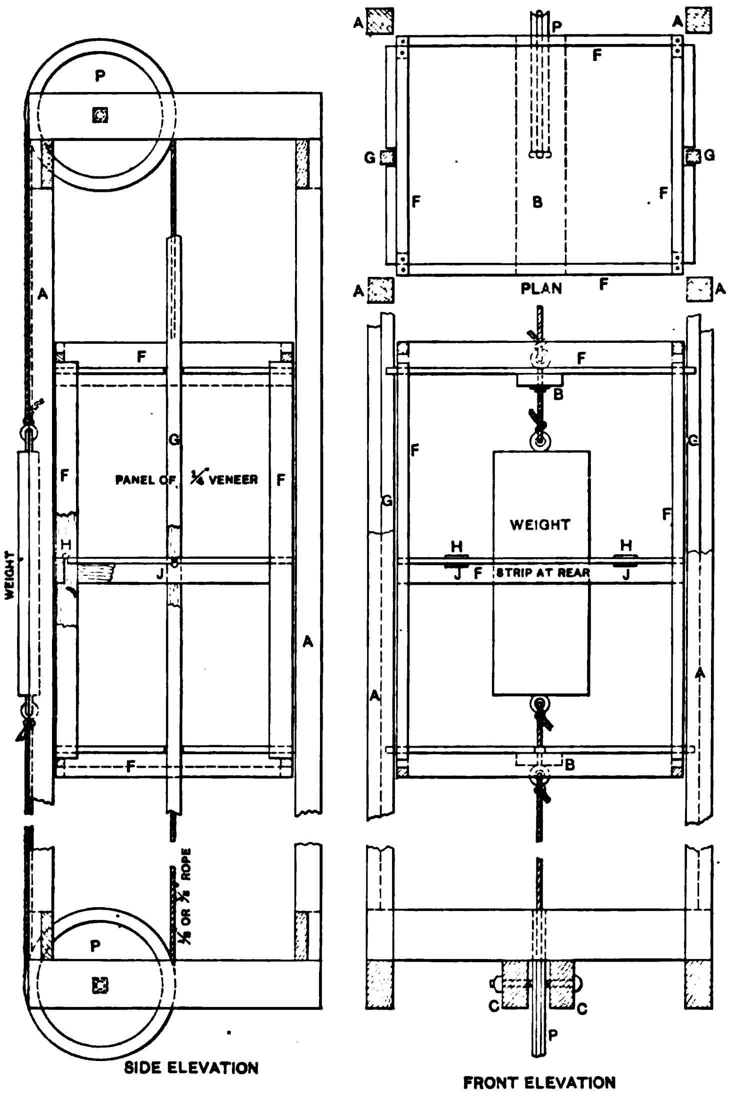
I would like to know where, except in Milwaukee, can ice men be found who can serve ice to boxes located as shown in the first prize design. I may be wrong in my figures, and if so it would not be the first time; however, I now in advance would apologize to the author of the first prize design if he shows that I have lost the calculus.

My calculations are based upon the following figures: I make the hight between stories 9 ft., and, allowing 10 in. for the timbers, makes 9 ft. 10 in., or 118 in. from the level of the first floor to the top of the second floor. The number of risers in the flight of stairs to the second story is 15, or 7-13-15 in. to a riser. The point at which the ice must be handled is eight risers above the first-floor level, or 8 times 7-13-15 equals 63 in. Subtracting 63 in. from 118 in. leaves 55 in., the distance between the eighth riser and the top of the second floor. Assuming that the hight of the ice box is 2½ ft., or 30 in., I add this to the 55 in., which makes 85 in., the hight the ice man must reach in order to place the ice in the door of the ice box.

It is possible that the author of this design had in mind when drawing his plans an appliance such as the gas lighters used in my boyhood days—a short ladder—which they carried about with them to climb the lamp posts. If this was the case he failed to say so in his specifications.

Constructing a Dumbwaiter.

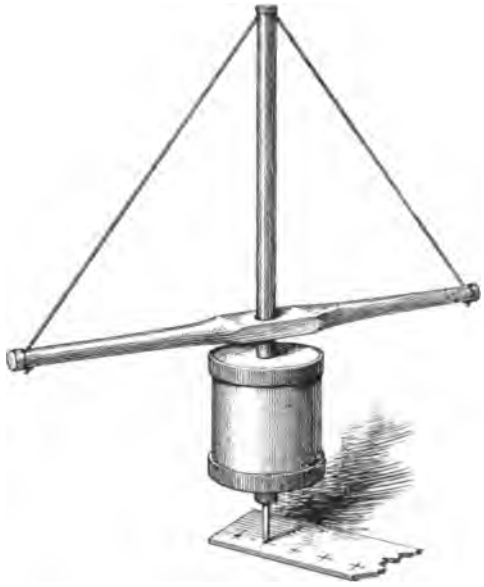
From C. A. Wagner, Port Jervis, N. Y.—I am sending herewith rough sketches of a dumbwaiter for the benefit of "H. H. W.," Conesville, Ohio, and for any other readers who may be interested in this particular subject. At the outset I would say that the weight should be about one-half heavier than the car and load; for example, suppose the car load to be 45 lb., then the weight should be about 65 or 70 lb. I use ⅞ x 2 in. stuff for my framework and make the car 3 ft. over all in hight, with a depth ranging from 16 to 20 in., and the width from 18 to 30 in., all according to the requirements of the case or the space available. Sometimes the room required governs the width and depth, but for private dwellings or ordinary flats a hight of 3 ft. over all would seem to meet the bill. The shelves I make of ½-in. material and they extend over the framework ½ in. so as to be notched in the center for the guide strip to work in. The top shelf is placed on the underside of the ⅞ x 2 in. frame piece and the center and bottom shelves on top of the ⅞ x 2 in. frame piece or strip. The center shelf is hinged on the rear end from the upper side and the center is hinged from the lower side, the rear end being hinged to come even or flush with the top of the ⅞ x 2 in. cross frame, this bringing the center just half way. This I do in order to make room for larger materials which may be placed in the car, and by this arrangement the center shelf can be pushed to the rear end of the car practically out of the way, yet it may very easily be pulled into position again.



Constructing a Dumbwaiter.—Design Submitted by C. A. Wagner.

I use white wood or white pine for the car, although hard wood can be used if desired, but it adds considerable weight to the car. I also groove or plow the framework so that all but one of the sides are inclosed. I use ¼-in. veneer for the panels, this being placed in the grooves when putting the frame together.

The top and bottom of the dumbwaiter should have a reinforcing piece or cleat into which to place the eye hook and should be screwed to the top and bottom of the car. Referring to the accompanying sketches which represent a plan together with side and front elevations, similar letters refer to similar parts, A A represent the frame within which the car moves, while F, F, F, F represent the frame of the car, G G represent the guide strips, B B are the nuts and washers in connection with the screw eyes at top and bottom of the frame of the car and to which the hand rope for operating it is attached. The hinges of the center shelf are indicated at H H, while P P represent the wheels over which the hand rope passes. These wheels can be of any ordinary construction such as one would readily find in stock, or the



A Home Made Drilling Machine.

car could be built to suit wheels which can readily be obtained. The hand rope may be ½ or ⅝ in. in diameter according to the requirements of the case.

I have placed a number of dumbwaiters of the construction here indicated and they work with entire satisfaction. I might add in this connection that I cover the weight box with sheet iron on the car side, screwing it in place. The arrangement, it will be seen, is practically an endless rope, which serves the double purpose of pulling the car down when it is up and pulling it up when it is down.

I have also made use of two small wheels at the top and bottom with good results, but would advise the correspondent not to use too small a wheel. Generally a 10, 12, 14 or 16 in. wheel can be very easily obtained and it can be placed the narrow way of the car so as to center the car and weight. These are bolted between two 2 x 4's and fastened to the frame already arranged.

A Home Made Drilling Machine.

From C. J. M., St. Johns, Newfoundland.—I am sending herewith a sketch of a handy drilling machine which I am inclined to believe may interest some of the numerous readers of the paper. It will be seen from the sketch that the device is a very simple affair, consisting essentially of a round block of wood, about 8 in. deep and 8 in. in diameter, ringed at top and bottom with an iron band to prevent splitting. Through its center and protruding about 2 in. below is a smooth round wooden staff, about 1¼ in. in diameter and 3 ft. in length. Both ends of this staff are also protected from splitting by a ring or ferrule. The yard or cross bar is a piece of wood about 3 in. wide, 1 in. thick and 3½ ft. long, having a hole in the center large enough to allow the yard to move easily up and down on the staff and shaped as shown. The ends of the yard may also be protected by ferrules if necessary. A hole is bored in the end of the yard and also in the upper end of the staff. Through these holes a piece of strong cord or rawhide thong is passed and drawn tight, with the yard standing, squared, about 1 in. above the block. The cord is then secured from slipping in the holes by means of knots and pegs driven tight in the holes.

A drill is inserted in the end of the staff below the block, and may be made of an old hand saw file ground to a triangular point.

To set the machine in motion, place the point of the drill on the spot where a hole is to be made, with the apparatus in an upright position, and while grasping the yard in one hand with the other turn the staff around until the yard is raised as high as it will go. Then lay hold of the yard with both hands and press smartly downward. This will cause the machine to revolve in one direction. The weight of the block gives sufficient motion to wind up the cord and raise the yard again, when a second downward motion of the yard causes a revolution in the opposite direction. In this way the work is accomplished by pressing down the yard and allowing it to rise again as the cord winds and unwinds upon the revolving staff.

This is a very simple and effective piece of machinery for drilling small holes in metal. There is very little labor required to work it, as the weight of the block does practically all the work.

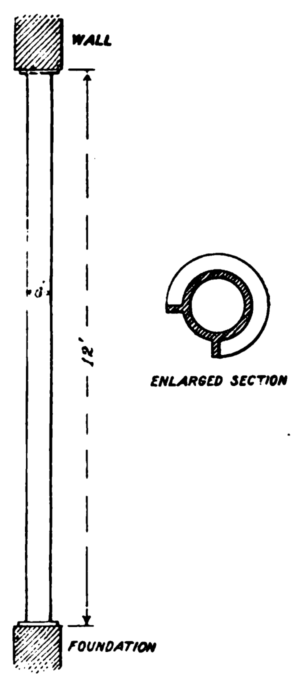
Machinery Equipment for General Woodworking Shop.

From C. W. G., McCook, Neb.—Will some reader of the Correspondence columns kindly tell me what is the best and most practical machinery for general shop work where possibly half a dozen machines will meet the requirements?

Safe Loads for Cast Iron Columns.

From N. H. D., Newburgh, N. Y.—As an old reader of *Carpentry and Building*, I would ask an answer to the following questions: 1. What would be the safe load of a round 6-in. cast iron column 12 ft. long, cast hollow and stood on end on a solid foundation, as indicated in the accompanying sketch?

2. What would be a safe load for similar columns 8 and 10 in. in diameter and 12 ft. long, such as are used for store fronts? They are cast hollow and an enlarged cross section of one is indicated at the right in the accompanying sketch.



Safe Loads for Cast Iron Columns.

The usual thickness of the shell is about ⅝ in. The head and foot are about 1 in. thick.

3. What is the safe load hollow cast iron columns round and square?

I have been a constant reader of *Carpentry and Building* for more than 20 years and have found it very useful in my business.

Answer.—In the table which follows will be found the safe load for round and square columns 12 ft. long, varying in diameter from 6 to 10 in., and of different thickness of shell. The loads given were calculated by the formulae given in the engineering hand books:

Hight. Ft.	External diameter. In.	Shell. In. thick.	Safe load. Round. Tons.	Safe load. Square. Tons.	Safe load. N. Y. building law. Tons.
12	6	⅝	30.6	43.6	Not lawful (1).
12	6	¾	36	51	73 square.
12	8	⅝	51½	·70.5	Not lawful (2).
12	8	¾	61.1	85.4	82 rd. 107 sq.
12	10	⅝	85.5	98	Not lawful (2).
12	10	¾	99.5	116	141 sq.
12	10	1	134	151	171 rd. 182 sq.

(1) Not lawful for that thickness of shell and for that hight.
(2) Not lawful for that thickness of shell.

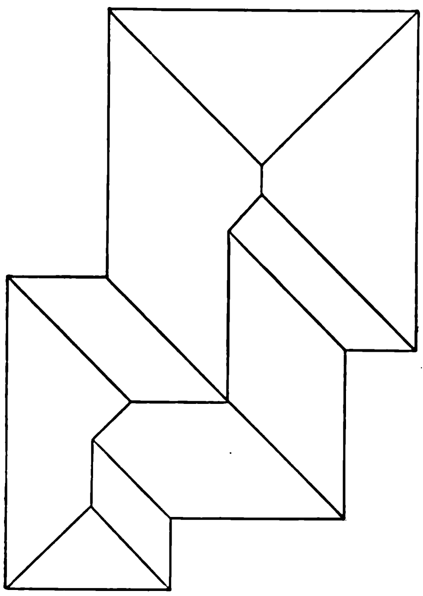


Fig. 1.—Plan Submitted by "A. G. R."

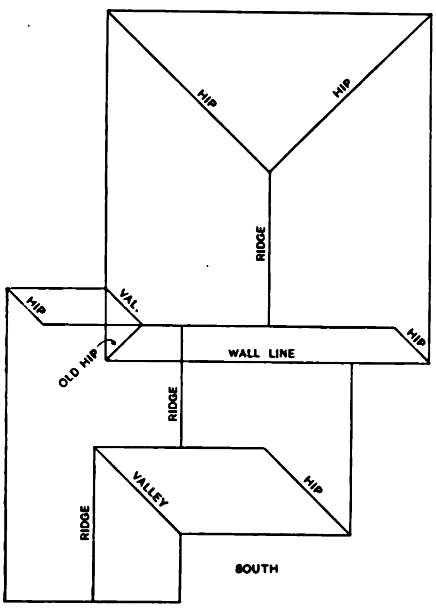


Fig 2.—Plan Furnished by "J. A. L."

The A. C. C. standard fireproof columns of steel have safe loads as follows, but with thickness of shell not stated. They have an interior reinforcing pipe. All interior space is filled with concrete and all columns are round:

Hight. Feet.	External diameter. Inches.	Safe load, tons. Light section.	Tons. Heavy section.
12	6	29	..
12	8½	..	72
12	10½	..	107
12	12½	..	140

Cast iron columns should be examined for cold shuts, sand and blow holes. These can be tested for by tapping the column smartly with a hammer for the defects, which are filled by the founder with loam or with cement and filings, causing a deadening of the sound, which can be readily distinguished from the sound produced by a perfect column. The thickness of the shell in closed columns is tested by drilling a number of ⅜-in. holes. Flaws, shrinkage, cracks and bolt holes may occur in the lugs, brackets, connections and capitals, and the columns should therefore be carefully inspected. The iron should be soft enough to be slightly indented by the blow of a hammer on the edge of the casting. If the iron be hard and brittle fragments will be broken off.

The Lally fireproof columns have the following guaranteed safe loads:

Hight in feet.	Diameter in inches.	Safe load.—Tons.
12	5½	25
12	6½	35
12	7½	47
12	8½	58

The thickness of the shell is not given, but the above loads correspond to the manufacturer's heavy plate. The shell is of steel and the interior of the column is filled with concrete. C. POWELL KARR.

Problem in Roof Framing.

From A. G. R., Holderness, N. H.—The roof plan which I am sending, Fig. 1, is in reply to the request of "J. E. D.," Milton, Iowa.

Note.—We also have a solution similar to the above from "V. K. R.," Westover, Pa.

From J. A. L., Centerdale, Iowa.—I am inclosing sketches showing my solution of the problem in roof framing propounded by "J. E. D." in the April issue of the paper. One sketch, Fig. 2, represents the roof plan, and the others, Figs. 3 and 4, the front and rear elevations, which afford the reader an idea of how the roof would appear when finished. I do not understand from the original inquiry that the present roof is not to be altered in any way, but simply that the change is to be made without removing any material part of the present structure. This can be done in accordance with the plan as here furnished by extending the present roof in the directions indicated by the plan, which any carpenter accustomed to working from architects' drawings will, I think, readily understand. The two gables that come together near the center of the house will lap each other the width of their respective projections. I might add

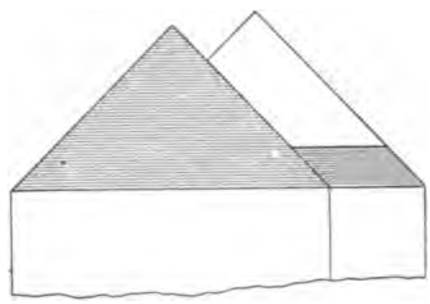


Fig. 3.—North Elevation.

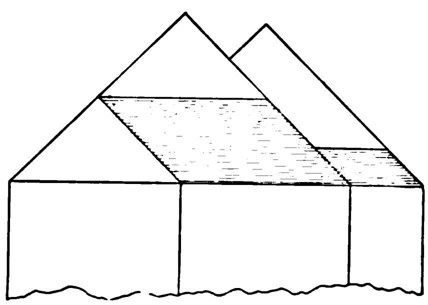


Fig. 4.—South Elevation.

Problem in Roof Framing.—Solutions by Different Correspondents.

that the shaded portions of the elevations indicate sloping roof, while the clear spaces are vertical gables.

Finding Bevels in Truss Construction.

From Hee H. See, Sacramento, Cal.—It is now some little time since the above *nom de plume* was seen in the Correspondence pages of *Carpentry and Building*, but if I have been too busy to write I have not been too busy to read, and my interest in these same pages is as keen as ever it was. This being the case and having a little time to spare at present, I feel called upon, after seeing the various methods put forth under the above heading in the May issue of the paper, to illustrate the way in which I would handle this very simple little problem.

Assuming that "J. A. K." is able to get the foot cut and the length of the brace, the following will, I think, explain to him the method of getting the miter cut where the brace joins the straining beam. As there are four of these cuts to make in one truss, it will be better to have a pattern for the cut, using a piece of 1 or ½ in. board, about as wide as the timber that is to be used for the truss. "Shoot" one edge of the board straight and lay the square to it, with the rise of the brace on the tongue and the run of the brace on the blade—in this case 6 in. on the tongue and 12 in. on the blade. Mark by the blade.

The diagram, Fig. 1, shows the board as it will now appear, the position of the square being indicated by the dotted lines. Now place the heel of the square at the point where this line intersects the edge of the board, and keeping the upper edge of the blade fair with the line, mark along the inside of the tongue. Reverse the square, and with the heel of it at the same spot and the edge of the blade fair with the edge of the board, mark again along the inside of the tongue. A line drawn from the edge of the board where the first line intersects it, through the intersection of these other two lines, bisects the angle of the truss and is the bevel required. Fig. 2 explains the method thoroughly, the positions of the square being shown by the dotted lines.

I have given a rather lengthy description of this method in order to make it as plain as possible, but in actual practice I will undertake to mark out and cut one of these patterns in less than 2 min.

Sometimes the blade should be used for marking the intersecting lines instead of the tongue, this depending upon the width of the board and the angle of the truss.

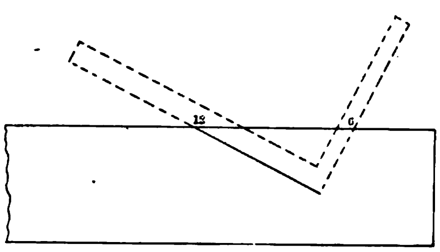


Fig. 1.—Board with Steel Square Applied to It.

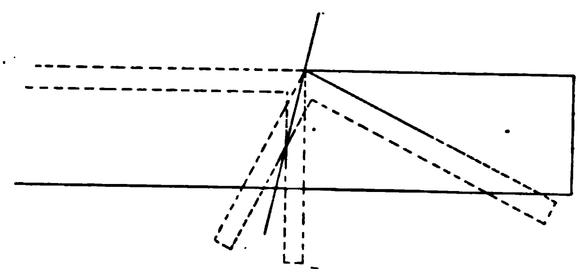


Fig. 2.—Bisecting Angle of the Truss to Secure the Bevel.

Finding Bevels in Truss Construction.—Sketches Furnished by "Hee H. See."

Criticism of the Problem in Roof Framing.

From C. T. B., Dubuque, Iowa.—I wish to make a criticism of the roof plan submitted by "R. J. A.," New York City, and published on page 203 of the June issue of the paper. The small roofs sloping together will form a snow pocket for this section of the country from which the owner would have incessant trouble on account of the water backing up and getting through when the snow melts either from heat underneath or from the sun. An examination of Figs. 1 and 2 of the sketches accompanying the correspondent's letter will make clear what I mean.

The elevation shown in Fig. 5 and submitted by "A. H. J. C.," Kennebunkport, Maine, does not correctly show the elevation of the roof at "A" of the plan as stated. On the contrary it shows the opposite side.

Copies of Carpentry and Building Wanted.

From A. H. Fidler, Jamestown, N. Y.—I am desirous of securing some back numbers of *Carpentry and Building*, and as I understand from the publishers that the editions of the issues prior to a few months back are entirely exhausted, I take this means of asking the readers of the paper if they have any copies which they would be willing to sell. I desire none prior to January, 1906. Those who have extra copies with which they are willing to part kindly state the price per copy.

Construction of a Moving Picture Theatre.

From C. H. S., Patchogue, N. Y.—I would like to have some of the practical readers of the paper tell, through the correspondence columns, how they would construct a moving picture theater. I would like to have the correspondent answering the question give sketches and full particulars.

Floor for Carriage Wash.

From F. S. B., Salt Lake City, Utah.—Some time ago I asked a question in the correspondence columns and received in reply to it more information than I could have secured in any other way, and I wish to thank the publishers for the privilege that is given to correspondents to avail themselves of the valuable knowledge that is to be gained through the columns of the paper.

I would like to ask at this time if some of the brother carpenters will tell me what kind of a wooden floor to lay for a carriage washstand. I want one that will give the best service and the most satisfaction; in other words, the best wooden floor that can be laid.

Designs for Workingmen's Cottages.

From F. C. B., St. Thomas.—I have been very much interested in the competition in dwellings for two families, but I am inclined to think that we sometimes lay too much stress upon houses of this type and not enough on the cheaper class. I think there is just as much room for head work and architectural ability in designing a small cottage for the workingman, and as a builder I would like to have some of the readers of *Carpentry and Building* furnish for publication their ideas of a comfortable workman's cottage; say one suitable for erection on a lot 33 ft. in width. The subject doubtless is one which affords opportunity for interesting discussion and comment, and I hope that I may have the pleasure of reading the views of many in the near future.

Designs for Village Bank and for a Boarding House.

From J. C. Valadie, New Orleans, La.—The data given by "W. A. W.," Paxson, Va., is insufficient to enable one to intelligently furnish a design for a village bank and a boarding house as requested in the June number of the paper. He leaves much to be assumed, but I would say that I am working out a drawing which I will be glad to send for publication as soon as completed. If it does not meet the requirements of the correspondent in question he can state in a succeeding issue wherein it is deficient and in what respects it would better meet his wants.

CABINET WORK FOR THE CARPENTER.

WORKSTANDS AND SEWING TABLES.

BY PAUL D. OTTER.

THE sewing stand or work table is like the wholesale warehouse—not drawn upon constantly but a place of last resort when the stock of litle things is exhausted in the small basket the ladies like to carry about. The stand, however, in large operations of dressmaking and also when sewing is laid aside is quite indispensable and is a part of the furniture equipment of a well furnished home.

In the construction of the work stand the early colonial models are perhaps the best because of simple pattern and because the industrious women of those days knew more of the requirements than unfortunately do many women of the present day. Fig. 1 represents such a type with two drawers and drop leaf on each side.

What few original pieces are to be found and the many copies made from them in recent years are always made in mahogany or are examples of careful veneer work in crotch or cross band veneers. Custom has so dictated the use of material or color for certain purposes that it is no whim to say—from a selling standpoint—that such a piece of furniture would prove acceptable to critical taste even if made in any other wood than mahogany.

The work stand while infrequently used takes up space and for this reason should be a sightly piece, while the idea of utility and beauty are equally important.

Referring again to Fig. 1 it may be interesting to state that it consists of four 2 in. square posts turned, as shown. Three open frames are made shouldered to receive the squared portions of the posts, as indicated in the drawing; one for the bottom, one to divide the two drawers and one fitted flush with the top of the posts. These frame rails, which are 13-16 in. thick, may be immediately doweled into posts or made into glued up frames and the corners cut out to receive the posts, the latter being then drawn up to the corner by countersinking screws in a diagonal hole. The sides and back having been relished on the inside edges are set in grooves prepared for them in the posts. The top then is pulled down tight by means of screws set in from under the top open frame. In passing it may be stated that it is not advisable to glue any table top to its frame or bed as it is unable to go or come in different temperatures. True surfaced and well fitted to the case or apron with screws properly located will be sufficient.

The drawers are made in the usual way, lap dovetailed for the front corners and common dovetailed for the rear corners. The fronts, however, are 1¾ in. thick to permit of a well rounded mold that is generally faced with a nicely selected piece of veneer jointed in the middle of the drawer in crotch effect—that is, burl veneer edge

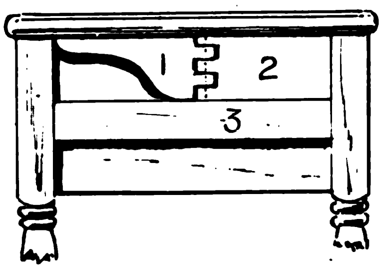


Fig. 2.—Detail of Table Leaf Support.

Fig. 3.—Colonial Workstand.

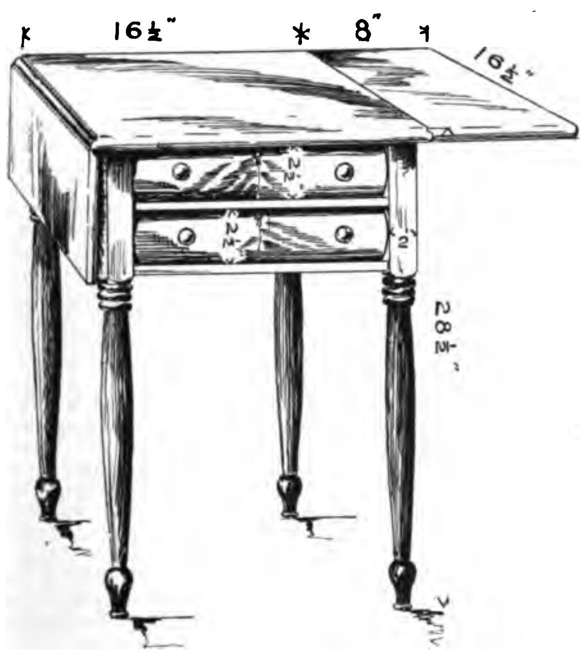


Fig. 1.—Colonial Work Table.

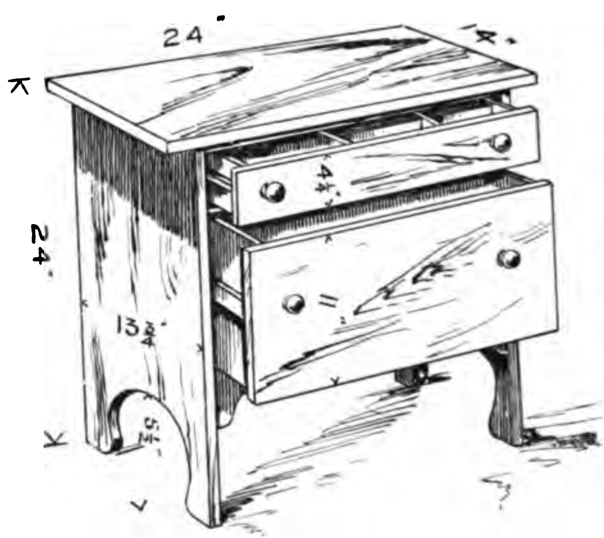


Fig. 4.—Workstand.

Cabinet Work for the Carpenter.—Workstands and Sewing Tables.

jointed in a diagonal manner with the figure taking the directions of an inverted V. It will be noticed that the rule joint is one of the features of such table tops. It certainly is desirable in comparison with the square edge and should be so treated if a pair of planes can be improvised to make the hollow and concave mold.

Another feature which is good enough to copy is one manner of holding up the two side flaps of the table, as shown in Fig. 2. In order to provide for this, the panels on each side of the drawers are set into posts sufficiently to allow of the three pieces 1, 2 and 3 of ¾ in. thickness to set 1-16 in. within the face of the posts. The parts marked 2 and 3 are glued and fastened to the side panel, while No. 1 operates in a loose double tone and groove joint provided in No. 1, a steel wire holding them in place. In operation No. 1 is swung out when the table leaf is raised in position and forms a firm support for it.

The construction of the work stand shown in Fig. 3 is very similar to that of Fig. 1, having the two small drawers for materials and the large lower drawers for more bulky goods. The two seven faced compartments on each end of the stand offer ample room for sewing under way or in progress or for rolls of material which accumulate at dressmaking time. The cover or top of the two compartments hinge and lay back on top of the table when open.

In Fig. 4 is shown a very serviceable wall stand which takes into consideration ample top drawer space for scissors, spools, needle books and other equipment, leaving the large lower drawer free to put away unfinished work. As will be seen the sides of the drawers are parted from the outside of the case by the thickness of sliding strips of ⅝ in. hardwood, one being secured to the drawer side and operated between a top and bottom strip fastened by screws to the inside of the ends. These closely fitted and rubbed with soap or paraffin will cause the drawers to work smoothly and evenly.

WHAT BUILDERS ARE DOING.

WHILE building operations are not being conducted upon anything like the scale of last season, the volume of new work has been showing a slight improvement each month since the first of the year. In other words the decrease in the value of the building improvements for which permits were issued in the leading cities of the country has been month by month growing less and less as compared with corresponding periods a year ago. Reports from nearly 50 cities of the country for the month of May show a falling off in the value of new work of a trifle more than 30 per cent., as compared with the same month in 1907, and with about 35 per cent. in April and 40 per cent. in March. It is interesting to note that in some of the smaller cities the month of May indicates a slight gain in operations as compared with last year, the only large cities showing a notable increase in volume of operations being Pittsburgh, Denver and Salt Lake City. The amount of work under way in Chicago is practically the same as a year ago, the falling off being only about 1 per cent. As April and May, however, are usually the months of maximum building operations, it will be interesting to watch the developments in the building line from this time forward.

Cleveland, Ohio.

Building operations in this city show no improvement and the outlook for the balance of the year is not very promising. There were 600 building permits issued by the building inspectors' office during May aggregating in value $668,-070, as compared with 988 permits valued at $1,310,040 during the corresponding month a year ago. Of the permits issued during May 214 were for frame structures, to cost $310,306; 37 were for brick, stone and steel buildings, to cost $94,339, and 349 were for alterations and additions, to cost $263,425.

The Cleveland Builders' Exchange has decided to hold its annual summer "outing" this year at Burlington Bay, Ont. The members will leave here on Tuesday evening, July 13, by boat for Buffalo from where they will take a special train to their destination. They will remain at the resort until Friday, July 17. On their way home they will stop at Niagara Falls.

Denver, Colo.

The activity noted last month in building operations continues upon a gratifying scale, although the number of permits issued are not materially greater than last season. The estimated cost of the improvements, however, are appreciably in excess of a year ago at this time, thus showing that the buildings under way are of a much more pretentious and expensive character. According to Inspector of Buildings Robert Willison, there were 265 permits issued in May for building improvements estimated to cost $686,-260, while in May last year there were 207 permits taken out for operations costing $325,350.

The amount of new work undertaken thus far the current year is also in excess of that for the corresponding period in 1907, thus emphasizing the remarks of the inspector that "Denver is the one bright spot on the map today." According to his figures the value of the improvements for which permits were issued in the first five months of this year was $3,854,255, while in the same five months of last year the improvements involved an outlay of $2,-757,740.

Kansas City, Mo.

There is a fair degree of activity in building circles this season, notwithstanding the severe depression which has recently been experienced, and from which the country at large is now suffering in greater or lesser degree, according to local surroundings. Here in Kansas City the volume of work under way is appreciably less than it was at this season last year, although the decrease is not so great as to render it unduly conspicuous or significant.

According to the figures compiled in the office of Superintendent of Buildings John T. Neil, there were 343 permits issued in May for building improvements involving an outlay of $977,595, as against 402 permits for improvements costing $1,280,135 in May, 1907. Of the permits issued last month 42 were for brick structures having a frontage of 1756 ft. and costing $482,650, while 139 permits were for frame buildings having a frontage of 4132 ft. and costing $412,120.

Minneapolis, Minn.

The members of the Builders' Exchange and their friends to the number of more than 200 gathered in the new quarters of the organization in the Warner Building, on the evening of May 27, to participate in a housewarming. Among those present were representatives from the Builders' Exchanges in St. Paul and Duluth, as well as several prominent local architects and others identified with the building trades. William A. Elliott, president of the exchange, welcomed the members and their guests, explaining that the housewarming was not intended to be anything formal or elaborate, but simply a gathering to inspect the new quarters and meet together socially for a pleasant evening. Harry B. Cramer, the chairman of the Entertainment Committee, who had charge of the programme for the evening, was then introduced.

The first speaker was William Rhodes, president of the Builders' Exchange at St. Paul, who, responding for the St. Paul delegation, extended hearty congratulations upon the new quarters and to the members of the Minneapolis Association and the guests present a cordial invitation was extended to make use of the rooms of the St. Paul Exchange when in that city. James R. Quigley of Duluth, responding for the Duluth Builders' Exchange, called attention to the fact that his organization had inaugurated the fight for the open shop and had carried it to a successful finish. Other speakers included R. D. Cone, president of the Minneapolis Real Estate Board; James G. Houghton, Inspector of Buildings, and George W. Higgins, ex-president of the Exchange. Interspersed in the programme and between speeches were musical numbers, including vocal and instrumental solos, while the Paint Club Orchestra rendered a number of selections which were well received.

After this portion of the programme had been completed the members and their guests adjourned to the dining room, where a dainty luncheon was served.

In this connection it may be mentioned that the Exchange in its new quarters occupies 5200 square feet of floor space on the third floor of the Warner Building, and that affiliated with it are a number of the different trades and professions. The Engineers' Club has quarters with the Exchange; the Master Sheet Metal Workers' Association meets in the rooms from time to time, and the Master Painters' Association has also held frequent meetings there. The new quarters include an assembly room, which will seat about 250, and in the center of the building is a lounging and smoking room occupying a space 30 by 40 ft., and equipped with easy chairs, tables, writing desks, telephones and other paraphernalia calculated to add to the comfort and convenience of the members.

Montreal, Que

The depression which has characterized all lines of business in the States for the past six or eight months appears to be reflected in some measure in this city, more especially in the building line where the operations for May show a heavy shrinkage as compared with the same month a year ago. The official report of the building inspector indicates that 156 permits were issued in May for improvements valued at $509,960, while in the same month last year 231 permits were granted for new buildings and improvements estimated to cost $1,870,465. The building inspector is of the opinion that conditions will improve as the season progresses.

New York City.

About the only feature of special note in connection with building operations during the month just closed is the showing made in high grade construction work, such as mercantile buildings and elevator apartment houses. The office building construction is practically all of a superior kind, the projects represented by the figures of the Bureau of Buildings for the Borough of Manhattan, including the new home of the Emigrant Industrial Savings Bank on Chambers street, the new office building for the Farmers' Land & Trust Company on Beaver street and Exchange place, and the eastern section of the proposed Grand Central Terminal Station on Depew street. The tenement house construction fell off appreciably, there having been permits issued for only 18, costing $1,513,000, as against 49 in May last year involving an outlay of $3,988,000. Permits were issued for seven office buildings, costing $2,790,000, as against nine in May a year ago costing $3,058,000. The grand total in the Borough of Manhattan was 56 permits for building improvements estimated to cost $6,286,400, as compared with 141 permits in May last year involving an outlay of $10,197,559. The total number of new buildings projected in the Borough of the Bronx for May was 141 calling for an outlay of $1,115,750, while in May last year $2,353,700. For the first five months the total amount of new buildings projected, including alterations, in Manhattan and the Bronx was $35,617,323, as against $59,336,878 in the same period last year.

The showing for the Borough of Brooklyn equals in volume a trifle more than half what it was last year; in other words, in May 596 permits were issued for building improvements costing $3,294,241, while in the same month a year ago 916 permits were issued for improvements costing $6,377,750.

For the first five months of the current year new buildings were projected to the extent of $10,727,863, and in the first five months of last year to the value of $31,694,704. To these amounts must be added for alterations $2,129,989 and $3,278,238, respectively.

The first meeting of the members of the Building Trades Employers' Association in their new quarters on the top floor of the new Builders' Exchange, 29 to 35 West Thirty-second street, was held on the evening of June 5. There were over 300 in attendance, and a feature of the occasion was the presentation to Lewis Harding, the retiring chairman of the Board of Governors, of a handsome watch and chain and a beautifully illuminated set of resolutions. The committee having charge of the matter consisted of John Beattie, Ronald Taylor, B. D. Traitel, C. G. Norman and Robert Christie. Mr. Traitel made the presentation.

The resolutions were signed by members of the special committee, Ross F. Tucker, chairman of the Board of Governors, and W. J. Holmes, secretary of the association.

While the opening of the new rooms was altogether of an informal nature a brief address of welcome was made by C. G. Norman, chairman of the House Committee, and short speeches by Isaac A. Hopper, president of the association, and Charles A. Cowen, one of the charter members of the old Building Trades Club, from which the present organization was evolved.

Ottawa, Can.

The Builders' Exchange, which was organized on the 10th of March last, is in a flourishing condition and the outlook for its future is most flattering. At the time of the organization the membership was about 75, while at the present time it is nearly 120. The Exchange is a member of the Canadian National Association of Builders and sent delegates to the convention held in Montreal on the 21st and 22nd of April. The present officers of the Exchange are as follows:

President, George A. Crain.
First Vice-President, Alexander Christie.
Second Vice-President, J. Thorpe Blyth.
Treasurer, J. R. Hooper.
Secretary, D. J. MacKenzie.

These, with a representative from each trade or business, constitute the Board of Directors.

The Management of the Exchange is endeavoring to have the contracting business and the awarding of contracts conducted in accordance with a sound and businesslike system. The Exchange meets monthly, the trades meet twice a month, and the Board of Directors hold bi-monthly meetings.

Philadelphia, Pa.

While it was expected in many branches of the trade that the month of May would show some improvement, it failed to materialize, and according to the statistics of the Bureau of Building Inspection, a falling off as compared even with the previous month was to be noted. The report of the bureau shows that 818 permits for 1444 operations were issued, at an estimated cost of $2,909,500, while in May last year, 1015 permits for 2041 operations were issued, at an estimated cost of $5,683,920, showing a falling off in value of $2,774,420, or nearly 50 per cent., which illustrates quite forceably the condition of the building trades in this city at the time.

So far this year the total value of work begun is $10,750,465, while for the same period last year it was $19,588,595, a loss of $8,838,130, of which the decline in dwelling operations alone represents nearly $5,000,000.

During May, the number of permits for the erection of two story dwelling houses was 121, the estimated cost being $1,175,765, which shows this class of building almost stationary, as during April there were 120 permits issued, valued at $1,231,475. In three story dwellings there was a decline of $153,990 in the work begun last month, as compared to that started in April.

While the month of May developed but little business, there is a good volume in view, and it is believed that June will make a much better record. Financial matters are easier, but banks and trust companies still hesitate when it comes to advancing money on building work. Plans, however, are being made for some considerable work, in one instance for an operation of 600 dwellings, two and three stories high, which will cost something like $350,000; while another of 104 two story dwellings, costing $139,000 will develop, it is said, in a few weeks; the city also has plans prepared for a considerable amount of municipal work, the most important of which is for a new high school to cost $400,000. In the suburbs, considerable activity in building work has been shown, and while statistics regarding it are not available, the aggregate value of the work started and already underway is quite large.

Eighty members of the Master Builders' Exchange enjoyed their annual shad dinner at the Orchard, Essington, on the afternoon of May 20. They first were treated to a delightful sail down the river as far as Chester, and returned to Essington at 5 o'clock, when dinner was served, W. S. P. Shields, chairman of the Entertainment Committee, presiding. A delightful informality pervaded the occasion, and after dinner several of the members indulged in a baseball game. On the return trip to the city the members sang popular and patriotic songs under the leadership of Thomas F. Armstrong.

Pittsburgh, Pa.

The notable increase in the value of improvements over May last year is due to certain large operations which are about to be commenced. One of these, the Allegheny County Soldiers' Memorial Hall, will cost about $700,000, and the addition to the Carnegie Technical Schools will cost in the neighborhood of $650,000, these two accounting for $1,350,000 of the total for the month. Aside from these there has been a notable increase in the number of ordinary operations.

San Francisco, Cal.

Continued improvement was shown in the building situation during May and good progress is being made on many large structures. Work has been resumed on several buildings which had been held up for lack of funds, and now very few buildings are being delayed. The use of reinforced concrete in the smaller cities is on the increase, and in this city a good deal of concrete construction is under way. During the month of May 598 building permits were issued, the total valuation being $2,709,731.

There has been no increase in the prices of building materials, and there are ample stocks of everything needed for the erection of buildings. The lumber market is still very low and arrivals of lumber are in excess of the demand. The supply of common brick is large, and the pressed brick and terra cotta plants now in operation are prepared to fill large orders promptly. Shipments of structural steel from the East are coming through in record time. Very little steel is being erected just now, but a good many moderate sized jobs are pending.

Work has been started on a four-story class A building, on the south side of Post street, between Kearny street and Grant avenue, for what will be the first of the new department stores in that district. It will cost about $250,000, and will have a frontage of 137½ ft. on Post street and Union Square avenue in the rear, and will be 122 ft. deep, with a terra cotta front. Reid Brothers are the architects.

Amendments to the tenement house and building laws have been passed by the Board of Supervisors whereby owners of corner lots less than 100 ft. in depth are exempted from the provision of the law which requires them in building to leave at the rear of the lot a 10-ft. areaway. They are, however, required to give practically the same amount of space to light wells in the interior of the building.

The classification of the 598 building permits of a total valuation of $2,709,731 issued during May is as follows: Class "B," two buildings, $268,000; Class "C," 24 buildings, $740,890; 373 frames, $1,505,690; 199 alterations, $194,351.

In April, 589 permits were issued, with a total valuation of $2,084,015. Architects are at work on plans for three buildings, which will cost between $800,000 and $900,000, to be erected on the Blythe Block, and will cover 220 ft. along Grant avenue, 160 ft. on Geary street, and 120 ft. on Market street.

A summary of the larger work for the summer in the downtown district shows that 13 notable buildings, to cost an estimated aggregate of $9,255,000, will be erected, several being already under way. Eight of these are of a semi-public character, clubhouse, fraternal buildings, educational, &c. The 13 are as follows: Mechanics' Institute, to cost $400,000; Union League Club, to cost $160,000; University Club, to cost $150,000; Academy of Sciences, to cost $480,000; German House Association, to cost $500,000; Pacific-Union Club, to cost $500,000; Order of Elks, to cost $200,000; Masonic Temple, to cost $1,000,000; California State Building, to cost $250,000; Palace Hotel, to cost $4,000,000; Bohemian Club, to cost $315,000; Union Trust Company and two stores on Blythe Block, to cost $800,000; and the First National Bank, to cost $500,000. The figures given do not include the cost of the sites.

Contracts for the completion of the State University Library Building in Berkeley, Cal., have been awarded by the Regents of the University. The Raymond Granite Company will complete the cut stone work for $194,000; the American Bridge Company, the structural steel, 940 tons; the Contra Costa Construction Company, the fireproofing of the building; Couchot & Thurston, the concrete work, and C. A. Blume, the steel construction. The total cost of the contracts agrregates $325,000.

Tacoma, Wash.

The total building operations during the month of May exceeded in every respect those of the same period in any preceding year of Tacoma's history. Residence work of a high order was a prominent feature of the month.

Architects Darmer & Cutting have prepared plans for a large nine story building, which is to be completed within nine months for F. S. Harmon & Co. It will have a frontage of 150 ft. on Pacific avenue, and 125 ft. depth. A gallery will give the first story 26,000 ft. of floor space, and the total floor area of the building will be 170,000 sq. ft. Concrete, with structural steel cores, will be the construction material.

The building will be used for a wholesale furniture store and repository. In order to secure lower insurance rates, the structure will be practically divided into two buildings by a tile partition through the center. All elevator shafts and stairways will be inclosed with fireproof material, and all windows will be protected with wire glass or steel shutters. Each floor will be equipped with automatic sprinklers. Concrete retaining walls have already been built at the rear of the site.

Santa Cruz, Cal.

A meeting of the leading building contractors was held on the evening of May 8, at the office of Heins & Williams, for the purpose of perfecting the organization of a Builders' Exchange. The object primarily is to promote the interests of local builders, and it will be conducted along lines similar to other builders' exchanges throughout the country. The meeting was called to order by Charles Monroe of the Santa Cruz Lumber Company, and temporary officers were elected as follows: George Curtis, president; J. M. Pugh, secretary, and E. Whitney, treasurer.

Salt Lake City, Utah.

The month of May was a record breaker in this city, so far as building operations were concerned, and there seems to be little evidence of the depression which is reported in other sections of the country. There were 100 permits issued for new buildings, to cost $601,000, whereas in May last year only 64 permits were taken out, calling for an estimated expenditure of $108,000. This notable increase over last year is due to the carrying out of a number of important undertakings, and the outlook for the balance of the year is regarded as of a flattering nature.

St. Louis, Mo.

There is very little difference in the volume of building operations this season as compared with last, a condition which some are inclined to attribute to the stimulus to general business growing out of the "prosperity meetings" recently held in this city. While this, however, may call for a considerable stretch of the imagination, yet the fact remains that building operations for May were only $103,000 less than in the same month a year ago. The total estimated cost of new construction last month is given as $1,880,767, while in May, 1907, the estimated outlay of the improvements for which permits were issued was $1,983,758.

The number of permits issued for new brick buildings last month was 242, estimated to cost $1,662,005, against 255 in May last year, costing $1,728,208. There were 379 permits issued for new frame buildings last month, estimated to cost $101,027, while in May last year 392 permits were issued for frame buildings costing $90,099.

Washington, D. C.

Building operations for the month of May show a decrease of nearly $325,000 as compared with the previous month, the shrinkage, however, being attributable to the natural falling off in building work after the unusual activity which characterized the early spring. According to the figures compiled in the office of the building inspector 415 permits were issued in May for buildings estimated to cost $749,157, these including 34 brick dwellings, 40 frame dwellings, 12 apartment houses, six stores and dwellings and one church.

Notes.

During the month of May 558 permits were issued from the office of chief building inspector for the city of Los Angeles, Cal., representing a total valuation of $830,320, these figures comparing with 589 permits and a valuation of $1,005,605 for the corresponding month last year.

Decorating a Metal Ceiling.

A Wisconsin correspondent of that journal who desires to know the proper method of preparing a steel or galvanized iron ceiling for decorating, so that the paint will not flake or peel off; also, what kind of paint should be used, is thus answered in a recent issue of *The Painters' Magazine.*

Metal ceilings are usually prepared by the manufacturers, who give them a coat of dipping paint that dries hard enough to enable them to stack the sheets on top of one another and box them for transportation. This is done to keep them from rusting, and unless they are abrased in fastening them on the ceilings they need no other treatment before painting, but a good washing with naphtha to remove grease and dirt. When, however, sheet steel or galvanized metal has been put up without any previous preparation or shop coating, it is necessary to use a special priming in order to avoid the risk of peeling of the paint from the metal. For galvanized metal apply the following solution before painting: One ounce each of copper nitrate, copper chloride and sal ammoniac are dissolved in one-half gallon of water, and when this is effected add one ounce of commercial or crude hydrochloric acid. The solution must be made in an earthen or glass jar or bottle, not in tin cans or other metal. Any druggist can furnish the ingredients or make the solution for it. Apply to the metal with a soft brush and let stand for at least 12 hours, when a grayish film will have formed. Go over this with the duster, then go ahead with any good oil paint that you wish to use, and you need not apprehend any risk of peeling. If the metal be sheet steel the best preparation is to remove grease or dirt with naphtha. The first coat of paint should be semi-flat in order to have it adhere well. A priming made from keg lead with any desired coloring matter, ground in oil, thinned with equal parts of coach japan, rubbing varnish and turpentine, will give the desired result. Any other paint, glossy or flat, will adhere well to this coating.

Brooklyn's New Hotel.

The new hotel which is about to be erected on the Plaza at Prospect Park, Brooklyn, N. Y., in accordance with drawings prepared by Architect Robert T. Lyons, of the Borough of Manhattan, will be 12 stories in hight and will cost in the neighborhood of $2,700,000. It will be of reinforced concrete and in its exterior appearance somewhat resemble the Hotel Astor in Times Square, Manhattan. The plans provide for a strictly fireproof structure faced with white terra cotta and glazed brick. It will contain 1200 guest rooms, arranged in suites of one to four rooms each, with bath. It will have a private plant for heating and lighting as well as a cold storage and ice plant, Turkish baths, &c. It is expected that the new building will be ready for occupancy in September of next year. The construction work will be in charge of C. J. Zimmermann, the secretary and treasurer of the Consolidated Mortgage Company, for which the hotel will be erected.

Construction of Concrete Block Silos.

One of the many uses to which concrete blocks are being devoted at the present day is the construction of silos which constitute an important adjunct of the equipment of the up to date farm, be it large or small. The principle of the silo is the same as that of canning food for human beings, the idea being to pack the silage as closely and firmly in it as possible when in its green state, exclude all the air and preserve it in this condition for use during the winter months. The silo as a rule is built circular in shape with a door or means of access the full hight, thus enabling the farmer to load and unload at all levels.

Silos vary in size from 10 to 20 ft. inside diameter and from 20 to 36 ft. in hight. Experience has shown that very large silos are not economical, as it is better to build several small ones so that the fodder on top may be taken off clean each day. If one very large silo is used and the silage removed from half of its top surface one day and from the other half the next day the top of the first half has had time to lose much of its nutrition through exposure to the air.

If the stable or barn is a very long one it is best to have the silo about midway of the structure and adjoining it so as to save steps at feeding time. It is generally regarded that about the cheapest form of silo is the round stave construction, but the floor should always be of cement. The average life of a stave silo, says a writer in a recent issue of the *Journal of Modern Construction*, is somewhere between 5 and 10 years. The acids in the silage having a deteriorating effect upon the wood. As the material is not costly and not much of it is required it is not an expensive undertaking to rebuild the silo every few years, although it is quite an annoyance. To keep the silage in perfect condition the walls should be air tight, and for this reason when a stave silo is used the edges should be beveled that they will fit flat against each other, which is not possible with the ordinary dressed lumber built into a round silo. One disadvantage of the stave silo is that like all other wood tanks the staves will shrink during the summer when it is not in use, opening large cracks and making it necessary to tighen up the bands each fall before using.

Some silos are built with the staves tongued and grooved and while this no doubt is an advantage it is not absolutely necessary. As the silage settles there is a very heavy pressure which must be taken into consideration to avoid any mishaps, and this is the principal reason for building the silo circular in form.

Silos are also built of stone, brick and concrete blocks, and it is with reference to this last form of construction that special attention is to be called in this article. Frost is not permanently harmful to silage, but it is best to make the walls as frost proof as possible. A stone silo should be at least 2 ft. thick to be frost proof, which makes it impractical on account of the great outlay in material and cost of construction. A brick wall is rather hard to build on account of the poor bonding of the bricks in a circular wall and, when used, should be cemented up on the inside. The remedy for most of the evils in the construction of silos out of the materials mentioned is the cement block wall and for many of the points on this new form of construction we are indebted to H. E. Murphy, a pioneer in this style of silo construction.

In Fig. 1 of the illustrations is shown a silo 14 ft. in diameter inside and 30 ft. high, built of concrete blocks. These blocks are made by procuring a set of circular plates and altering slightly the cores of the regular block machine. The blocks being molded circular in form make a perfect bond and true circle without any cutting or fitting. Along the outer edge of the block is a ½-in. groove, in which is put a heavy steel wire or bond to assist in taking up the lateral pressure when the silage is settling. These tie rods extend across the entrance to the silo at about every sixth course of blocks, as shown in the plan of the entrance, Fig. 2. There is no door, the opening being closed up by 2-in. planks, which are placed on the inside against the frame, one on top of the other as the silo is being filled, and are removed one at a time from the top as the silage is used. The pressure of the silage against the planks keeps them in place. They will, of course, through the action of silage acids be rendered useless in the course of a few years, but can be easily replaced at very slight expense.

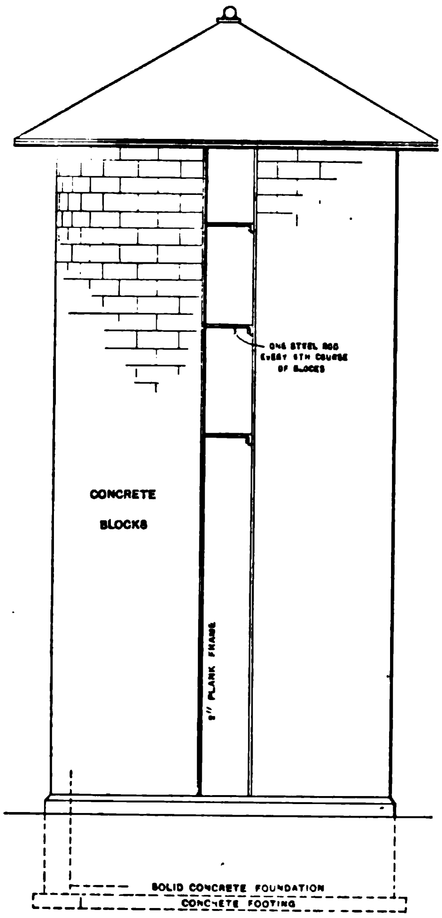


Fig. 1.—Elevation of Silo.

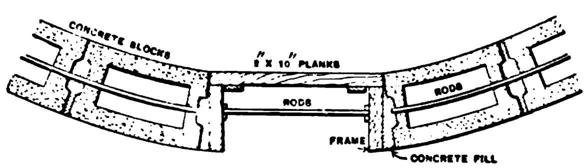


Fig. 2.—Plan of Entrance to Silo.

Construction of Concrete Block Silos.

The foundation should be built of field stone or of solid concrete. Where concrete is used, if the soil is firm, no form is required. A circular trench is excavated the proper width of the wall and is then filled with the concrete. After the concrete is set, the earth inside is removed to the depth of the wall, which should be from 4 to 6 ft. into the ground. The blocks are laid in the same manner as for any building except for the steel bands or rods which are put in at proper intervals. It is claimed by some that there should be a rod for every third course. When this is done, the rods extending across the opening maks a fairly good ladder, but make it hard to get in and out of the silo and prove quite a nuisance. For all practical purposes it is therefore best to have one rod about every sixth course. This precaution with the walls properly built is plenty strong for every requirement.

It is best to plaster the inside of the concrete wall with a smooth ½-in. coat of rich cement plaster as the acids of the silage work upon the lime in the joints. This plaster also makes a wall smooth enough to allow for the free settling of the silage, an important item. The advantages of the concrete silo are first, that it is a permanent building and in addition to this there is no continual adjusting of steel bands, no painting or other repairs required. Second, that it makes as tight a job as is possible for a building of this kind and is practically frost and fireproof. It is also proof against severe winds and cyclones, and so far as is known the silage acids have no deteriorating effects on it.

The Problem of "Extras" in Building.

It is the clear purpose in the preparation of any well-considered contract specifications so to cover the proposed work as to include all parts of it, and thus to avoid the disputes or contested claims which characterize the completion of nine contracts out of ten, or perhaps ninety-nine out of every hundred, remarks *The Engineers' Record*. The specifications are intended to be so complete as well as so discriminating as to show what must be done, not only in connection with the main features of the work involved, but also as to any preparatory operations, so that the contractor shall be in no doubt as to what he is to be paid for the direct work of the contract and for preliminary or preparatory construction, if there be any. In spite of the most scrupulous consideration by the engineer of every provision of the specifications, it will be invariably found, if the work is of sufficient magnitude to include a variety of operations, that when it is completed there is enough doubt either as to the character of some of the work done, or in the language of the provisions covering its performance, and in the items of payment relating to it, to open the way for extra claims on the part of the contractor and for contesting their payment on the part of the engineer, both, it may be assumed, acting in good faith.

The purpose of the engineer is, or ought to be, to provide for his client a reasonable and economical construction, as expressed by plans and specifications fully and clearly enough to enable any competent contractor to ascertain just what he is expected to do in every particular, should the contract be awarded to him. Yet it is not uncommon even at the present time to find a kind of blanket provision in specifications as to some portions of the work, the character or amount of which is indeterminate, or perhaps about which there is much doubt as to its being required at all, and under which provision the contractor must actually make a gamble as to what such a feature of the work is to cost him. Consequently he must either take his chances on escaping the work or name a high price for a large profit. Fortunately for the construction of large works at this time such uncertain contract provisions are not so frequent as they once were.

It is reasonable to assume that a reputable and experienced contractor makes his bid in good faith and intelligently, and yet such a contractor will find himself much at sea in attempting to fix prices for items or features of construction like those just described. It is not surprising that in the execution of such portions of the contract conditions should arise quite different from those either named in the specifications or anticipated by either the contractor or the engineer, nor is it at all remarkable that the contractor and the engineer should take distinctly different views as to the proper payment to be made to the former. Although not specifically so stated in the specifications, neither party in interest pretends to gauge the hazard; both tacitly recognize it and the engineer plainly warns the contractor that it exists, but practically intimates that the contractor must determine for himself its character and amount and take his chances as to a loss or a profit. This is obviously likely to lead to a costly issue for the owner. As already observed no contractor can afford to gamble for a loss. If he is going to gamble at all, he will inevitably take his chance for the largest profit possible, and in doing so he is simply following the dictates of prudence. Furthermore, the very existence of these doubts, and the lack of clearness in setting forth precisely what is to be done afford just the opportunities which a shrewd contractor can easily turn to serve him as a basis for plausible claims for extras. When the plans and specifications show or express with clearness all the items of work to be done, the latter are outlined with precision and accuracy, effectively preventing any claims for extra work. It follows from this, what is otherwise equally clear, that an engineer's duty is to delimit completely every part of the contract field. No contractor is unreasonable in setting up an extra claim for work which is not plainly covered by the items scheduled in his contract, and in the final settlement experience has shown that he can collect in a court a fair compensation for such work.

These observations are applicable to a far greater number of contracts than is ordinarily supposed, although fortunately they are becoming less applicable as specifications are more carefully written and as unit price contracts displace those which provide for lump sum payments. On the other hand, the greatly increasing magnitude of structural work and the necessarily more elaborate character of the contracts required for their construction, make it more difficult in a number of ways to eliminate contractors' claims for extras. At the present time these great contracts frequently call for an extraordinary amount of work of considerable variety for the installation of the contractor's plant. Any one of a number of large contracts in various parts of the country, such as a great irrigation reservoir, a modern high masonry dam, or even a great bridge, may necessitate the construction of a contractors' railway or the excavation and grading of a great yardage of material for the installation of crusher and power plants, storage or fabrication yards, and other similar purposes. While it may appear sufficient to warn the contractor to make a complete examination of the vicinity and form his own estimates of cost, as no allowance will be made for any part of the installation of his plant, there may be occasions where such a procedure is not advisable. It is by no means unheard of that the precise location of a great work may be somewhat changed at the last moment, and enough to demoralize materially a contractor's estimate of this part of his cost. It is not unreasonable for him under these circumstances to claim compensation for his increased cost of installation.

There obviously may be danger in the owner assuming the expense of a contractor's installation; in fact, that procedure, as a rule, is certainly to be avoided. At the same time, where there are such items as large quantities of excavation or well-defined classes of construction, all of which are capable of complete control by the engineer, it may be best to include them under suitable items in the contract. All possible claims for extras would be avoided, and in at least some cases decided advantages would be attained. In this, as in every other item, the specifications should make clear just what is allowed. There has also been no little difficulty experienced in connection with specifications in which the full application of some one payment item has not been clearly indicated. Wherever there is obscurity of language or of definition the contractor is put into a position of doubt as to what is required of him. Under those circumstances, the engineer has failed to make clear his requirements and the contractor can scarcely be considered unreasonable if he makes claim for extra compensation for something done which it cannot be conclusively shown he was required to do.

Much has recently appeared in the trade press relative to the "Ideal 20th Century Home" just completed at Carrollton, Ill., for a member of the Light, Heat & Power Company of that place. Although the idea is not altogether new, a similar house having been erected some years ago for an official of an electric company at Schenectady, N. Y., and described somewhat in length in these columns at the time, it is of sufficient interest to make mention of it at this time. The house is constructed of concrete, but is entirely without a chimney and is heated by steam from a central station. The house is also wired for electric heat in case anything should happen to the steam heating system. Cooking and lighting are also accomplished by electricity, thus doing away with the necessity of a chimney.

New Publications.

Architects' and Builders' Pocket-Book.—By Frank E. Kidder, C. E., Ph. D.; 1662 pages. Size, 4½ x 7 in. Illustrated with 1000 engravings, mostly from original designs. Bound in leather with back title in gilt. Published by John Wiley & Sons. Price, $5, postpaid.

This is the fifteenth edition of a well-known handbook for architects, structural engineers, builders, and draftsmen by the late Frank E. Kidder, the changes in the edition consisting of corrections of typographical errors reported to the publishers and the re-writing of some of the chapters. The work has been done by R. P. Miller, who for 10 years was connected with the Department of Buildings, New York City, and for the last five years its chief engineer. During his connection with the Building Department he had extended opportunity for studying fireproof construction in particular, at the same time giving the subject of reinforced concrete very careful consideration. It is claimed that he drafted the first regulations promulgated in this country regarding its use, and that these regulations have formed the basis of those since adopted by many of the cities throughout the land.

At the time of the late Mr. Kidder's revision for the fourteenth edition he was not altogether satisfied with the chapters on fireproofing and reinforced concrete, and had he lived would have personally revised them. In Chapter XXIII one-half of the matter in the old edition has been used and new matter substituted for such parts as have been found unnecessary or out of date. The chapter on reinforced concrete is entirely new, the manuscript being originally Mr. Miller's own work.

The section on paints and varnishes has been brought fully up to date by Prof. Alvah H. Sabin.

The work as it stands constitutes a most valuable reference book for the architect, engineer and builder, as Mr. Kidder enjoyed an enviable reputation in the particular line in which he devoted his energies. It is comprised in three parts, the first of which deals with mensuration, weights and measures, geometrical problems and trigonometric formulas; Part II considers the strength of materials and stability of structures; while Part III gives much useful information for architects, builders and superintendents, covering as it does heating and ventilation, hydraulics and plumbing; illuminating gas and lighting; electrical definitions, rules and tables; weights, quantities and data for estimating cost; dimensions and data useful in the prepartion of plans; glossary of technical terms and legal definitions.

The make-up is thoroughly in keeping with the high standard of excellence of earlier editions and no architect or builder who desires to be abreast of the times can afford to be without a copy, as it constitutes a necessary adjunct of his library of reference books.

The Bungalow Book.—By Henry L. Wilson, architect. Size, 8 x 11 in. Numerous designs. Bound in illuminated paper covers. Published by the author. Price, $1.

This is the second edition of an interesting work containing a large number of designs of bungalows accompanied by floor plans and brief descriptive particulars. The pictures of the completed buildings are half tone reproductions from photographs, thus showing just how the bungalows appear in their finished state. The rapidly growing popularity of dwellings of the bungalow type renders more than usually interesting contributions to the literature of the subject, and among the opening pages of this publication is a short sketch of the evolution of the bungalow from its primitive crudeness to its present state of artistic beauty and cozy convenience. In presenting his book to the attention of the public Mr. Wilson points out that the California bungalow is a direct descendant of the original attempts at architecture in that part of the country. He says, "It surely can trace its simple artistic lines directly back to the old Mission of the Sapanish Padres and its low overhanging eaves, large porches, and general air of hospitality and coziness to the adobe houses of the pioneers. From the 'dobe shacks of the early settlers to the charming homelike bungalows of to-day may seem a long stretch, but it has come along as a steady process of evolution and improvement, until to-day the California bungalow is known the world over."

Within the covers of the book under review are 56 half-tone engravings, line etchings and wash drawings of bungalow exteriors, 82 floor plans and numerous sketches of interiors, cozy corners, nooks, mantels, buffets, sideboards, &c. In view of the reduced costs of labor and materials, there accompanys the book a revised estimate of cost of each design illustrated.

Practical Steam and Hot Water Heating and Ventilation.—By Alfred G. King; 402 pages and 300 illustrations. Bound in board covers. Published by the Norman W. Henley Publishing Company. Price, $3, postpaid.

This work is well adapted to the requirements of the contracting steam fitter and others interested in the subjects indicated by the title. It is the sort of book that goes in more for description than discussion, the different apparatus and materials entering into the various heating systems being pictured at considerable length and the advice with regard to the determination of sizes and scope of the equipment being concise. The matter has been presented in such a way by the author that if the reader masters even a large portion of the information presented within the covers of the book he will be far better grounded in the subject than is the great majority of those at present indentified with the trade. The forms of valves, fittings, radiation, and the like in common use are illustrated and the different systems of steam and hot water heating, including exhaust and vacuum heating, are taken up in turn.

One of the unusual features is a brief historical sketch of the development of modern heating, while a valuable provision is found in an appendix of a notably large number of tables needed for reference at one time or another and always convenient if found within the one set of covers. There is also a list of general rules and miscellaneous information such as the care of heating apparatus, the bronzing and painting of radiation and guaranties for heating work. The work, taken as a whole, is one which will be found a desirable addition to the library of those interested in the subject indicated.

The American Practice of Gas Piping and Gas Lighting in Buildings.—By Wm. Paul Gerhard, C. E.; 306 pages. Size 6½ x 9½ in. Bound in board covers. Published by the McGraw Publishing Company. Price, $3, postpaid.

The above work is intended chiefly for the use and enlightenment of the gas consumer and the householder, but within its covers is much valuable information for architects, builders and building superintendents, as it is calculated to give them a better knowledge of the manner of introducing, distributing and utilizing gas in buildings. In preparing the book the object of the author has been not to treat of the various processes of manufacture and distribution of illuminating gas, nor discuss the lighting of public streets, parks and squares, but to explain how gas fitting should be done so that gas may be advantageously employed in the illumination of the interior of buildings. In other words the author takes up the subject of gas installation and gas utilization practically at the point where it reaches the consumers' premises.

One of the most interesting chapters from the standpoint of our readers is that on the lighting of country houses. Here the author brifly discusses the various methods available for this purpose, giving considerable attention to lighting by gasoline gas, acetylene gas and the machines required for its manufacture, electric lighting, &c. He shows the cost of gasoline and acetylene gas lighting, as well as the cost of various illuminants. The requirements of the National Board of Fire Underwriters to insure safety in the use of gas machines are given, as well as those for a standard acetylene generator. Another interesting portion of the chapter is devoted to the requirements, installation and use of acetylene gas. Among other notable chapters special reference may be made to those treating of the "Arrangement of gas piping in buildings"; "The testing of gas pipes"; "Practical hints for gas consumers"; "Dangers to the public health from illuminating and fuel gas"; "Historical notes on the development and progress of the gas industry," and a "Bibliography of gas lighting."

A Reinforced Concrete Bungalow.

Just at the present time attractive cottages under the name of "bungalows" are rapidly growing in favor in many sections of the country, and the designs are being executed in materials to suit the taste of the owner. One of the latest attempts in the mission style of architecture using reinforced concrete for the exterior walls, partitions and porch is the bungalow recently completed at Fort Thomas, Ky., by Architect Gordon Sheppard. In erecting the building the concrete work was first completed, and then beams for the floors and roof were placed in what might be termed gains in the concrete. Over the arches and window openings plain round rods ½ in. and ¼ in. in diameter were used. The interior partitions are 4 in. thick, while the exterior walls range from 7 in. to 12 in. in thickness. Wooden "forms" were used, consisting of 2 x 4 in. studding with matched and surfaced sheathing boards. A mixture of one part of Portland cement and six parts bank gravel was used. The outside finish was a mixture of hydraulic lime and sand in the proportions of one to one, applied as a stucco coat. The floors and ceilings are of wood, while the roof is of red tile.

The interior finish is of mission oak, with exposed beams and hardwood floors. The outside walls are furred with 2-in. strips of wood and plaster in the usual way.

The house has a frontage of 35½ ft. and a depth of 27½ ft., and is one story and attic in hight. The total cost is said to have been $3800. The main floor has a living room, dining room, kitchen, two bedrooms and bathroom.

Retirement of Samuel Disston.

Under date of May 25 Henry Disston & Sons, Incorporated, Philadelphia, Pa., announced that Samuel Disston, secretary and general manager of the business for many years, had resigned as such and been appointed chairman of the Board of Directors. The duties performed by him in the former position have been transferred to others, but Mr. Disston will still give the company's interests the benefit of his ripe experience.

In this connection it may be interesting to state that in the year 1850 Samuel Disston entered the employ of Henry Disston, who at that time employed only about 35 men. He served his apprenticeship as a sawmaker, gaining a general knowledge of the business, and then entered the office. Subsequently, he became the road representative of the firm, traveling extensively, and becoming widely known. As a result, Mr. Disston is held in the highest esteem by the Hardware trade and others with whom he came in contact. The business of Henry Disston & Sons grew rapidly, and in the year 1894 Mr. Disston was made secretary and general manager of the company, which at the present time employs 3500 men, its plant at Tacony covering over 50 acres. Advancing years and ill health have, however, made it impossible for Mr. Disston to give the close and undivided attention to business which had been his characteristic trait ever since his connection with it, and he has been compelled to realize that nature's demands must be heeded, and to announce his retirement from active duties and responsibilities connected with the management of this great industry.

On Thursday evening, May 26, at the Bellevue-Stratford Hotel, Philadelphia, a complimentary dinner was tendered to him by the foremen and the old employees of Henry Disston & Sons, and a large number of experts in the different departments of the business representing both the manufacturing and commercial sides, were thus brought together. There was aboundant evidence of the affection and honor in which Mr. Disston is held, in token of which a handsome loving cup was presented to him.

In view of the retirement of Samuel Disston, the personell of the management has undergone a change. The officers and directors now are as follows:

President, William Disston.
First Vice-President, Henry Disston.
Second Vice-President, Robert J. Johnson.
Treasurer, Jacob S. Disston.
Secretary, William Miller.
Assistant Secretary and Assistant Treasurer, E. B. Roberts.

Board of Directors—Samuel Disston, chairman; William Disston, Jacob S. Disston, Henry Disston, Robert J. Johnson, Frank Disston, Albert H. Disston, Henry C. Disston, William Miller, E. F. Cooper.

The broad foundation on which the business has been established will be strengthened wherever possible, and the high reputation achieved for the quality of Disston goods will be maintained in the future as in the past.

CONTENTS.

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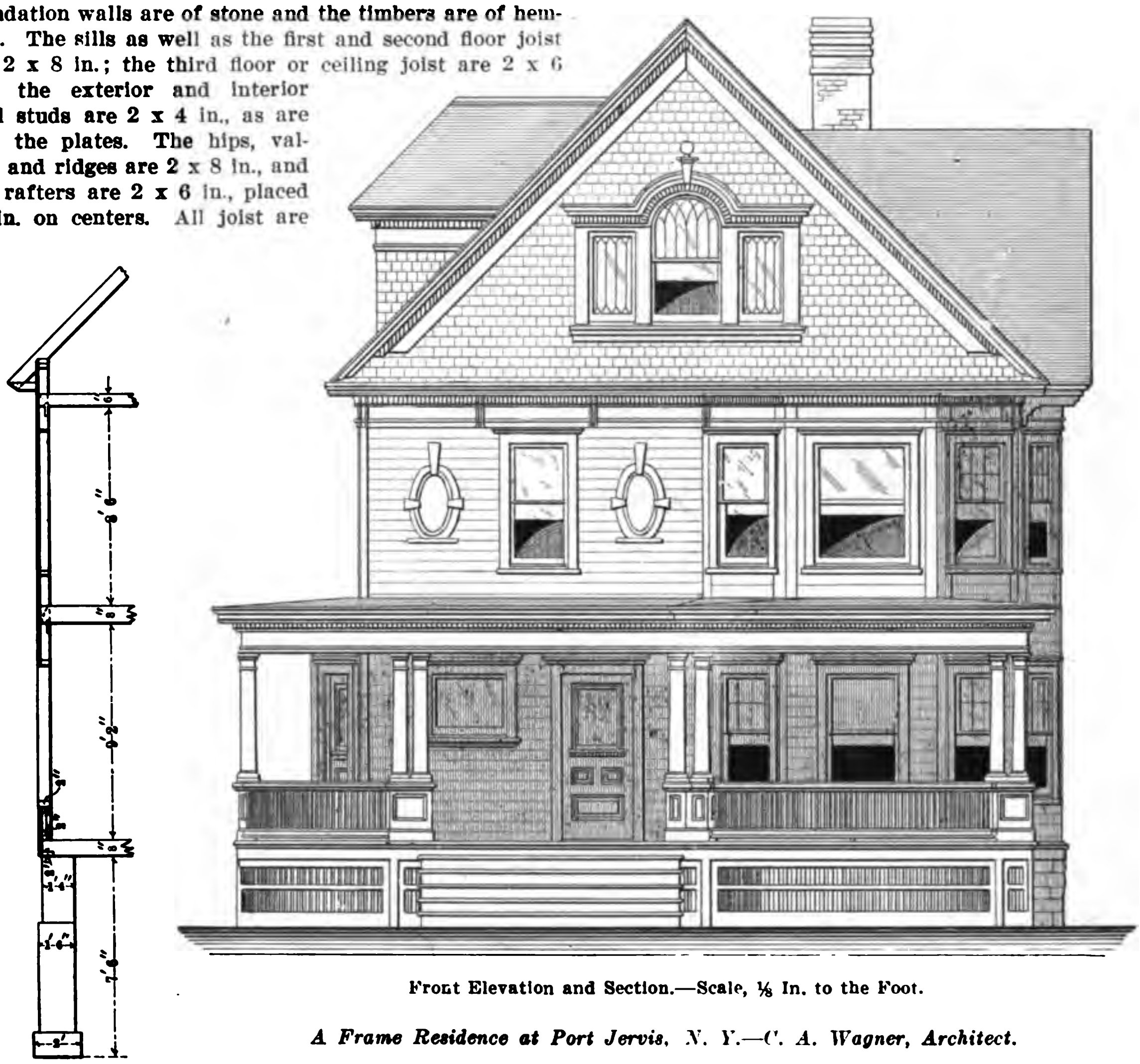
Carpentry and Building

NEW YORK, AUGUST, 1908.

A Frame Residence at Port Jervis, N. Y.

WE have taken for the basis of our half-tone supplemental plates this month a two-story and attic frame residence recently erected at Port Jervis, N. Y. On one plate is shown two views of the finished house, while the other represents an interior as viewed from about the center of the rear parlor and looking toward the dining room. The floor plans upon the following page clearly indicate the general arrangement of the rooms, while the various details show the construction employed.

According to the specifications of the architect the foundation walls are of stone and the timbers are of hemlock. The sills as well as the first and second floor joist are 2 x 8 in.; the third floor or ceiling joist are 2 x 6 in.; the exterior and interior wall studs are 2 x 4 in., as are also the plates. The hips, valleys and ridges are 2 x 8 in., and the rafters are 2 x 6 in., placed 24 in. on centers. All joist are bridged once in their entire length, and if over 12-ft span twice with 1 x 2½ in. bridging. The corner posts are 4 x 6 in.; the porch joist 2 x 8 in., and the soffit beam 2 x 10 in.



Front Elevation and Section.—Scale, ⅛ In. to the Foot.

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

The exterior of the frame is covered with surfaced hemlock sheathing, over which is placed a layer of Phillips building paper, this in turn being covered between water table and main cornice with 6-in. white pine clapboards laid not more than 4¼ in. to the weather. The main roof is covered with 1 x 6 in. hemlock boards laid about 2½ in. apart, on which are placed 16-in. red cedar shingles laid 1 in. less than one-third their length to the weather. The gables and sides of dormers are also shingled the same. The hips are shingled in and the valleys are laid open. The shingles on the sides of the dormers and gables were dipped in Cabot's shingle stain 1 in. over two-thirds their length before being laid. The main roof was treated to a brush coat of the same stain applied after the shingles were laid. The tin roofs, porch, pantry, piazza and dining room wing roofs are covered with IC Merchants American "Old Style" tin.

The porch floors are of 1⅛ x 2¼ in. white pine tongued and grooved strips well driven up and laid with white lead. The ceilings are ½ x 3 in. matched and beaded North Carolina pine.

The walls and ceilings of the various rooms are lathed and plastered with two coats of Higginson's wall plaster, the last coat being hard finish. The floors of the house are double, the bottom one being of ⅞ x 8 in. surfaced hemlock put on diagonally. The rear entry, kitchen, pantry and bathroom have a top floor of ½ x 2 in. white maple tongued and grooved flooring, while all other rooms in the first story have a top floor of ½ x 2 in. white oak quarter sawed, tongued and grooved flooring, blind nailed. All remaining finish floors are of well seasoned ⅞ x 6 in. white pine.

The finish in the reception hall, front and back parlors and dining room is in quartered white oak, while the rest of the finish on the first and second floors as well as in the servant's room in the attic is of cypress, finished natural by filling and varnishing. The doors shown in the rooms on the first floor are veneered to match the finish of the rooms in which they show. All the doors on the second floor are of cypress of the five cross panel variety. The sliding doors are fitted with McCabe hangers and ball bearing roller, stop and strike.

The kitchen and pantry are wainscoted 3 ft. wide and are finished with wainscot base and cap. In the bathroom and at the back of the sink, the wainscoting is 4 ft. high, of ½ x 3 in. beaded tongued and grooved cypress.

The main stairs are of white oak up to the second floor, while all others are of white pine, painted. All interior hardwood has one coat of Wheeler's paste filler and two coats of coach varnish, left a dull finish. The kitchen, pantry, rear entry, the entire second floor and the attic room have one coat liquid filler and two coats of Spar varnish. The attic and rear stairs, as well as those leading to the cellar, have two coats of Jewett's lead, zinc and linseed oil. All hardwood floors are finished with one coat of Wheeler's paste filler and two coats of Berry Bros.' floor finish.

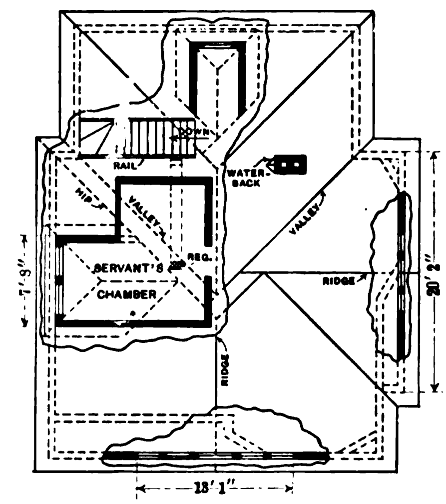
The Main Stairs and Reception Hall as Viewed from the Parlor.

All exterior work is painted with two coats of Jewett's lead, zinc and linseed oil.

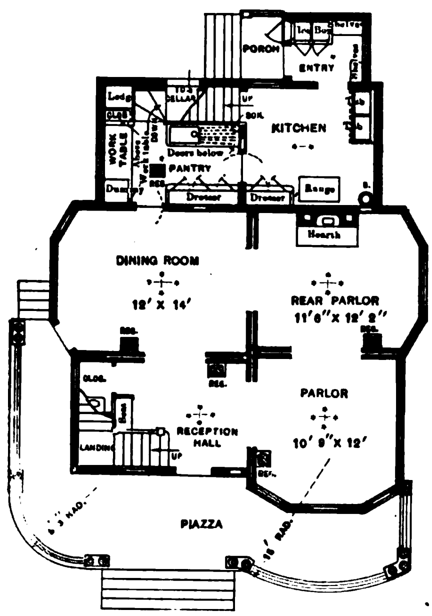
The house is piped for gas and wired for electric lighting, call bells, &c., the wiring being in accordance with the rules and regulations of the Board of Fire Underwriters.

The kitchen is fitted with a two part Alberene 4 ft. wash tray, with hardwood covers; a 20 x 30 x 6 in. Alberene sink, and a 40-gal. extra heavy galvanized iron boiler. The bathroom is equipped with a low-down double syphon-jet water closet with tank lined with 14 ounce copper; one 5 ft. standard 3 in. roll rim cast iron porcelain enameled bath tub, with nickel plated fittings, and one 20 x 24 in. Standard lavatory, with nickel plated basin cocks and supply pipes. Under the main stairs on the first floor is an 18 x 24 in. Standard lavatory with nickel plated basin cocks, supply and waste pipes, &c. In the cellar is a low down double jet closet with tank, &c., complete.

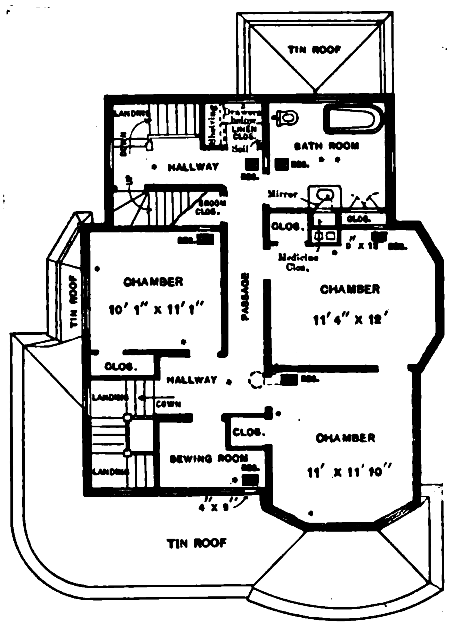
In the cellar is a Boynton portable "Admiral" furnace with pipes leading to the various registers, the joist and studding where necessary being protected with tin sheathing.



Attic and Roof.



First Floor.



Second Floor.

A Frame Residence at Port Jervis, N. Y.—Floor Plans.—Scale, 1-16 in. to the Foot.

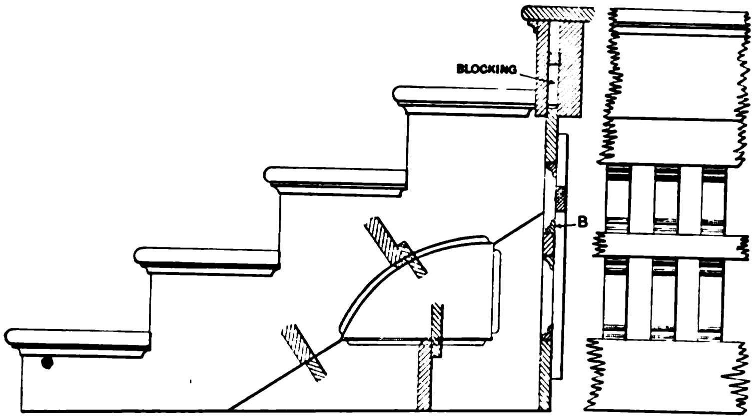
The residence here shown was designed by C. A. Wagner, architect, Port Jervis, N. Y., and was erected for F. N. Mason, on Ferguson avenue, in that place.

THE committee which has had in charge the selection of a site for a new Supreme Court House for New York City, has submitted its report to the Board of Estimate, suggesting the area bounded by Union square on the west, Irving place on the east and extending from Fifteenth to Seventeenth streets. The site is a block less in area than the one advocated last year. It will close only Sixteenth street, while the first site selected closed Fifteenth street as well.

An Architect's Opinion of Concrete Blocks.

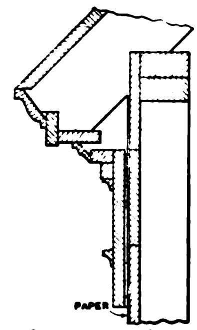
At intervals in the recent past we have presented in these columns extracts from the writings of Robert C. Spencer, Jr., a prominent Chicago architect, who has contributed not a little to the literature of architecture and building. In one of his more recent articles he takes up the question of which material it is best to use in the construction of our dwellings, and in *The House Beautiful* he discusses the merits of cement blocks, brick and terra cotta for the purpose named. What he has to say is of such absorbing interest to architects and builders all over the country that we reprint the following paragraphs:

The hollow Portland cement or artificial stone block industry has grown wonderfully within a few years under the stimulus of high cost of lumber and low cost of cement. Dozens of different machines for mixing and molding concrete are being extensively advertised, and small yards where blocks are made are appearing in every town where sand and gravel are at hand or to be cheaply had. Not only is there a wide demand for these blocks for foundation work, but many dwellings and the small buildings are being entirely built of them. It is evident that where the manufacturer of the blocks is near at hand that this material costs little if any more than wood. So hideous in appearance, however, are those imitation rock faced stone blocks, absolutely hard and mechanical, that the writer in common with most of his professional confreres, has left the use of this material thus far to the speculative builder, and is not therefore definitely advised as to its relative cost. The makers of block machines have been sermonized somewhat upon the immoral ugliness of their sham stone walls. Not until the artistic body of the profession demand and employ a better form of block, will the "rock face" abominations cease to spring up. Some materials are beautiful, others are merely serviceable. Among the latter is concrete in block form; like cheap common brick, it serves well as the body and bone of a wall, to be incrusted with some more seemly material like "rough cast" plaster.

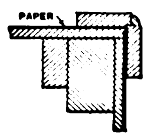


Details of Steps and Lattice Work.—Scale, ¾ In. to the Foot.

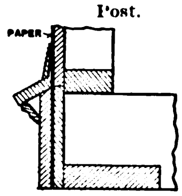

Piazza Cornice



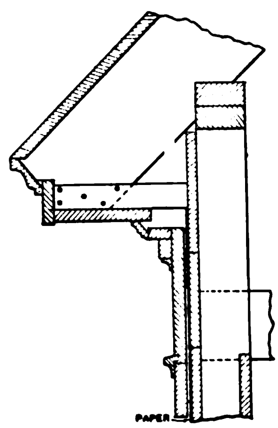
Dormer Cornice.



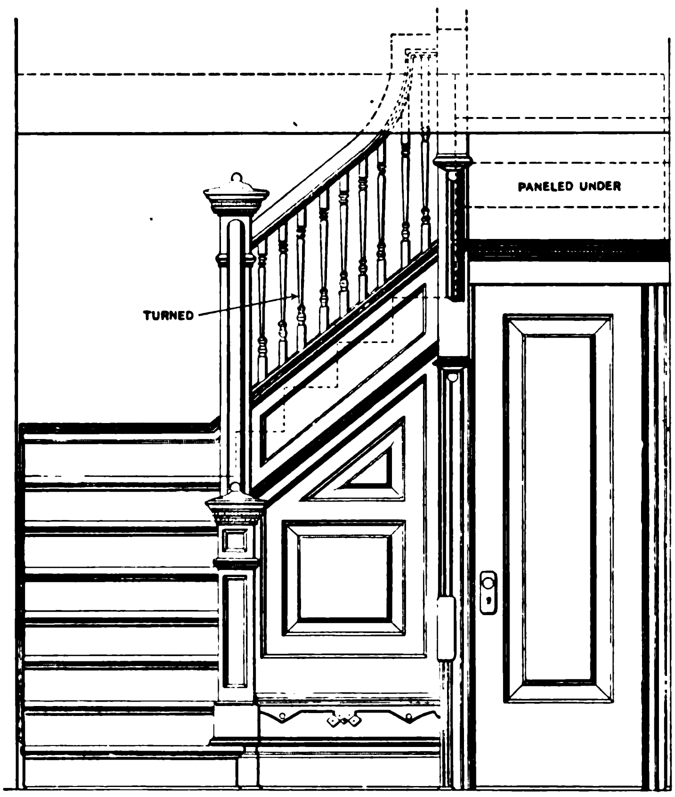
Corner Board and Post.



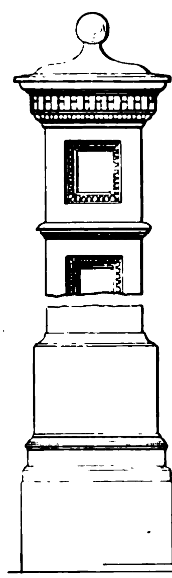
Water Table.

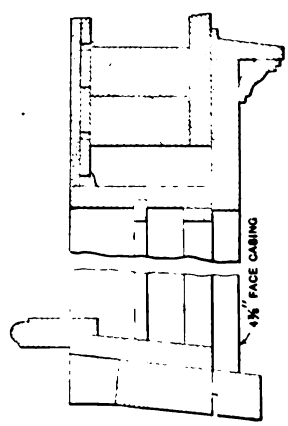


Detail of Main Cornice. Scale, ¾ In. to the Foot.



Elevation of Main Stairs as Viewed from the Front Parlor.—Scale, ⅜ In. to the Foot.


Detail of Main Newel. —Scale, 1 In. to the Foot.



Details of Window Frame. —Scale, 1½ In. to the Foot.

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

To rough surfaced concrete blocks thoroughly wet plaster will adhere solidly. The cement block house of the future, if it is to be beautiful will be in appearance a monolith, warm, light and soft in coloring. As in England many of the most charming houses are of cheap bricks, rough casted, so we may hope that here, if the cement age is not fleeting, we may have many charming rough casted houses of hollow blocks. As plain, rough concrete blocks can be had cheaper than the "faced" ones, the monolithic rough cast treatment should cost little more than sham stone work of cement blocks.

In the use of stucco over wood or concrete, there are always uncertainties of workmanship and coloring to contend with, and the architect must superintend such construction with an ever watchful eye.

In building with brick, however, the difficulty of getting good color largely disappears, the unit of construction is relatively small and easily handled by the designer and workman, and while more labor is involved in the designing and detail drawings for brick construction, the superintendence is not difficult where good bricklayers can be had. But there's the rub. Skilled bricklayers are scarce, and incompetent ones so many and so confirmed in their bad habits that constant vigilance in superintendence is the price which the architect must pay for work which is even acceptable, particularly if he attempts any interesting effects in bond or pattern. Nevertheless, in spite of these drawbacks, brick is the ideal material for domestic architecture—in color, texture, strength and durability. It improves with age, the soft dull reds of the commoner clays fit quietly, yet cheerfully, into the summer or winter landscapes. Their surfaces invite the upward growth of clinging vines where stone is scarce.

Steel Sheet Piling Solves a Difficult Building Problem.

An interesting installation of steel sheet piling has recently been completed in the foundation for the A. A. Pope building, Cleveland, Ohio, near the junction of Euclid avenue and Huron road southeast. The use of it solved a difficult building problem and enables the builders to effect a very great saving in cost without sacrificing any of the features especially desired by the owner. In excavating the unusually deep basement water was encountered from a very thick and active vein of quicksand which had to be kept out until the foundation walls and grillage beams were in place. As putting in the foundations under compressed air would have been prohibitive in cost, it was decided to inclose the entire excavation in a large cofferdam, approximately 100 x 200 ft., extending through the quicksand and penetrating the hard clay below. On account of the depth of the penetration however, and the nature of the quicksand, wood sheeting could not be used, so steel sheet was decided upon, the type chosen being the United States 35-lb. section, manufactured by the Carnegie Steel Company. The contract for the basement work up to the curb line was let to T. B. Bryson, 60 Wall street, New York City, who undertook to build this great steel cofferdam, and the driving of the piling was sublet to the Great Lakes Dredge & Dock Company, of Cleveland.

Penetrating Quicksand.

The vein of quicksand was met about 20 ft. below the curb line and extended 27 ft. deeper. The entire lot was first excavated to about 4 ft. above the quicksand. The piling, which was furnished in 35 ft. lengths, was then driven through the remaining 4 ft. of water sand and the vein of quicksand, finally penetrating 4 ft. into the clay below.

Work was commenced August 20, 1907, with one drop hammer, beginning at the middle of the west side of the building and working south. After a few days this hammer was changed to steam and steam hammers were used on the balance of the driving, except a portion along the east side. During the first of the work the most difficulties were encountered, chiefly because the crews of the drivers were inexperienced and had to learn that steel piling must be driven differently than ordinary wood sheeting. This was corrected by a representative of the Carnegie Steel Company, who remained until this part of the work was completed. Before the end of the job the crews did some very good driving. At the outset a water jet was tried, but unsuccessful, and practically all of the piling was driven without its use. Other experiments were tried, such as the use of toggles and blocking, but most of them were found to be unnecessary and were given up.

Drop Hammer Used.

The work along the east building line required a drop hammer because the piling had to be given within 8 in. of a party wall, and there was not sufficient clearance for using a steam hammer. Care had to be exercised to get the piling down straight and while the work was necessarily slow, it proved, upon excavation, to be some of the best done on the entire job. Not only were quarters cramped along this side, but the soil proved to be harder than elsewhere, and at times less than ⅛ in. progress was made at a blow. However, this side when completed leaked less than any other part of the work.

Soon after the first hammer had started on the east building line, a second hammer, operating under steam, was started on the west side, working north. Connection was made with the first pile driven by a tee rail, the flange of which was chipped off to fit inside the jaws of the pile driven. This rail was driven to place and the next pile was entered over it. On this part of the work the fastest driving was done, the soil being softer and the crews by this time more expert. In one day this hammer drove 25 piles to the full length of 35 ft., which was the record.

When the second hammer reached Euclid avenue it was elevated about 12 ft. on a staging, an dalong this end the piles were driven until their tops were level with the staging. The hammer was then taken back over the same line, and by means of a follower the piling was driven down to the depth required. This method of driving was applied to decrease danger of a serious cave-in, to maintain a truer alignment and lessen the tendency of the piles to pull apart in driving. The two drivers met near the corner of Euclid avenue and the east building line, completing the circuit of the building.

As the excavation proceeded a system of heavy timber walling and bracing was carried down in horizontal tiers about 4 to 6 ft. apart, to the bottom of the final excavation and centering on large, round, wooden piles, driven at intervals in the central part of the excavation. This bracing held the steel cofferdam in place until the permanet walls and interior structure could be built. The walling timber used was 12 x 12 in., and the bracing was put in on about 8-ft. centers. During this work a single centrifugal pump, discharging about 275 gal. per min., was used, but it was not necessary to operate it continually. Where caulking was necessary, oakum was used very satisfactorily.

Efficiency Demonstrated.

This job proved the efficiency of steel sheet piling for work of this character, as it enabled constructing a very large and practically water tight cofferdam through treacherous soil, within which it was possible to excavate and set grillage beams and build outside foundation walls at much less cost than would have been possible under the pneumatic caisson system. It is impossible to lay down any very exact rule for handling and driving steel sheet piling, as the nature of the work is nearly always entirely different in different cases. In the present case, for instance, it is hard to say whether the results obtained by the steam hammer were better than those obtained by the drop hammer or vice versa, as the best work on the job was about equally divided between the two methods; that which would produce the best results in one place might fail utterly in another place. The general adaptability of steel sheet piling to works of this character seems, however, to be established, and its use will probably increase in all manner of cofferdams, ditches and locks, and especially in cases like the Pope Building, where a large open excavation makes it possible to handle the setting of foundations most economically and rapidly.

THE ART OF WOOD PATTERN MAKING.—VII.

BY L. H. HAND.

WE will now take up a piece of work which should be worthy of a few moments' study, namely, a broken casting from a freight car truck, as indicated in Fig. 94 of the engravings. Its construction will be better understood from an inspection of the cross section, Fig. 95. Upon examining this casting it was found that the original pattern had been arranged to lift out of the sand by a loose strip, *a a*, which could then be taken out as we have before described. It was desired to procure four of these castings only and the cost of a wood pattern of this kind for so few pieces was of course to be avoided if possible. Upon examination I found that I had nearly two-thirds of the bolt hole at the break, Fig. 94. It will be noted that this was a large, heavy piece with 1 1-16 in. bolt holes. Having carefully cleaned up the entire casting I turned up hard wood plugs and filled all the bolt holes, taking care that the plugs fitted very tight. To these plugs I fastened long stop core prints extending clear across the casting, as shown in Fig. 96, the stop core prints being indicated at *s, s, s, s*. I next got out a square piece of hard wood for a core print to hold the core, which would form the groove in the side of the casting. This I drove into the groove with a block and heavy hammer; then to the plug in the bolt hole at the break and the square core print I contrived to secure a wood block, which I shaped up with a sharp firmer to represent the part of the casting which was missing. The part supplied I painted black.

The core box for the groove core was of course simply a square box. The stop core box was made to produce two holes instead of one, as shown in Fig. 97. As I heard no complaint about this pattern and saw the castings unloaded at the storeroom door I presume no trouble was experienced at the foundry.

The pattern for a mud ring to a locomotive boiler is in reality a difficult job, if made as patterns usually are. For the benefit of those not familiar with this subject I will say that the mud ring is a circular angle iron of the diameter of the required boiler, say from 36 in. to 60 in. or more. This would require considerable material and in the larger sizes probably it would be necessary to build a special face plate for turning it up. Also, valuable time would necessarily elapse for glue to dry before the work could be put in the lathe. All of this can be simplified, providing the molder does your casting for you, by using a section of the ring for a pattern. Let us suppose the ring is 60 in. in diameter and that the angle iron is 3 x 3 in. face and each part of the angle 1 in. thick. With the beam compasses set at 30 in. describe an arc of indefinite length on a piece of 1-in. plank, say 24 in. long. Move the point back to 27 in. and describe another arc; then on a piece of 2-in. plank lay out an arc of 30-in. radius and another of 29-in. radius. Cut this out on the band saw and glue them together, taking care that there is sufficient draft to lift readily out of the sand. This will give a section of the ring of sufficient length for practical purposes and can be finished up in a few minutes.

Now, provide two arms, say 1 x 3 in., to extend from the center of the circle to the outer edge of the section of the ring. Secure the arms to the section of the ring with wood screws and to a suitable block at the center. Now, with the beam compasses set at 30 in., find the exact center on the block by striking a short arc on the block from either end of the section of the ring. At the center so located bore a ⅜-in. hole, and drive into it a ⅜-in. iron pin, allowing it to project below the arms 2 in. or more. Now, provide a stout pointed stake, say 3 x 3 and 1 ft. long. In the center of this stake bore a 13-32-in. hole, all of which will be readily comprehended by examining Fig. 98. To cast from this pattern the stake is driven firmly into the floor of the foundry, the sand is then leveled clear around the stake and the center pin placed in the hole in the stake while the sectional pattern is moved and bedded in the sand until the desired circular groove is obtained to mold a complete ring. We used this method exclusively in a locomotive repair shop in which I worked for four years.

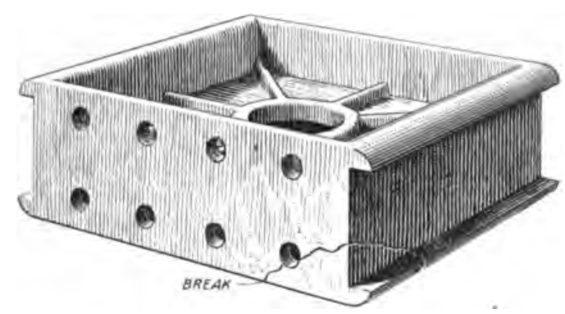


Fig. 94.—Perspective of Broken Casting.

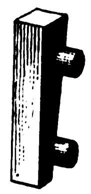


Fig. 97.—A Double Stop Core.

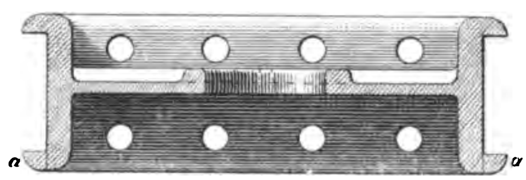


Fig. 95.—Cross Section of Casting.

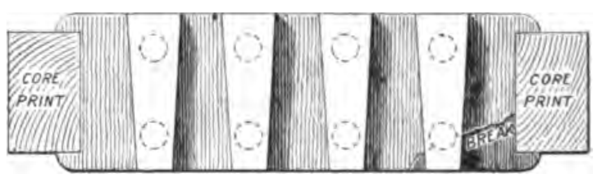


Fig. 96.—View of Broken Casting Ready for Molding.

The Art of Wood Pattern Making.—VII.

In casting sheave pulleys it is customary to core the groove for the rope as shown in Fig. 99. To the uninitiated it would seem to be impossible to draw such a pattern out of the sand without a core. However, if the pattern is made to part in the center the molder can make a double parting in the flask with his trowel and easily draw the pattern. An idea of what is intended may be gathered from an inspection of Fig. 100. Sheaves with more than one groove will necessarily require to be cored out and the core box calls for considerable attention and skill in order to make it properly. In large sized sheaves a core box which will produce one-sixth of the core is sufficient, as the molder can make six cores and place them in position in the sand, as shown in Fig. 101, or it may produce only one-half the thickness, in which case he could use 12 pieces to make the complete core. The exact calculation depends upon having the core box the exact length and radius so that everything will fit snugly and there will be no cutting or crowding.

WHEN the new building for the Mutual Life Insurance Company was in course of erection in the City of Mexico the methods employed by the American contractors greatly astonished the natives. In fact the feeling went so far that the Mexicans declared the contractors were closely associated with his satanic majesty. When the pneumatic riveters were at work putting together the steel frame for the structure, a fence had to be placed around the scene of operations in order to keep the curious natives from getting inconveniently near and retarding the progress of the work. The literal translation of the phraseology used by the Mexicans in describing the instruments in the hands of the riveters was "Agency of the gringo devils." In their vernacular "gringo" means about the same as "greaser" and is not to be construed as expressive of admiration.

Homes in the Philippines.

What the American people have done within nine years to engraft upon this corner of the Orient Western ideas of the art of government and education would fill a large and creditable volume, says W. S. Lyon, writing from the Philippines. What we have effected through force of precept and example in raising the standard of living and in beautiful externals hardly redounds so much to our credit. The Government has done enough, or as much as certain conditions would warrant. Public health and public safety inexorably demanded and called for expenditures which in other communities, and under other circumstances, might have been deflected in the line of civic beauty. As individuals we have done too little. We have come, stayed and gone away and left too little imprint behind of our personality as home makers and builders. There are some few notable exceptions, but where else in the world would a settlement of 10,000 well to do representatives of a highly civilized nation have built in nine years so few handsome houses, planned and laid out so few gardens or left so few lasting monuments to their reputed love for the artistic and appreciation of the refining influence of the beautiful?

What we have is strictly Spanish. The Spanish architecture, with its tropical modifications, has much to commend it in the way of both beauty and comfort. The large apartments, lofty ceilings, abundant ventilation and tile roofs (where permitted) all make, so far as they go, for unlimited comfort. The trouble is they do not go far enough. What we have known for 40 years as modern household conveniences are only found in houses of American origin. The bath and toilet accessories of the most pretentious native mansions are barbaric relics of prehistoric times. The kitchens of these houses are generally the size of a dog kennel, and for gloom, lack of convenience and discomfort, have no parallel outside of a charcoal burner's hut. The larger and more palatial the dwelling the more extensive the stable quarters under and within the house, and so arranged that the occupants above will have the full benefit of the pungent effluvium of ammoniacal gases with every breath of air they draw and with every mouthful of food they eat.

The few Americans who have built homes have wisely adopted some features of Spanish architecture, but have improved upon the internal conveniences, and eliminated the stables from beneath their drawing rooms or dining rooms. But the number who have made such homes is a shockingly small percentage of those who still house with the horses and *réne* unsanitary kitchen. Nor is it explicable on the ground of economy or poverty. For those unable to buy lands for building long and renewable ground leases are easily obtained. Building associations are here with funds for such loans to home builders and the one whose resources do not admit of erecting a mansion, not even a bungalow, can put up a convenient, attractive and comfortable nipa house for rather less than one-half the cost of a cottage of like floor space in any part of the United States, where lumber and building material are cheap.

Nipa houses are accused of being short lived, and relatively to hard material houses are; nevertheless, if well built, are sufficiently lasting. There are nipa houses in Manila which were hurriedly constructed three years ago that are nearly in ruins now, and others, built nearly six years ago, are still in an excellent state of repair.

In view of the exorbitant rentals which have prevailed since American occupation the builder of the three-year house has made no loss, and the maker of the six-year house is all to the good.

A compromise, known as the "mixed material" house, having wooden posts and floors, "suale" walls and nipa thatch roof, if provided with ample verandas, is the acme of comfort, and far and away the most picturesque house which can be built. There is no other dwelling so cool, except that covered with tile, which, owing to its enormous weight (the tiles are bedded in cement), calls for exceptionally heavy and strong structural material. This enhances the cost of a tile roofed house to rather more than tenfold the cost of one of mixed material. There is no house in any country which depends less upon architectural accessories than a mixed material nipa roofed cottage. The pale yellow of the suale walls and the dull dark ashen color of the nipa lend themselves to our vivid perennial green and gorgeous sky effects with most harmonious results.

However good and artistic the house, its background or setting in the tropics, where one lives out of doors or on the verandas the year round, becomes of the last importance. The small barrios or villages of the province are all pretty. Every squalid thatch hut is metamorphosed by its invariable setting of betel nut palms, bamboo and bananas, with here and there the necessary dash of color given by the flaming hibiscus or a fire tree.

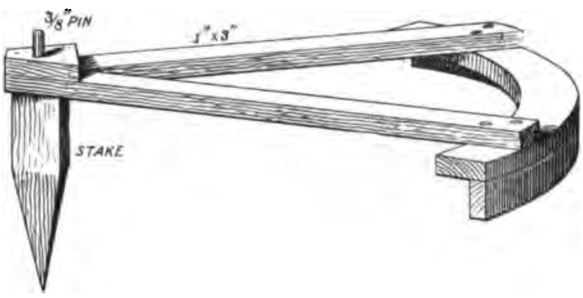


Fig. 98.—Sectional Pattern for Molding a Circular Casting.

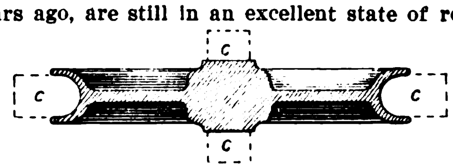


Fig. 99.—Ordinary Method of Molding a Sheave Wheel, the Cores Being Indicated by *c, c, c, c*.

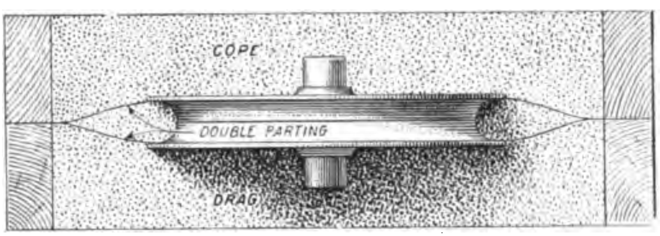


Fig. 100.—Casting a Sheave Wheel by a Double Sand Parting.

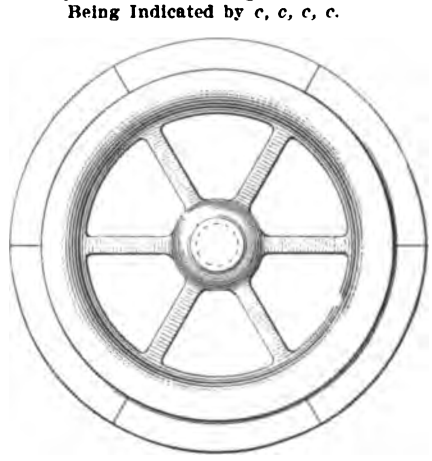
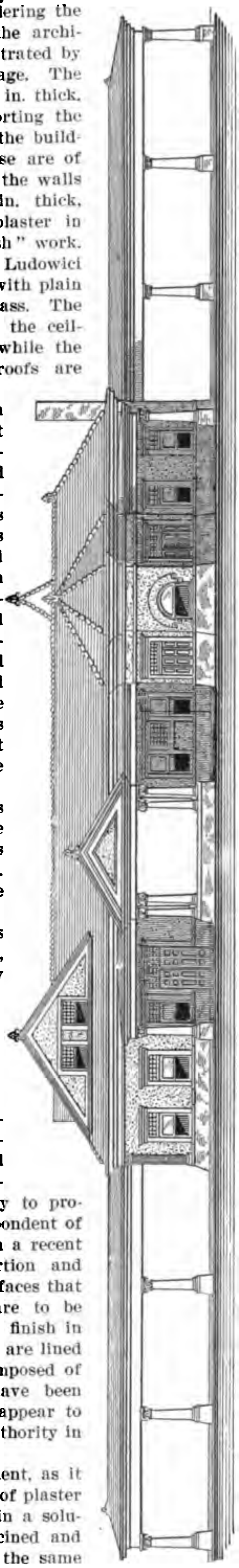


Fig. 101.—Coring Out the Grove in Large Sheave.

The Art of Wood Pattern Making.—VII.

DESIGN FOR A SUBURBAN RAILROAD STATION.

A DESIGN which is well adapted to meet the requirements of a suburban railroad station and can be executed at a reasonable cost considering the accommodations provided and the architectural effects produced, is illustrated by plan and elevation upon this page. The building has stone foundation 20 in. thick. The base of the columns supporting the covered sheds and the base of the building up to the window sill course are of white brick. Above this course the walls are of frame construction 6 in. thick, finished exteriorly in cement plaster in what is known as "slap and dash" work. The roof is covered with red Ludowici tiles. The windows are glazed with plain white double thick American glass. The entire woodwork outside except the ceilings is painted a dark green, while the ceilings of the over-hanging roofs are cream white.



Street Elevation of Station Showing Porte Cochere in the Center.

An inspection of the floor plan shows the general arrangement of the building, the special feature being the *porte cochere* and the spacious passageway dividing express and baggage rooms from the main building, thus keeping all the trucking and handling of baggage away from passengers. The general waiting room is generously lighted by windows and there are special rooms for both men and women. The floors are of hard pine finished in oil. A feature of the women's retiring room is an open fireplace with seats at the right and left, or, as some term it, an "ingle nook."

The elevation of the station is that which is seen from the street side, while the plan, as shown, faces the railroad tracks. The walks about the station are granolithic.

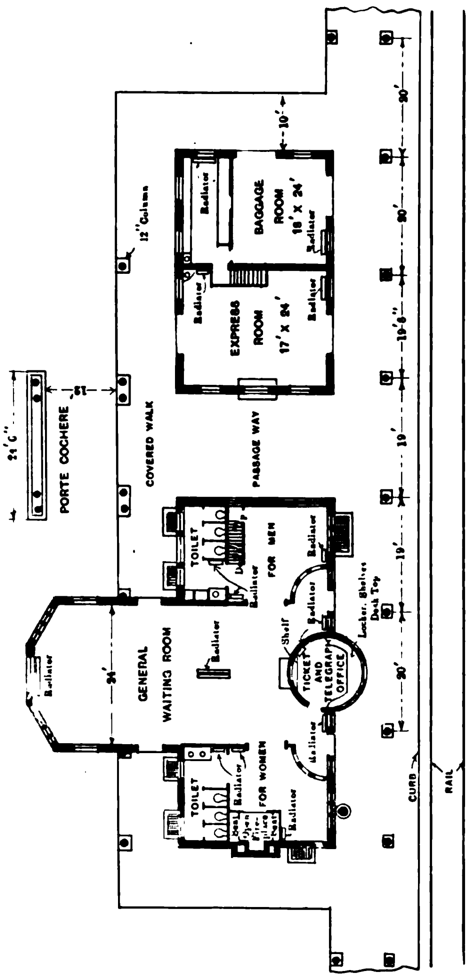
The building here shown was designed by William S. Babcock, architect, 17 Battery Place, New York City.

Enameling Cement Coated Walls.

The question of enameling cement coated walls has frequently come up for discussion and various have been the suggestions as to the treatment likely to produce the best results. A correspondent of *The Painters' Magazine* asked in a recent issue as to the proper proportion and treatment of interior cement surfaces that are comparatively fresh and are to be enameled. He is called upon to finish in white some bath room walls that are lined in imitation of tiles and are composed of Keene's cement. The walls have been finished for several weeks and appear to be fairly dry. In answer the authority in question says:

Keene's cement or marble cement, as it is sometimes called, is composed of plaster of paris that has been steeped in a solution of alum and is then recalcined and reduced to powder. It is used the same as plaster of paris, and while it will not stand outside, it is admirably adapted for interior work as a stucco. There is no extra caution required in preparing it for painting, as it is not caustic, like Portland cement, but requires sizing to stop suction.

For the walls of a bath room, we should not suggest the use of glue or glue or alum size, but for economy's sake would recommend the use of a good wall varnish, such as is offered by reputable varnish manufacturers. Two thin coats of this will stop all suction effectually. Over this two coats of a good inside flat white, the last coat of which should be smooth sandpapered, if required, in order to obliterate brush marks, then one coat of a good white enamel, which for a first-class job should be mossed down and finished with a flowing coat of the same white enamel, to which has been added some white enamel varnish or white damar varnish to enhance the



Main Floor Plan.—Scale, 1-32 In. to the Foot.

Design for a Suburban Railroad Station.

gloss. Of course, every coat must be permitted to dry hard before applying another.

In cases where Portland or similar cement has been employed, two coats of white or bleached shellac varnish are preferable to the ordinary wall varnish, but in all cases the walls must be given time to dry before sizing.

Polishing a Varnished Surface.

In order to obtain a good surface for polishing, each coat of varnish must be sandpapered, rubbed or mossed down, as a polish can be obtained only on a surface that is perfectly level. Therefore, the last coat of varnish, when thoroughly dry and hard, must be rubbed with No. 00 steel wool or FF pumice stone and water or oil, following with rotten stone and water or oil, and when perfectly done cleaned off thoroughly to avoid scatches. For producing a very fine polish, says a well known authority, mix with one pint of shellac that has been cut in grain alcohol one-half pint of raw linseed oil. Shake well every time when applying it to a woolen cloth, rub briskly until the polish is hard and lustrous.

EVIL EFFECTS OF COMPETITIVE BIDDING.*

IF the characteristics of our people have been truly reflected in the nature of our architecture, then our buildings must be distinctly marked with evidences of the strenuous and economic commercial spirit of the times. Our greatest structures are *not* those dedicated to religion, art or science, but to commerce. The greatest of all is the office building. Yet, if the signs of the times are read correctly, things are already changing and will change more in the future. As men acquire wealth and reach the stage of competency in their fortunes, they are beginning again to realize that financial supremacy and commerce are not the only objects of human existence. They are awakening to the fact that there are other things in the world besides money of great intrinsic value. There is surely coming a time when you, the builders, and we, the architects, will have an opportunity to create an architecture which shall at least be devoid of the narrow influences of our times.

In conclusion I wish to make a few suggestions as to the cure for the evil effects of competitive bidding. I realize, I hope, as much as any one the great difficulties in the way of making any radical change in a custom so long established, as competitive bidding. However, I believe that this system, which may have been all right in its day, has worn itself out. I believe that it is a misfit in our present day conditions; that our modern problems of construction will in time force it out of existence. To illustrate this, I wish to refer to the comparatively new problem of letting a contract for a reinforced concrete building. This new kind of structure may be successfully built, with a reasonable degree of safety, provided that it is properly designed and carefully and conscientiously constructed. Yet, if any one of the many important parts of this building is slighted, or if the contractor, or even one of his workmen, undertake to apply any money saving economies, or rush methods of the ordinary building, the penalty that is sure to follow is awful. The builder or the workman is liable to answer for it with his life.

Here is a new feature in the problem that will surely receive a hearing at the letting of the contract. It will soon become evident to the public, if it is not already so, that completion only on the basis of cost cannot with safety be entertained for a concrete building. Those sterling qualities of character in a builder on which so much depends for the excellence of the work, will receive a new and higher appreciation. A builder's ability, his integrity, his loyalty, his skill, his aptitude for his work, will again be put at a premium, as they used to be in olden times. When I refer to the concrete building, I have in mind not only the concrete building familiar to us with the ordinary slab, or floor beam construction, but those wonderful constructions in Europe where astonishing things are done with concrete, both structural and ornamental. These great problems will undoubtedly come to us, and then the contractor will be called upon to execute the most difficult work that has ever been attempted. His ability and his skill will then be even in greater demand than they are now, and the best man will no longer be selected by competition on price. However, this instance of the concrete building was only given in this connection to show that the character of this work was such, and the danger of accident so great, that an owner and, therefore, the public, will find that competitive bidding is not a safe way to let the contract for a concrete building.

In considering the remedy for the evil effects of competitive bids on contracts, it is evident that a very radical change must be made if any great good is to result. To suggest a scheme which would in itself be radical and at the same time effective, is a very difficult problem, and it is likely that if an improvement comes, which I surely think will, that it will come perhaps gradually. It is necessary, first of all, to educate the mind of the public and to bring it to understand that there are a great many defects and evil results in building operations from our present system. I believe the difficulty would be largely overcome if the problem could be worked out of determining the real cost of a building beyond question of a doubt. The fact that contractors' bids differ so widely in amounts for the erection of every building, is a feature which has made the public regard the estimate for every building with suspicion. I understand that in England, where the estimator, called a "Quantity Surveyor," who is independent of the contractors, takes off the quantities of materials, that the bids of contractors, based on these estimates do not differ nearly as much in amounts as the American bids do. I am informed that there is very little difference indeed between the bids of English contractors, as based on these estimates furnished by the "Quantity Surveyor."

I do not believe that there is a single owner about to erect a building who would not be willing and glad to enter into a contract with any good contractor, and pay him a reasonable profit on all work done, if the owner could be assured beyond a doubt of the real cost of the building. On the other hand, I do not believe that there is a single contractor who would not be glad to undertake any ordinary contract, provided he was assured also of a reasonable profit. I believe firmly that these are the facts, and if they are, the problem would seem one of getting these two parties together on the proper basis.

Following out this line of thought, I have taken the liberty of outlining a system which I believe in a general way would meet the requirements. However, I wish it understood that this is merely given in the form of a suggestion, with the hope that some of you, who are better qualified than I, will some day start the movement for a reform, which is so much needed in this part of our work.

The outline of my suggestion for a system of letting contracts is as follows:

1. To establish some way of determining the absolute cost of a building.

2. To have the estimate of the quantity of material and labor made by some one independent of the contractor.

3. To have you, gentlemen, the estimators, set up offices of your own, as the English quantity surveyors have done, but estimate not alone the quantity of material, as they do, but the quantity of labor as well; you to receive your pay as they do, by getting a percentage on the cost of the building, and to be appointed as the estimator for a building by the owner or architect.

4. The contractors to agree upon a reasonable and proper percentage on the cost of buildings as their profit, and to execute a contract the same as they do now by hiring all labor and buying all material. Each subcontractor in the various building trades to take his work on a regular percentage of the cost of the building, either separate contracts of a general contract to be let for the building, according to the wishes of the owner.

5. A definite fixed sum as the cost for the building and of each part of the work as estimated by the independent estimator to be agreed upon by the owner and contractor or contractors as the proper cost for the building, or the several parts of the building. This sum or sums to be made a part of the contract or contracts. If, in executing the work, the amount of labor or material, or both, exceed in cost the amount or amounts named in the contract, this excess of cost to be borne equally between the owner and the contractor or contractors. If the cost of the amount of labor and material is less than that agreed on in the contract, then the money so saved should be equally divided between the owner and contractor or contractors.

* Concluded from page 231, July issue.

THE Soldiers' Memorial Hall which is under way at Pittsburgh, Pa., will when completed be one of the handsomest structures in that city. It has been designed by Palmer & Hornbostle and will occupy a site opposite the Schenley Hotel, at the corner of Bayard street and Grand Boulevard. In connection with the foundation work concrete piles will be used, the contract for placing them having been awarded to the Raymond Concrete Pile Company, New York City. The general contractor for the building is P. W. Finn.

DESIGN FOR A DWELLING FOR TWO FAMILIES.

IN view of the popularity of the two-family house the design which we present herewith is likely to prove of more than ordinary interest to a large class among our readers, especially as it represents thoroughly up-to-date construction. The design is well adapted for execution upon a city or suburban lot, giving a broad front with such an external architectural treatment as to make it appear as a single family dwelling. The first story of the exterior is plastered with sand finish, while the second story and gables have the half timbered effect, with panels plastered with combed finish.

The entire house is balloon framed, 4 in. studs being used for all outside walls and 4 in. and 3 in. studs for interior walls. The exterior frame is covered with matched sheathing, over which is a layer of building paper, this in turn being covered with plaster cement applied to metal lath, the plaster being left in its natural color. All exterior trimmings are stained two coats of dark gray, the trimmings being fine sawed instead of planed, so as to give a better effect for staining. The roofs are covered with cedar shingles treated with two coats of Tile red stain. The chimneys and underpinning are of dark red paving brick laid up with black mortar. The cellar walls are of rubble stone and the entire cellar is cemented.

In the New England States it is customary to refer to a house intended for occupancy by two families as a "two-tenement" house, the term "tenement" being used to designate all classes of dwellings. We make mention of this use of the term for in the present instance the architect refers to the fact that "each tenement is entered by way of a front and rear porch," and that each tenement is arranged in such a way as to give "a feeling of privacy, space and freedom within the outlines of its walls."

At the front of the house one enters an open vestibule into a separate hall. It will be seen that the stairs which start from each story give a separate entrance to rooms on the third floor which are used in connection with each "tenement." The main stairs are finished in chestnut, stained a silver gray.

A large living room occupies the front of the house, and opposite the broad opening leading from the hall is a fireplace finished with green tile and having wrought iron bands and hood. The hearth is of the same material as the fireplace, and at one side of the latter is arranged a seat. From this room one may enter a sitting veranda, so placed that it is well secluded from the street and so arranged as to be enclosed in winter with sash, making a very desirable sun parlor. The dining room forming the key to all rooms is placed back of the living room and is finished in chestnut stained a dark brown, while the wainscot panels are treated with green stain with the pattern design in red. This wainscot is finished with a simple plate rail. On the outside wall there is a bay effect between the two china closets, making the room symmetrical.

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

Design for a Dwelling for Two Families.—William E. Hunt, Architect, Waterbury, Conn.

From the dining room one enters a hall which connects with the various bed rooms, the bath room and the kitchen. An examination of the plans will show ample closet room, which is an all essential factor in dwellings of this character. The bedroom, closets, bath room and connecting hall are finished in white wood painted three coats of white paint.

The kitchen, pantry and rear stair hall are finished in North Carolina pine stained and varnished. The floors throughout are double and the finishing floor in the halls, living rooms, dining rooms, kitchens and bath rooms are rift North Carolina pine planed and hand smoothed and stained, waxed or varnished, according to requirements. All other floors are of North Carolina pine.

The kitchens are fitted with wash trays of Alberene stone and sinks of enameled iron. The walls of the kitchens, rear halls and pantries are painted two coats of oil paint. The bath rooms have plastered wainscot 5 ft. high, marked off in imitation of tile and enameled and finished with a wood cap.

All plumbing fixtures are of the J. L. Mott enameled iron type except the water closets, which are of the porcelain wash down syphon type. All piping is exposed and nickel plated.

The several rooms in the attic, which are divided between the occupants of the two "tenements," are painted the same as the bed rooms on the main floors. All doors are Morgan stock doors, finished to match the room in which they show, except where the rooms are painted, then the doors are stained a dark brown.

The house is piped for gas and wired for electric lights, bells, &c. The heating apparatus, placed in the cellar of each "tenement" is a Kelsey hot air generator of ample size and capacity, with cold air ducts placed beneath the cellar bottom. All registers except in the halls are of the side wall variety.

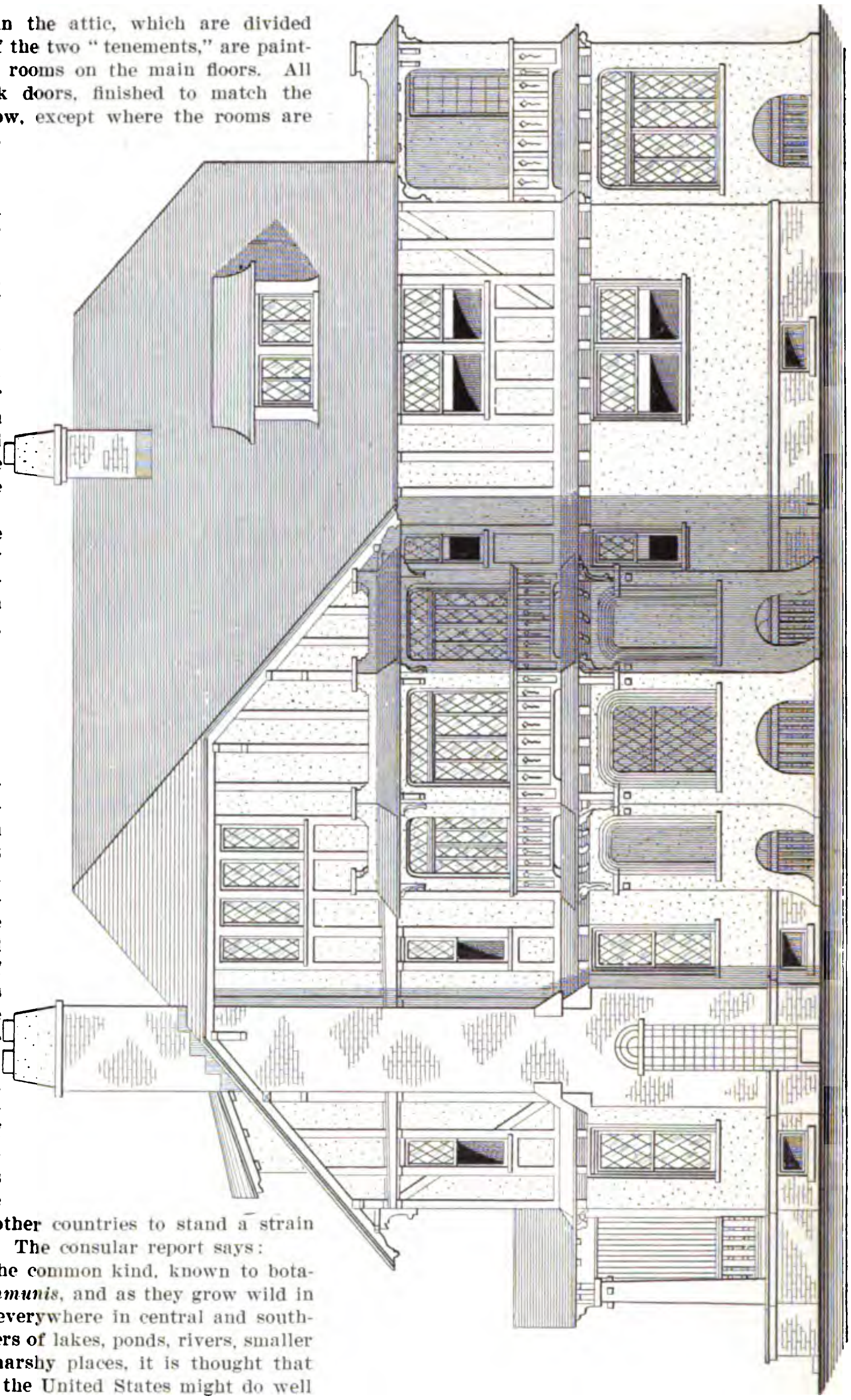
The building here shown was designed by William E. Hunt, architect, 51 Leavenworth street, Waterbury, Conn.

The Use of Reed Laths in Sweden.

Some rather interesting information concerning the preparation and use of reed laths in Sweden is furnished in a recent report submitted to the State Department by Consul W. H. Robertson of Gothenberg. It appears that wood laths are comparatively little used in that country on account of their cost, although Sweden is regarded as a country of unusually extensive forests in proportion to its size, and is therefore better able than many other countries to stand a strain upon its wood products. The consular report says:

These reeds are of the common kind, known to botanists as *Phragmites Communis*, and as they grow wild in large quantities almost everywhere in central and southern Sweden, on the borders of lakes, ponds, rivers, smaller water courses, and in marshy places, it is thought that builders and farmers in the United States might do well to look into the entire proposition with a view of seeing whether these or similar reeds, that may undoubtedly grow wild also in the United States, could not be utilized for the same purpose and their growth artificially cultivated and extended. This would give rise not only to a cheaper building material, but to an industry of growing and harvesting the reeds, and manufacturing them into a sort of matting, where this is found preferable to using them in their raw state in building operations.

As to the methods used here in applying both the raw and the manufactured reeds to the walls and ceilings, as well as the machinery used in making the latter, it is thought that it would be easy materially to improve upon both, and it is the certainty of the ability on the part of Americans to do this with facility that makes the whole proposition capable of development and of a thoroughly useful application to our building operations. It is also not at all impossible that experimentation and development along the one line might show the reeds suitable for other purposes.



Design for a Dwelling for Two Families.—Side (right) Elevation.—Scale 1/8 in. to the Foot.

The reeds are used in Sweden in both the raw state and in the form of a woven sort of matting, according to the customs and preferences of the builders.

The method, however, that would be most likely to appeal to American builders is the one where the reeds are woven into a matting which is much more readily nailed to the walls and ceilings than where each reed is nailed on and wired by hand.

In single reeding the mats are nailed to walls or ceilings in the same way—viz., fasten all the wires of one end of the mat, unroll the mat over the wall or ceiling;

stretch the middle wire tight, be careful and see that the mat hangs or lies straight, and then stretch the other wires in the same degrees as the first one. Then fasten every wire by nails placed about 6 or 8 in. from each other.

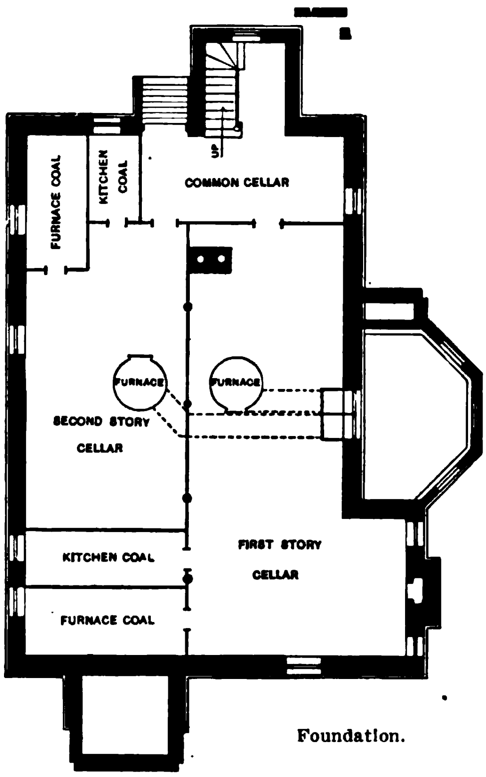
For ceilings the connecting edges of the mats should be dovetailed so as to make a joint about 5 in. wide, and loose wires are stretched along the joint and fastened in the usual way with 1-in. plastering nails.

For double reeding of ceilings or outside walls mats with larger spaces between the reeds are used; the inside mat is put on in the ordinary way, although a somewhat larger space between the nails may be allowed. Then the second mat is put on in such a way that its reeds come at right angle to the reeds of the first mat. The fastening is done with 1¼-in. plastering nails.

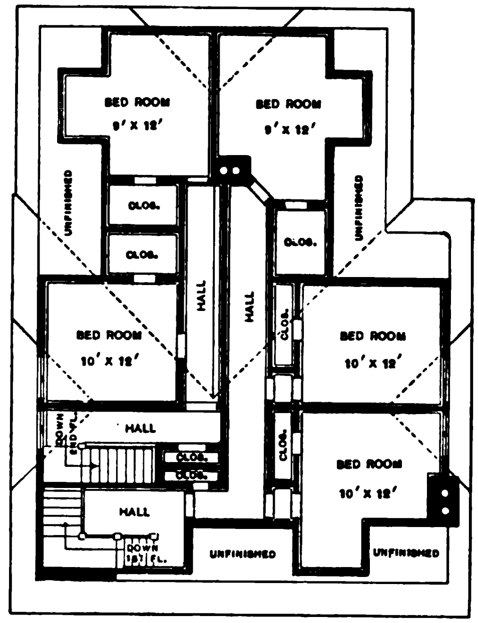
The full grown reeds are about 7 or 8 ft. high above water, and, when they are to be used as a plaster fastening material, they are cut in winter, after the leaves have dropped off and the lakes have been frozen over. They are never harvested in boats. The frozen surface of the lakes makes the reeds much more accessible that if one had to reach them through water or swampy land; but they should be cut as early in winter as possible, before the snow has broken them. The reeds are not cultivated in Sweden, but are regarded as so common that it is impossible to procure the young plants or the seed except by giving a special order for some one to go into the country for them at the proper seasons of the year, the spring for the plants and the fall for the seed.

A manufacturer writes as follows:

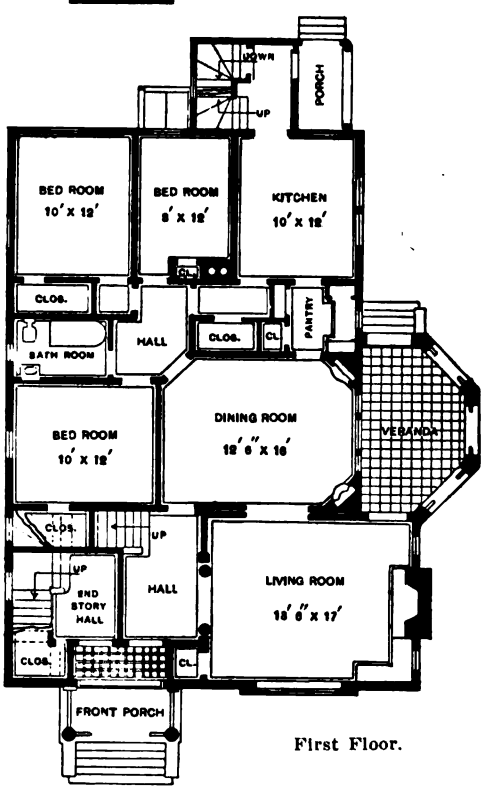
"Reed laths are probably just as durable as wood laths. The writer has seen houses torn down which were at least 75 years old, and found the reeds nailed to the walls, just as sound as when they were put there. All depends, however, upon the manner in which the reeds



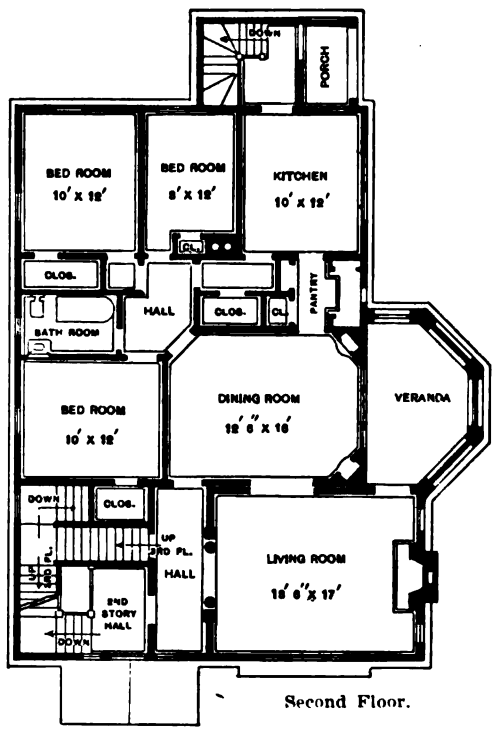
Foundation.



Attic and Roof.



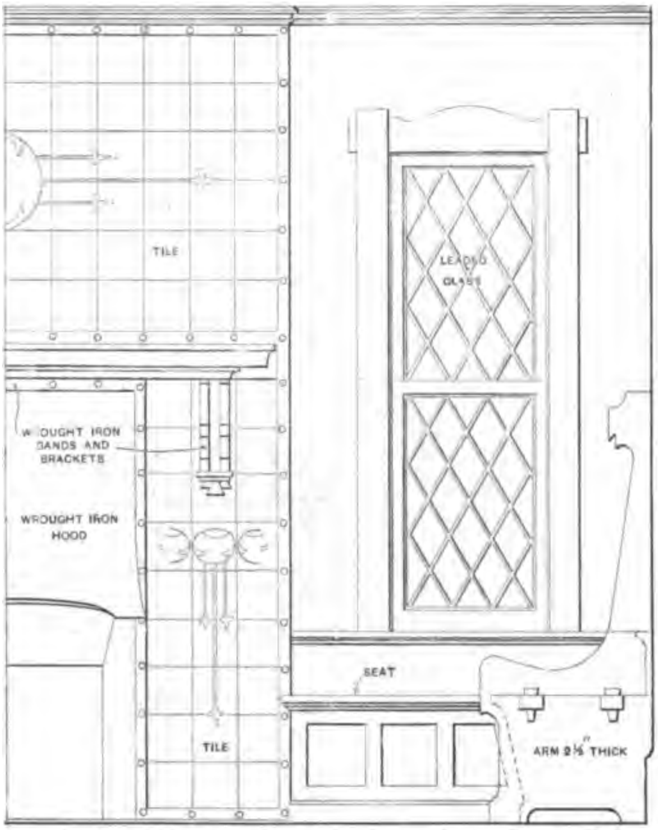
First Floor.



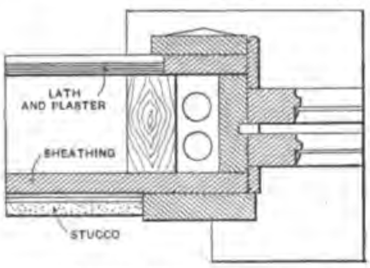
Second Floor.

Design for a Dwelling for Two Families.—Floor Plans.—Scale 1-16 in. to the Foot.

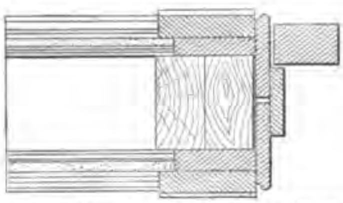
are harvested and kept, because they are easily damaged if the bundles are kept wet or covered with ice. Wood



Details of Mantel, Seat and Window in Living Room.—Scale, ½ In. to the Foot.



Horizontal Section Through Window Frame and Sash.



Section Through Interior Door Frame. —Scale, 1½ In. to the Foot.

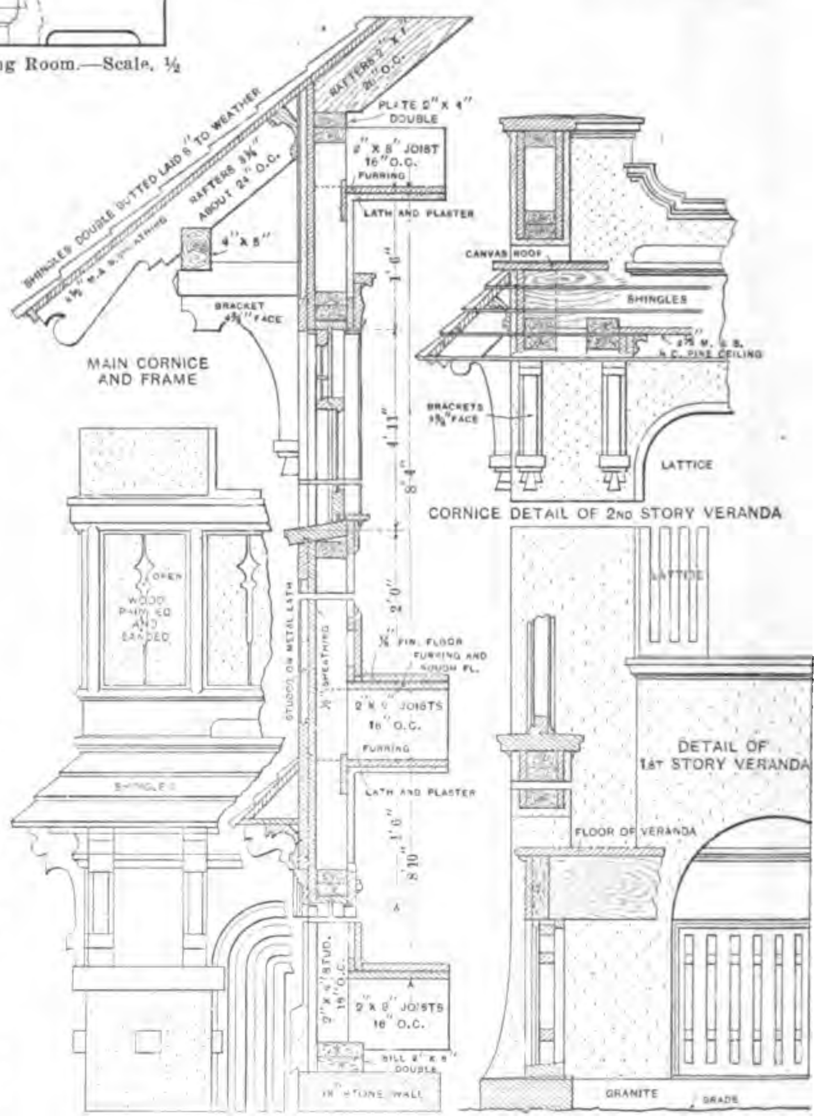
rivetting mats are scarcely manufactured any more in Sweden, because they are too expensive. Besides that the reed mats are considered better and more practical because when such are used the surface of the plastering does not crack, which was often the case when unseasoned wood laths were used. So-called loose reeding is used a great deal—that is, the loose reeds are nailed to the walls and ceilings by hand. If skilled workmen are available, such reeding can be just as good and practical as the mats. Whether one or the other of the two systems is used depends a great deal upon the custom of the respective building contractors. The old ones, among whom there are a number of conservative persons who hold on to old methods, prefer the so-called loose reeding. No practical preference can be given to either of the methods, except that when mats are used the reeding can be made more quickly and specially experienced workmen are not needed. The use of reed mats is also increasing, as compared with the use of loose reeds."

From the foregoing it will be noted that wood revetting mats are scarcely manufactured any more in Sweden, the reed mats being considered better and more practical for several reasons. The question not unnaturally occurs, however, as to whether it might not be a good idea for American lath manufacturers to try the use of wood revetting mats made after the Swedish model in case it should be found impracticable to grow or import the reeds. It would seem to furnish a cheaper and quicker method of attaching the laths to the walls and ceilings with much less labor. It appears that the insulating properties of wood and of the reed laths are considered about equal.

The manufacturer who supplies the prices and the mode of putting up the reed mats supplies similar information concerning the price and putting up of wood laths, as follows:

"Dimension, 1 by 20 m., at a list price of $1.34 per roll. The fastening of wood lath mats is done in the same manner as described for reed mats. Lath nails 1¼ in. in length are most suitable, and the nails should be driven in through the small opening found between the twisted wires close to the lath. In order to facilitate the making of proper seams or joints between two mats, the end of every other lath protrudes beyond the next one."

A NUMBER of lot owners in the Borough of the Bronx, New York City, are planning to improve their holdings with side entrance two-family houses in the hope of quickening sales. The side entrance is a new idea and is



Various Details of Exterior Construction.—Scale, ½ In. to the Foot.

Miscellaneous Constructive Details of a Dwelling for Two Families.

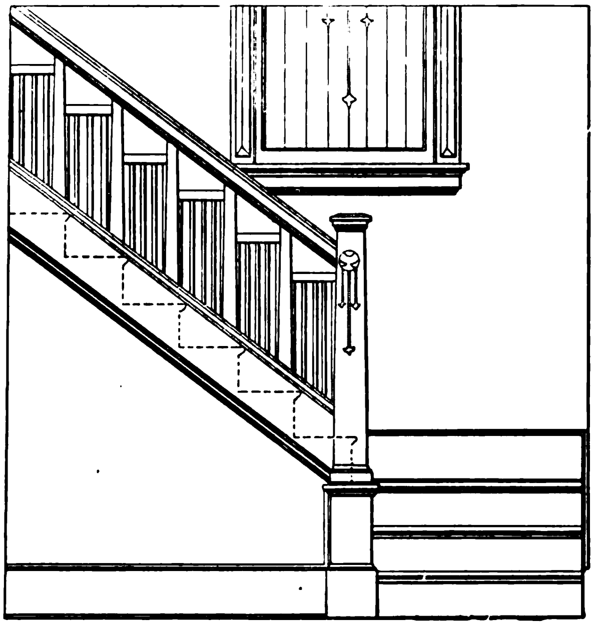
fast becoming popular. It eliminates the regulation hallway, allowing a sitting room at the front and a dining room at the rear, each the full width of the building.

A Soundproof Room.

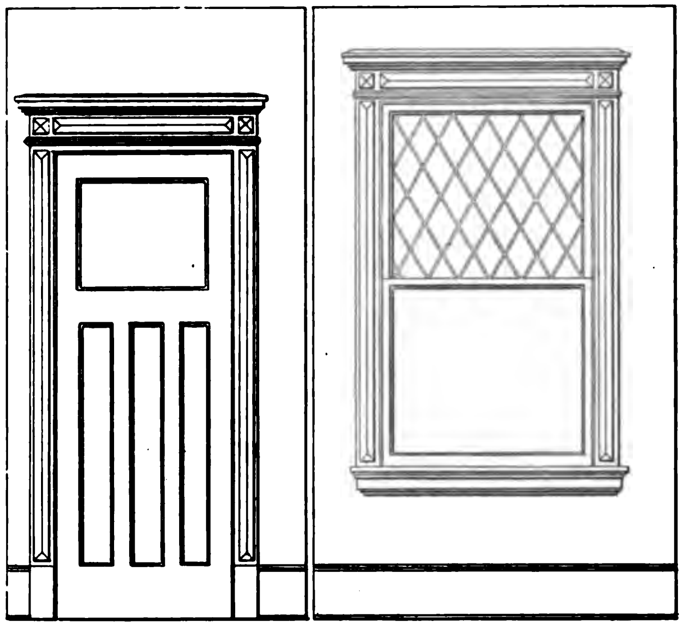
A feature greatly to be desired by dwellers in apartment houses, especially those of nervous temperaments, are soundproof walls and floors, so as to prevent noises from one apartment being heard on the opposite side of the division wall; but in very few, if any cases, is such a construction to be found. That it is possible, however, to so build a room that it shall be free from outside noises has been demonstrated at the Physiological Institute at Utrecht, where the noiselessness is secured by placing it at the top of the building on a floor seldom used and by constructing its sides in a number of layers. These consist of:

1. Trichopièse, a feltlike material made of horse hair and a very bad conductor and reflector of sound. This layer is covered with a net on the inner side to keep the hair from falling.
2. Porous stone. This part of the wall does not rest on the floor, but is isolated from it by a layer of sheet lead.
3. A dead air space.
4. A wood layer.
5. A mixture of ground cork and sand.
6. A special composition of ground cork called Korkstein.

The total thickness is 11 in. The ceiling has eight layers; the floor is chiefly lead and carpet.

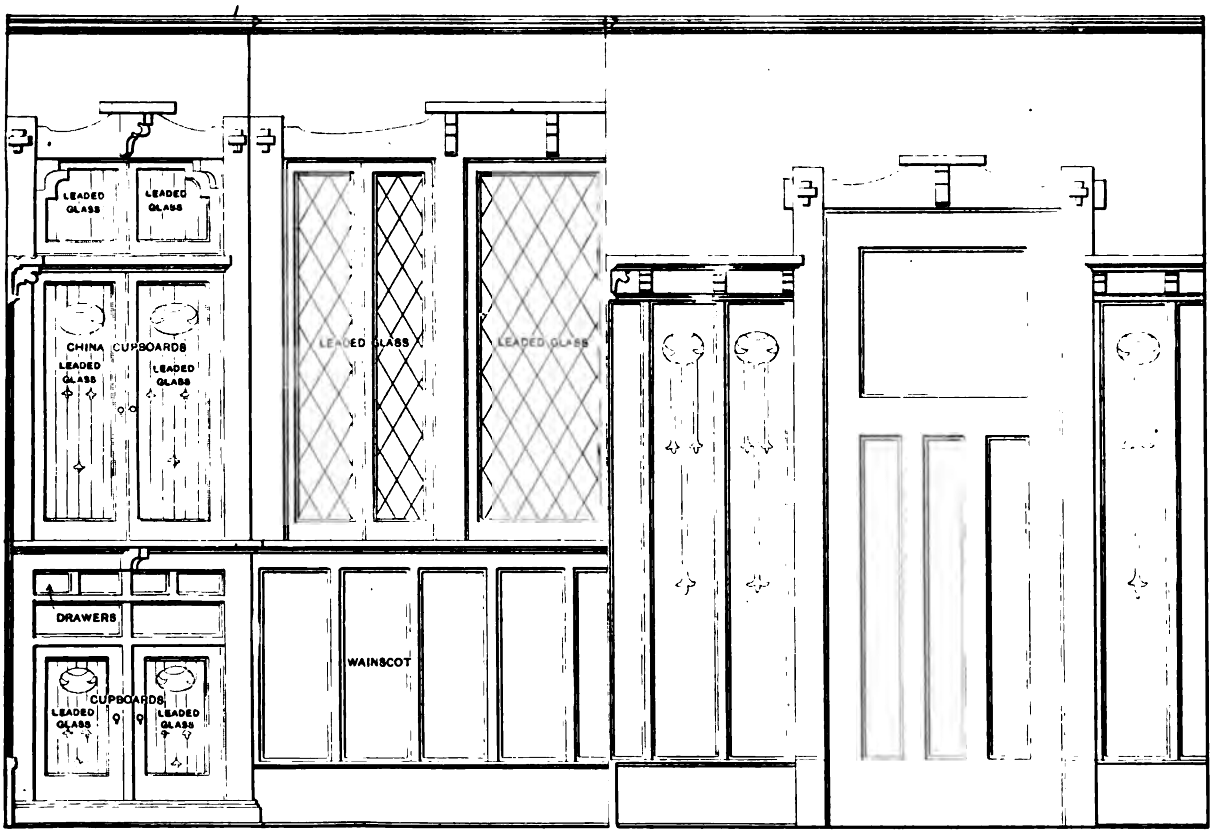


Detail of Main Stairs.



Detail of Door and Window Trim.

Scale, ⅜ In. to the Foot.



Detail of Dining Room Trim.—Scale, ½ In. to the Foot.

Miscellaneous Constructive Details of a Dwelling for Two Families.

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(Entered at the New York Post-Office as Second-Class Mail Matter.)

AUGUST, 1908.

Some Precedent for Earlier Working Hours.

The movement in the British Parliament to set the clock ahead an hour or so in the spring, so that people will get greater benefit from the long daylight, is generally regarded in this country as impracticable. Yet it recalls that there is a sort of precedent for the suggested custom in American industry. In some trades in New England the factories have started earlier in the morning in the spring months and closed correspondingly early in the afternoon, so that employees might have additional daylight in which to take recreation. While the practice has been by no means common, yet it formerly existed, and even now instances of it might readily be cited. The English idea is to set the clocks of the country about an hour ahead in the early spring, so that while the morning work will start at the same time by the clock, it will really be an hour earlier. It would be 7 a.m. when it is now 6. Bed time would be correspondingly earlier. The people, however, would have more daylight in their waking hours. In general theory the idea is not an impossible one. Each spring the clocks would be set ahead, to be put back again in the autumn. It is stated that in those American works which changed their daily schedules to start an hour or half an hour earlier in the morning, the trouble was experienced that employees did not change their hours of retiring, and consequently got an hour's less sleep. This usually meant a loss in production, because a sleepy workman loses some of his efficiency. Another manner of changing schedules in the spring has been to run 11 hours a day for five days, starting at 6.30 a.m. and allowing but half an hour at noon, thus making up for a Saturday half holiday without loss of time. This custom has been followed for years in certain textile mills employing English workmen, who use the whole Saturday holiday for their sports, making of it their summer vacations. In such cases the manufacturers state that there has been no loss in efficiency of labor.

Tallest Office Building in the World.

If the plans filed the latter part of June with the Bureau of Buildings for the Borough of Manhattan for a 62 story structure to occupy the present site of the home of the Equitable Life Assurance Society in Broadway, are approved and carried out, New York City will be in a position to boast of a skyscraping office building which in hight at least will outrank any heretofore erected, and will relegate to second and third places the much discussed Metropolitan tower facing Madison Square, and that of the Singer Building in lower Broadway. The plans in question, prepared by Architects D. A. Burnham & Co., Chicago, call for a building which will rise to such a hight above the level of the street as to make it the tallest in the world. The main building, 34 stories in hight, or 489 ft., will have a frontage of 167 ft. in Broadway, 152.3 ft. in Nassau street, 304.2 ft. in Pine street, and 312.3 ft. in Cedar street. Rising from the main structure will be a square tower 28 stories high, surmounted by a cupola and adding 420 ft. to the hight, thus making the total distance from sidewalk to the top of the cupola 909 ft. Surmounting the cupola will be a flag staff 150 ft. in hight. The plans filed show that the facades will be of brick and granite with terra cotta trimmings. The building will be constructed in the Renaissance style of architecture, prominent features being bays set between massive pilasters of Corinthian and Doric design. Elaborate carved work will decorate the bays and cluster columns will offset the corners. Placed around the base of the tower and on the main roof of the building will be cupolas several stories high. The plans show that the tower will be in two sections, one extending 15 stories above the main building and the other the remaining 13 stories. The massive structure will be fireproof throughout and embody the very latest features of modern building construction. There will be 38 passenger elevators built in two rows in a large elevator corridor, which will be finished in ornamental bronze, designed by prominent artists. The top of the tower will be reached by eight of these elevators, and there will be many others in the building for handling freight. The estimated cost of the structure is placed at $10,000,000, but no official time has been set for the beginning of the work of demolishing the old Equitable Building with a view to erecting the proposed new structure.

Freak Building Construction.

Every now and then public attention is drawn to some peculiar phase or feature of building construction developed with the intent merely of satisfying a personal whim or fad, but much of it is in the line of improving and rendering more efficient methods of construction in an important industry. We have had the "cyclone" house of unique form, designed to withstand the ravages of the tornado, and more recently public attention has been drawn to the concrete dwelling without a chimney of any form whatsoever. The latest freak, however, in dwelling construction is the revolving house, which a New York City jeweler is about erecting in one of the suburbs. It is said to be the result of many years of thought over the matter of genuine home comfort, and as proposed the house will be constructed on a turntable operated by electric power. The plans drawn by Architect Clarence True, who has made a study of the problem, call for an expenditure of about $35,000, exclusive of the site. The building will be in the Colonial style of architecture, with the kitchen occupying a separate building. On the first floor will be a large reception hall, dining room, den, library and pantry, and on the second floor five bedrooms and bath. By the arrangement proposed the house may be turned so that the windows of the various rooms shall follow the sunshine in winter or avoid it in summer. The pressure of a button by an occupant in any room will sound a warning to those about to enter or leave the house that the building is about to maneuver either to the right or the left, thus allowing the family, servants and guests time to get either in or out. The pressure of another button will revolve the building in either direction desired. Following close upon the announcement of this unique dwelling comes another dealing with a country residence in which disappearing partitions will be a conspicuous feature. In this case the partitions will be operated by electricity, making it possible to transform the ground floor into one large room at a moment's notice. The first floor partitions, except those forming the kitchen, will be lowered into the basement, giving a practically unobstructed floor space of the entire area. The working out of these unique features in dwelling construction will be closely followed by architects and builders not only in the immediate vicinity in which the work is being done, but by the fraternity the world over.

A Movement for "Trade Preference" in Pittsburgh.

At a recent meeting of Greater Pittsburgh Builders' Exchange League the following resolutions were adopted and copies were sent to contractors and builders throughout Allegheny County:

Whereas, About 50 per cent. of the workmen in the building trades of Greater Pittsburgh since January 1 have been and are now out of employment. These men and their families spend their earnings here. In the past a noticeably large proportion of work having been let or sublet to out of town contractors, who in turn draw from outside sources for their materials and labor, thereby taking away capital which is lost to the business interests of this city.

Be it Resolved, That this organization, representing all branches of the building industry of Pittsburgh, and striving for home progress and home loyalty, appeals to every owner of property, every promoter of building operations and every organization for civic advancement to encourage and wherever posible to *favor local trade* to the end that local architects, engineers, general contractors, subcontractors and building material dealers may *be given a preference* in all contracts and business transactions, thereby aiding resident workmen to procure employment, as well as the promotion and protection of home enterprises.

In view of the above resolutions the league now has printed upon its letterheads the following lines under the words "Trade Preference":

Members of the association having contracts or subcontracts to be let or materials to buy, should, as far as may be consistent with business principles, deal only with the members of this association, or at all events shall give their fellow members an opportunity to compete, and then shall give them the preference, other things being equal.

Architects Should Be Practical Builders.

In discussing the recently proposed plan to license architects and builders in the District of Columbia, Frank P. Milburn, a local architect, is reported by the Washington *Post* to have expressed the following views on the subject:

Architects should be practical builders and should have an exact and thorough knowledge of building. If a man who undertakes to erect a building, big or little, has not practical knowledge of building, there is a large chance that another such catastrophe as that which recently appalled Washington will occur. How is an architect to supervise the construction of a building he has designed with any justice to himself or to the owner if he is not thoroughly informed in regard to building?

There are too many so-called architects who are merely draftsmen, who can make a pretty picture, but who have not the practical knowledge of the building trade which makes them sure of themselves when it comes to erecting the building they have designed on paper. In my opinion, all architects should have practical training as builders, either before they take the course in the architectural schools or after they have finished that course. If the law required an architect to be a practical builder as well as a draftsman, there would be no falling down of buildings.

I do not believe that the plan of licensing architects in the District of Columbia would prove satisfactory. An examination, it is said, would be required before a license could be taken out. Such a plan would tend to shut out architects in other cities from all work here. It would mean that the architects of Philadelphia, New York, and other large cities, many of whom do much of the work here, would have to come here and stand an examination if such a law was put through.

I think that it would be unwise to cut off, or to take any step which would tend to cut off, the competition of the foreign architects with those of Washington. Perhaps other States and cities might retaliate by passing laws requiring examinations and licenses for architects in their confines. If this proved the case a large amount of time of architects would be taken up merely going from one State to another to stand these examinations.

Verandas Delightful Living Rooms.

Modern verandas are literally homes. They are readily transferred into living rooms, sleeping rooms and dining rooms. To furnish a veranda to the best advantage for living purposes, furniture should be utilized that can withstand the weather and hard usage, says a recent issue of the *Delineator*. Several large easy chairs, a settee, furnished with crash or denim-covered cushions, and hammocks are essential. Bamboo screens or awnings will add materially to the comfort of the veranda equipment; a swinging couch is a luxurious addition that will be greatly appreciated. Such a couch may be home-made, only length and depth and a wealth of pillows being necessary for comfort. It may be supplied with a home-made full-length pad or a number of pillows. It is a fancy of the moment to have summer porch pillows filled with pine or balsam needles, hops or clover. Husks from green corn are saved, and, with some lemon verbena, geranium, lavender or other leaves to give fragrance, make particularly nice pillow fillings. Lacking better material, finely torn paper with any sweet scented leaves intermingled makes cool and acceptable fillings for porch pillows.

A home-made folding screen which is both convenient and picturesque may be made by stretching green burlap over an ordinary frame. Over the top weave or darn an Indian border in colored raffia. This screen will be thick enough to serve as a protection from drafts.

SUBSTITUTES FOR CERAMIC TILING for bathroom floors are often not satisfactory from one cause or another. At one time rubber tiling, so advantageously used in a number of places, was believed feasible for use in bathrooms. A New York plumber, however, advised his customer before putting it in the bathroom to put a piece in an unused desk drawer for a day or so. This was done, and it was found that the odor given off, at least from new tiling, was objectionable, and probably would have been in a bathroom. Linoleum, although far less expensive as a covering for bathrooms, is fairly satisfactory, if tiling cannot be afforded. It is made in such a variety of patterns that generally something can be found to correspond harmoniously with the bathroom decorations. In laying this it is generally advisable to have the bathtub removed and rest on the linoleum, and at the same time have the lowest piece of the baseboard also removed and replaced again after the linoleum is down. This will cover up any irregularities in the cutting and make the room much more attractive in appearance.

FIREPROOF ROOFING MATERIAL may well be exhibited, in the opinion of a commercial delegate to the Italian Embassy in Washington, at an international exposition, which will be held in Turin during the year 1911 of fireproof material. Samples should be in sufficient quantity to cover at least 50 sq. m. of lumber (about 540 sq. ft.), and should reach Turin not later than the end of October, 1908. The samples should be sent to Direzione del Laboratorio di Docimastica del Regio Politecnico di Torino, Turin, Italy. Prizes in gold and silver medals and money are to be awarded.

THE USE OF BRICK AND HOLLOW BLOCKS FOR DWELLINGS.

AT the recent convention of the Iowa Brick and Tile Association, a strong argument for the use of brick and hollow block in residence construction was presented by O. C. Pixley, Des Moines, in a paper which he read and copious extracts from which we present herewith as being of interest to many readers of this journal.

When we hear the word tile we intuitively think of England, Holland and the other European countries where tiles have been made for centuries and always have been a creditable product. Mention hollow blocks in any part of the United States to-day, and there will be those within easy earshot who have paid dearly for investing in cement blocks. I would suggest that this convention requests our clay journals in the future to use the name hollow building tile to designate our clay product and distinguish it clearly from cement blocks.

In building brick residences tile are used extensively to-day, in foundations, basements and for backing up outside brick walls. Face brick are expensive, but hollow building tile is used simply to take the place of the cheaper grade of builders that would otherwise be used for backing up these walls. Were it not for the fact that tiles can be laid up so much more rapidly than common brick, the amount saved by using them would be little. Walls alone are a small part of the expense of building a modern house. The excavation, concrete, cement work, roof, floors, partitions, plumbing, plastering and the thousand and one other items that are absolutely necessary, are what make an up-to-date home expensive.

Economy of Tiles.

It is hardly fair to expect the use of tiles to effect a decided saving in the entire expense of a residence, but I blieve I am justified in making the statement that wherever tiles are used it would cost 50 per cent. more to use common brick in their stead, and that if hollow building tiles are used, as they should be, in the foundations, basement and for backing purposes, there should be a saving of from 6 per cent. to 10 per cent.

If by this word economy we do not limit ourselves to the simple financial saving in building a residence, then I can assure you there is much to be said on the subject. To-day, a house that is a few years old is out of date, for during that short period much has been given to the improvement of residences. The empty houses today are the old houses. The new flats and houses are all filled, as they are up-to-date and have modern improvements. It would be difficult to find an architect or builder who would refuse to say that a hollow wall is not only a superior wall but the best wall for residence work. Renters and prospective builders are aware of this fact and the time is at hand when residences in which hollow building tile are used are being given the preference.

If by using the tile less coal will be used during the winter, if they make a cooler house in summer, if they make a dry house throughout the year, in short, if tile make a better residence than solid brick, then there is certainly another side to this word economy, a side more important than the mere saving in the original cost price. Although this is all I can say in reference to hollow building tile as used in combination with brick, I do wish to say a few words in reference to tile as an independent building material.

Growth of Building Materials.

It is the history of every building material that from a modest beginning it has grown and developed into a satisfactory and useful material. I believe I would be safe in stating that our first log house was not an extensive affair. The first stone house was probably no larger or more elaborate. Did you ever think that when the early pioneers came out of the East and located in Indiana, Ohio, and other parts of the "far West" as it was known at that time, if they had had an unlimited quantity of lumber piled on the very spot which they had chosen as a building site they could not have used it. They had no nails, no tools and no experience. They used logs for they knew how to build a home with them that would keep out the frost, the wolves, and disease. There is no question but that frame dwellings were a decided improvement, but it took time to adopt them. We can all of us remember when the balloon frame buildings first came into use, for it was not so many years ago that we discovered it was not nécessary to use a 12-inch square purline plate to support a shingle roof. This makes me think of an experience I had four years ago. At that time we were just starting the manufacture of hollow building tile in Des Moines. I learned that at a certain place a residence was to be built and quite timidly I approached the excavation and fortunately found the architect there. After approaching him with due cosideration I suggested that perhaps hollow tile could be used in this foundation. I shall never forget the look he gave me when he said, "Why, sir, the weight of the entire structure is to rest on these walls." Of course, that was enough and I said no more, but in about one month's time I took occasion to go and see "the entire structure." I could not have carried it off on my back had I tried, but it would not have taken a very large wagon to have done so. It was a one-story frame dwelling and a small one. I was interested enough to enter the basement and see what he had used as a foundation and found that under "the entire structure" he had placed a solid 12-in. brick wall. There is no question but that this foundation would support a dwelling of this nature. Neither was there any question in times of old but that a 12-in. purline plate would support a shingle roof. We no longer see the massive frames that we had in the days of old, as they are not necessary, and the great walls of solid brick in a few years, and in fact to-day, are a thing of the past. I remember the first balloon frame built in our section of Northern Ohio. There was a question as to whether it would stand. A windstorm came and wrecked some of the older buildings, but the balloon frame stood.

Development of the Stone Hut.

Millionaires are living to-day in stone mansions that are but a development of the first stone hut. There is a theatrical term with which you are perhaps acquainted. Managers do not always start a show in a large city, but on the contrary they take it to some small place and, as they express it, they "try it on the dog." This does not seem to be the history of the hollow building tiles. When the great world's fair buildings of Chicago were being put up hollow building tile were used extensively for foundations. This was about the first practical work. A little over a year ago John D. Rockefeller, Jr., built a new home. I suppose he would call it a cottage. Be that is it may, it cost over $3,000,000. We suppose he had an architect and that he asked for a modern house. It was built of hollow building tile, roughly plastered on the outside and on the inside and treated to a Portland cement coat outside. Edward Bergstrom is one of the well-known architects of the Pacific Coast. He has just completed a residence for himself and family in Los Angeles. The home cost not less than $20,000, and is made of hollow building tile throughout, plastered inside and treated to a coat of Portland cement as an outside finish. It seems that we have started with the large buildings first in using this material, and the time is here when hollow building tile are to be used extensively for residence work.

In this great agricultural State of Iowa there are exactly as many silos as counties. Our agricultural colleges are constantly telling us that instead of one silo to a county there should be practically one to each farm. It is safe to say that within the next few years many of these will be built throughout the State. There is no more suitable material then hollow bluiding tile for this work. A silo should be built of material which will not easily rot or disintegrate and should be as nearly airtight as possible.

SOME TESTS OF CONCRETE BEAMS.*

BY RICHARD L. HUMPHREY, ENGINEER IN CHARGE.

AT the Structural Materials Laboratories of the United States Geological Survey in St. Louis, Mo., a series of important tests on the strength of plain concrete beams has just been completed. These tests form part of a comprehensive series of investigations undertaken by the Government for the purpose of determining the strength of concrete and reinforced concrete.

The work involved in these investigations consists of a study (1) of the constituent materials of concrete, (2) of its strength when molded into various structural shapes, and (3) of the methods by which its maximum strength may be developed through various forms of metallic reinforcement.

Although it is true that concrete possesses but little strength in tension and must be reinforced with metal to resist tensile stresses, it is believed that no study of concrete would be complete without a series of tests establishing its strength without reinforcement.

The tests reported indicate that concrete is unsuitable for use under conditions where it must resist tensile stresses, because of the small loads it will sustain, and particularly because of the suddenness with which it fails, in striking contrast to the behavior of reinforced concrete, which usually shows a gradual development of cracks preceding failure.

First Series of Tests.

This first series of beam tests covers 144 beams without reinforcement 8 x 11 in. in section and 13 ft. long, together with the corresponding compression test pieces, consisting of cylinders 8 in. in diameter by 16 in. in length and of 6-in. cubes. Of these tests those on 108 beams of 12-ft. span, with their cylinders and cubes, and those on 108 beams of variable spans, 6 to 9 ft., which were made of the larger part of the 13-ft. beams after rupture, are reported and comprise all of this series except the 52-week tests.

An attempt has been made to bring out, if possible, the comparative value of gravel, granite, limestone and cinders for use in concrete; the effect of age and consistency on the strength, as shown by the modulus of rupture of the long and short beams and by the ultimate strength of the cylinders and cubes, and the influence of age and consistency on the stiffness, which is indicated by the unit elongation of the long and short beams and by the initial modulus of elasticity, as determined by tests of the cylinders.

Three consistencies—wet, medium and damp—were somewhat arbitrarily chosen. Tests were made at the ages of 4, 13, 26 and 52 weeks.

The purpose of this series of tests was to determine:

(1) The effect of age on the strength of concrete;

(2) The effect of variation in the consistency on the strength of concrete; and

(3) The effect of different types of aggregates on the strength of concrete.

The first question is perhaps the most important, since an early attainment of considerable strength and no subsequent decrease in strength are two essential qualities in concrete, in order that a structure may be put to the use for which it is intended as soon as possible and that there shall be no subsequent deterioration in strength.

The least age at which any tests were made was four weeks, and at that period in no case except that of the cinder concrete—wet consistency—did the compressive strength fall below 2000 lb. per square inch, while the cinder concrete had in every case a compressive strength of at least 1000 lb. per square inch.

In every instance the compressive strength shows a substantial increase from 4 to 13 weeks, with the single exception of limestone concrete mixed to a wet consistency, for which a decreased strength is indicated by the tests, a decrease which continues to the age of 26 weeks. This decrease in the strength of the limestone concrete is unexplainable, and the results of the 52-week tests on this material will be of value as indicating whether or not this decrease continues to the latter period. The other aggregates show either the same or a slightly greater strength at 26 weeks than at 13 weeks.

The transverse tests on both the long and the short beams bear out very closely the fact indicated by the compression tests on the cylinders and cubes, and lead to the belief that the tensile and compressive strength are affected alike by both age and consistency. The effect on the strength of the variation in the consistency is clearly shown. In almost every case the concrete of the damp consistency is the strongest and that of the wet consistency the weakest. This is true for the three ages at which the concrete was tested, and is confirmed by tests of the beams, as well as of the cylinders and the cubes. Attention is called to the fact that the damp consistency used is much wetter than the damp consistency used in making mortar building blocks, for which the same conclusions may not apply.

The difference in strength of the stone and gravel concretes of the three consistencies is more pronounced than in the case of the cinder concrete. The effect of the consistency on the strength seems to depend to a great extent on the behavior of the concrete while being tamped and to the method used in tamping. Great care was taken to tamp all the concretes in the same manner. The thorough mixing of the concrete is absolutely essential and has a marked influence on the consistency.

While it is true that in almost every instance the drier mixtures give the greater strength it does not follow that dry (or damp) mixtures should be used in construction. Practical considerations warrant the use of a wet mixture. The difficulty in securing efficient tamping and a smooth finish in a damp concrete, the loss of strength due to the unavoidable drying out of the concrete used above water, the difficulty of securing in reinforced concrete an intimate union with the steel, and the far greater ease of placing wet concrete all seem to warrant the sacrifice of what in many cases is but a slight difference in strength for a greater ease of manipulation and a thorough bedding of the steel, which is of the utmost importance in reinforced concrete work.

Dangerous to Draw General Conlusions.

It is dangerous to draw any general conclusions as to the relative value of concrete made of the four aggregates used, unless the character of the aggregates used in this particular series of tests is carefully kept in mind. The gravel, granite, limestone and cinders were used as available representative types of aggregates, and while the results indicate that the granite makes the strongest concrete it should not be assumed, therefore, that a granite concrete is stronger than a gravel, limestone, or cinder concrete. Every material should be accepted or rejected on the results of the tests of its qualities, regardless of the tests of other materials of the same type. Apparently insignificant differences in two materials which appear to be similar often cause considerable difference in the strength of concrete made from them. For instance, two limestones from the same quarry, crushed and screened under similar conditions—except that one was screened while wet, which caused the dust to adhere to the surface of the stone—would make concretes of considerable difference in strength.

Because the hard, flinty gravel used in these tests gave excellent results, it does not necessarily follow that a similar, well graded gravel, but composed of soft limestone or shale, would give like results. No series of investigations, however elaborate, will do away with the necessity of careful inspection of the materials to be used. The relative value of materials to be reported in this forthcoming bulletin should be recognized, therefore, as applicable only to the particular materials from which the reported physical properties were obtained.

These investigations were carried on under the general direction of Joseph A. Holmes, expert in charge, of the Technologic Branch, United States Geological Survey.

* Published by permission of the Director of the United States Geological Survey

CORRESPONDENCE.

A Camera Obscura for Sketching.

From J. R. M., Dallas, Ore.—I wish for information which will aid me in constructing an apparatus to be used in copying and enlarging pictures and designs for wood carving and pyrographic work. I enclose a rough sketch of such an instrument, in which L shows the position of a lens and M that of a reflector placed at an angle of 45 degrees, so as to project an image of any object, O, upon a table below, where, under a dark cloth, the outlines can be traced in pencil on paper. I wish to know what sort of a lens I need, whether one or more, and, if more than one, what their distance from each other should be; what their focal lengths and diameters should be, and whether they should be fixed or movable, and also what should be the size of the box and mirror required for enlarging up to 14 x 14 in.

Answer.—Our correspondent's sketch, which we reproduce in Fig. 1, represents a type of camera obscura quite popular half a century ago, which was used for sketching landscape scenes as well as for exhibition purposes. For the latter purpose, the lens and mirror, properly adjusted to each other and fixed in a tube, were usually mounted in the apex of the roof of a circular tower or room so located as to command a good view of the neighborhood. In the center of the room a round table, its top being covered with white cloth, formed a screen, upon which the views were thrown from the lens above, and around which the spectators passed to view the scenes as the lens, being adjusted to revolve, made the circuit of the surrounding country.

The introduction of dry plate photography is no doubt responsible in a great measure for the disappearance of this form of camera obscura as an assistant in sketching objects, and lenses of this type are now no longer advertised.

The modern photographic camera is such a highly perfected instrument that its owner, having little to do except to "press the button," has no necessity for any knowledge of optical laws. As a result, there is very little literature published, outside of that contained in technical books, upon the very interesting study of optics, a general knowledge of which would be a great help to those who contemplate buying lenses for photographic or other purposes. Some information regarding lenses may therefore be interesting to our readers in general and to our correspondent in particular, who seems most concerned about this feature of his apparatus. He can then go as deeply into the perfecting of the lens as he deems sufficient for his purpose.

To begin with, a simple lens, consisting of one piece of glass, as an ordinary reading glass or a spectacle lens, of proper focus will no doubt produce an image sufficiently clear to answer his purpose, and as spectacle lenses of any desired focal length are quite easily and cheaply obtained two or more of them of different focal lengths could be kept ready to make changes necessary to different degrees of enlargement. The focal length should be as small as will permit sufficient working space between the lens and the table top or surface arranged to receive the image, for the reason that as the object to be sketched is brought nearer to the lens, for the purpose of enlarging the image, the focal length increases. When a point is reached at which the image is equal in size to the object itself the focal length becomes twice as great as when distant objects are focused upon the table or screen. That is, a lens whose normal focus is 12 in. when focused on objects, say, 100 ft. or more away, would, when brought within 24 in. of the object, produce an image the same size of the object upon a screen 24 in. back of the lens. When the object is brought still closer to the lens for the purpose of enlargement, the back focus will be still farther increased. This will require in the construction of the apparatus either a wide range of adjustment between the lens and table top or the substitution of a shorter focus lens when the scale of enlargement is very great.

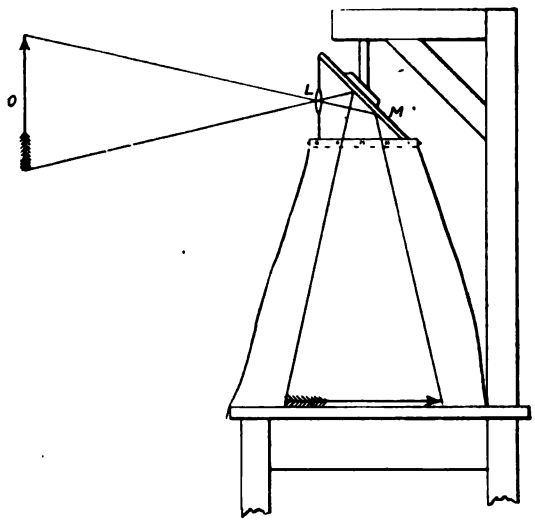


Fig. 1.—Reproduction of Our Correspondent's Sketch.

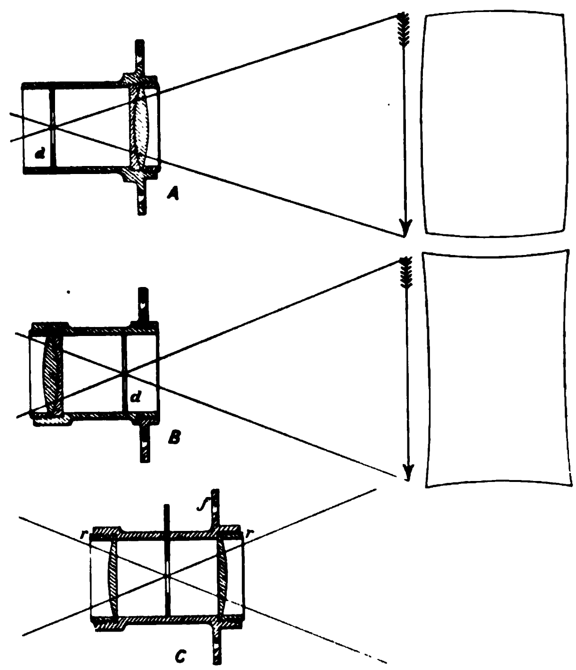


Fig. 2.—Illustrating Construction of Lenses.

A Camera Obscura for Sketching.

Of course a single lens will not give as sharp an image as a lens corrected for what is termed "chromatic aberration," by which term is meant the dispersion of colors resulting from the passage of light through any medium whose opposite faces are not parallel, as is the case with all lenses or prisms. This dispersion produces the fringe of color so often seen to surround objects when viewed through an ordinary magnifying glass. A lens corrected to overcome this difficulty consists of two pieces of glass of different qualities cemented together so as to appear as one piece of glass, the combination being usually ground so as to be convex on one side and plane on the other, as shown sectionally in sketches A and B of Fig. 2. This kind of correction becomes imperative in lenses for photographic cameras to insure perfect sharpness, and for all optical instruments in which the greatest degree of efficiency is required.

Visual sharpness, in the case of either the achromatic or of the uncorrected lens, may be increased by the use of a diaphragm which consists of a piece of thin metal or cordboard having a round opening at its center and placed usually some distance in front of the lens, as shown at *d* of sketch A. It should be arranged to slide in a groove so that it can be replaced by another having a larger or smaller aperture, as the necessities of the case may require. Its position should be next the flat side of the lens and about the diameter of the lens away from it, as shown in sketches A and B. The smaller the opening in the diaphragm the sharper will be the image cast, but of course the less brilliant will it be, owing to loss of light. The best results, if this kind of lens is to be used, will be obtained by placing the subject to be sketched in the strongest light available, and then using the smallest diaphragm or "stop," as it is familiarly termed, that will give an image of sufficient brilliancy, all of which can be determined by experiment, as these conditions will be found to vary with different degrees of enlargement.

Another kind of error, termed "spherical aberration," is produced by any single lens, whether achromatic or otherwise, the correction of which is of far greater importance in the construction of a copying camera than the first named error. When a single lens is focused upon an object composed of straight lines, careful inspection of the image cast will show that its lines will appear slightly curved, the amount of curvature increasing toward the margins of the picture. If the lens be constructed as shown in sketch A, the image of a rectangular object will appear to bulge somewhat at the sides, producing what is termed "barrel" distortion, as shown by the figure at the right. If, on the contrary, the position of the lens be reversed, as shown at B, the lines of the image will curve inward, instead of outward, producing "pincushion" distortion, as shown at the right in sketch B.

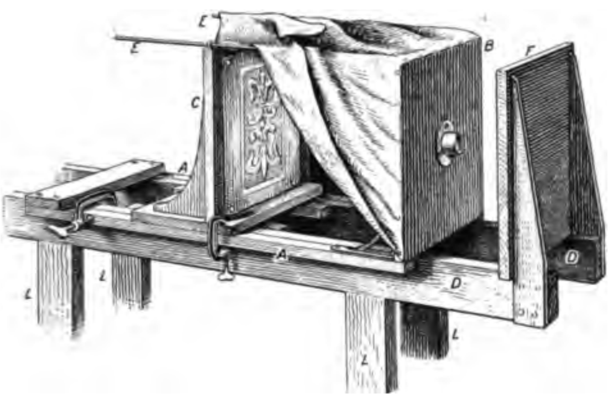


Fig. 3.—Simple Design for a Sketching Camera.

A Camera Obscura for Sketching.

Of the two evils, that shown at A is considered the lesser, and the cheaper lenses made for photographic purposes, and called landscape lenses, are arranged as in sketch A. As may be easily inferred, the perfect or "rectilinear" image is produced by combining the two lenses into one, that is by placing them with their plane sides toward each other and the diaphragm between them, as shown in sketch C. One error thus overcomes the other and produces a correct image.

In the construction of a lens for sketching purposes only, the combination most nearly perfect and at the same time cheapest may consist of two single (uncorrected) plano convex lenses, about 1½ in. in diameter, each having a focal length of about 12 in., and placed as shown in sketch C. The distance between them may be about 2 in., and the stop or diaphragm should be placed midway between them. The resulting focus of this combination will be about 6 in. By this arrangement each lens in a measure corrects both the chromatic and the spherical aberration of the other, thus producing a very good rectilinear image. In case of difficulty in obtaining plano convex lenses, double convex lenses may be used. If, however, one lens is a plano and the other a convex, it will be advisable to place the convex lens behind the plano, and in the case of two convex or two plano lenses, one of which is of shorter focus than the other, it is best to place it behind the one of longer focus, and in the two latter cases mentioned to place the diaphragm somewhat nearer the back lens than the forward. The lines drawn through the lenses in Fig. 2 show how the pencils of light which proceed from the different parts of the subject cross in passing through the opening of the diaphragm and produce an inverted image of the subject at the focus of the lens.

A proper mounting for the lenses may consist of a brass tube similar to that shown at C of Fig. 2, having a flange, *f*, by which it may be fastened to the front board, the lenses being held in place by threaded rings, *r r*. A more simple mounting can be made by first boring a hole through a block of wood, the diameter of the hole being somewhat less than that of the lenses, then counterboring at each end so as to form shoulders for the lenses to rest against. The lenses can be held in place by rings of rather heavy wire, made open and sprung in over them. In either method the barrel can be sawed half way through at the proper point, so as to admit the diaphragm into the kerf.

Referring now to what has been said about size of images, it will be seen that the combination just described, having a focus of 6 in., will produce an image the same size as the object or copy upon a screen placed 12 in. back of the lens, and that the back focus will increase indefinitely with the degree of enlargement desired, thus affording ample working space in which to trace outlines.

In the construction of a frame work to support the lens and the screen, it will be seen from the foregoing that the distance between the two must be capable of a wide range of adjustment, while the distance of the copy from the front of the lens can vary only between 6 and 12 in., if any enlargement is to be made. In the case of a framework made after the design shown in Fig. 1, the table or screen must necessarily be fixed at a convenient hight for working. This will require the lens and reflector to be raised and lowered in obtaining a focus, which means also corresponding raising or lowering of the copy to keep it in the field of view as well as a movement of the camera to or from the copy, operations which will require very accurate adjustment. Instead, therefore, of the design presented by our correspondent, we suggest such a one as that shown in Fig. 3, which embodies the principal features of the cameras used in those photographic studios of to-day which make a specialty of enlarging and copying.

The camera proper consists in general of a front board, B, carrying the lens, and a back board or screen, C, which is arranged to slide along the strips AA, forming the bed of the camera, as shown in Fig. 3. With regard to size, the screen C should be somewhat larger than 14 x 14 in., or the greatest size of enlargement desired, and the front board should, as a matter of convenience, be of the same size. Two long light rods, E E, fixed at one end to the top corners of the front board and allowed to slide through screw eyes or staples in the top of the screenboard, will support the dark cloth, which should be tacked along one edge to the top and sides of the front board, as shown.

It is of great importance that the copy to be enlarged should be viewed from a point squarely in front, otherwise a distorted image will result. Cameras for copying purposes are, therefore, mounted upon a pair of parallel guides or ways, D D, accurately framed together, at one end of which a board, F, is firmly fixed so as to be perfectly at right angles both vertically and laterally to the ways, and is thus kept perfectly parallel with the screen C, all as shown. The space between the ways should be filled in with any material most convenient so as to exclude any light which might be reflected up from the floor while the camera is being used. The ways thus constructed may rest upon a small movable table or, what is better, be provided with legs, L, framed together at the bottom or suitably braced, and of such a length as to bring the camera at a convenient hight for working while the operator sits in a chair at one side, the legs being provided with freely moving casters, which permit the whole apparatus being turned so as to bring the copy into the strongest light obtainable.

In operating the camera, the copy is fastened centrally against the board F, and white paper fastened by thumb tacks to the screenboard, as shown in Fig. 3. The camera is then slid along the ways to a position for trial, after which the back board is slid either way along the bed of the camera until the image appears distinct, when the size of the image can be noted. If it is found to be too small the camera must then be moved along the ways to a position nearer the copy, and the screen C slid further back until the image again becomes sharp, and is measured for size. These operations are repeated until the desired size of image is obtained, when both the camera and the screen can be firmly clamped in position by any convenient means. During these operations the dark cloth must of course be made to cover the entire space between the front board or lens and the screen, the operator placing his head under the cloth at one side to view the image. The focusing can be done with the full opening of the lens, but if when finally focused the image is not sufficiently distinct a suitable diaphragm must then be introduced into the lens.

This design of camera does away with the necessity of a reflector or a prism, which is sometimes used instead, either of which would add considerable expense to the apparatus, since a mirror suitable for the purpose must be made of polished metal.

One fact which must be kept in mind is that the image produced by the camera above described will be reversed; that is, the right side of the copy will appear at the left side of the tracing when it has been removed and is viewed in an erect position, which would not be the case had the reflector been used. This matter, however, remedies itself, since in the operation of transferring the design from the paper to the panel or wood in which it is to be burnt or carved the tracing is laid face down upon the wood, with the result that the transferred outline will be "positive" instead of reversed as on the tracing. It will be found convenient to use a tracing paper having a dull surface, which may be tacked over some thicker white paper on the screenboard, using a soft black pencil in tracing the outlines. When this tracing has been placed face down upon the panel, the outlines being clearly visible, can be easily transferred by pressure with a blunt pointed instrument. It is sometimes convenient to first perforate the outlines of the tracing and to then transfer them by an operation called "pouncing." A pounce bag is made of very thin muslin and filled with a fine black powder, as pulverized charcoal, which goes through the perforations in the paper when it is struck with the bag.

If on occasions it should be found that the design requires only a slight enlargement, the focus will become shorter as above explained when the necessary working space can be obtained either by removing the front lens of the combination, which, as explained, doubles the focus of the remaining lens, or by having another combination of longer focus. In any case such lenses will be used in the combination as will give a focus of such length as will answer the average degree of enlargement, changes being made for the exceptional cases.

Problem in Roof Framing.

From M. L. N., Dayton, Ohio.—I have noticed the problem in the April issue of "J. S. D.," Milton, Iowa, and am sending two sketches showing my idea of framing the roof in question. In Fig. 1 I show the old rafters; in Fig. 2 I show where the new rafters splice the old ones. This roof is based on the half pitch plan. In the first diagram the roof shows all hips and valleys, while in the second I show two gables to the front. I have been a reader of *Carpentry and Building* for three or four years and consider it the best journal for carpenters and other building mechanics that I have ever read. I am always looking forward for the next number.

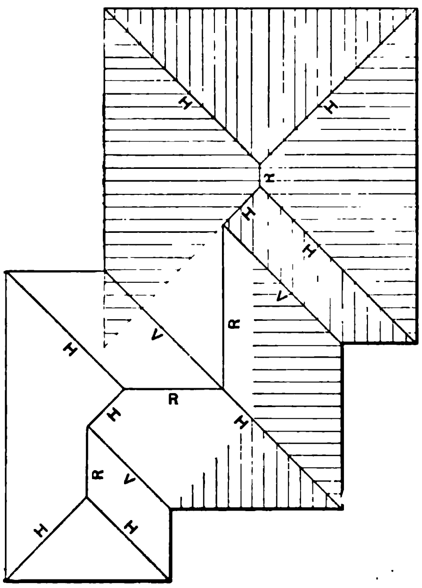


Fig. 1.—Plan Showing Old Rafters in Position.

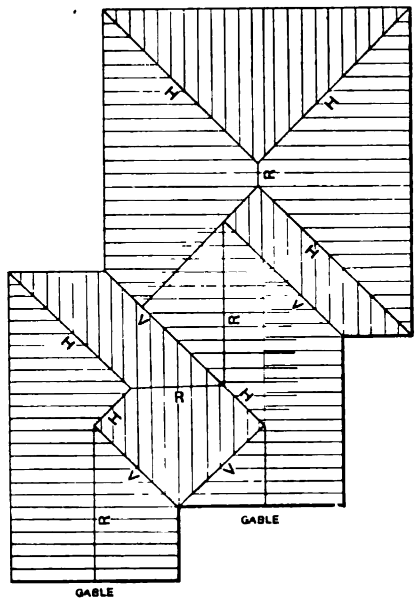


Fig. 2.—Showing Where the New Rafters Splice the Old Ones.

Problem in Roof Framing.

Finding Lengths of Rafters with the Steel Square.

From "Afraid-to-sign-his-name," Chillicothe, Ohio.—Will you kindly publish in the Correspondence columns of *Carpentry and Building* the length of rafters to meet the following conditions:

12 in. run to 8 in. rise and hip for same.
12 in. run to 9 in. rise and hip for same.
12 in. run to 10 in. rise and hip for same.
12 in. run to 11 in. rise and hip for same.
12 in. run to 12 in. rise and hip for same.

How much shorter will be the jack rafters placed 2 ft. apart.

Some Questions Relating to Plank Frame Barn Construction.

From Hee H. See, Sacramento, Calif.—If it is not asking too much, I would be glad to have Shawver Brothers explain the method of raising the barn shown on page 219 of the July issue of *Carpentry and Building*. I cannot understand why it should be necessary to have so many ladders and what is the arrangement at the left of the picture, directly above the horse and buggy. I would like to say that I am merely looking for information, not criticizing at all, as I know from pictures of their work that I have seen in *Carpentry and Building* that these men are "top notchers" in their line.

A Question in Barn Construction.

From A. C. M., Buckingham, Pa.—I am sending herewith rough pencil sketches of a barn floor and haymow which I desire to build. I would like to ask the readers if the construction shown by the side elevation will support the floors and the roof, which altogether will, as I figure it, be about 60,000 lb. on each truss, allowing for slate roof, snow and wind pressure. What size timbers will it be necessary to use in building the truss? Kindly give the formula for finding the sizes of the pieces I should use.

By reference to the top of the plan, Fig. 1, it will be noticed that I have marked one girder to have a truss rod underneath. This probably will have to be an inverted Howe truss, built of rods to carry the weight. The entire basement is to be used as a cow stable, without any posts or supports in the way, except the foundation walls.

Will the arrangement indicated support the weight of the floor and contents, which will be straw and hay, and what size of rod shall I use in the truss?

The side view, Fig. 2, represents the exact construction along the sides of the threshing floor and driveway, the truss indicated in the side elevation being that marked "truss-A" on the plan. The 8 x 8 posts will rest on the truss as shown, if the truss can be built to hold the weight. The truss need not essentially be exactly as I have shown it, provided some other style will be stronger. The idea is to keep the upper member of the truss about 7 ft. from the barn floor, as I do not want it to extend any above the hay mows.

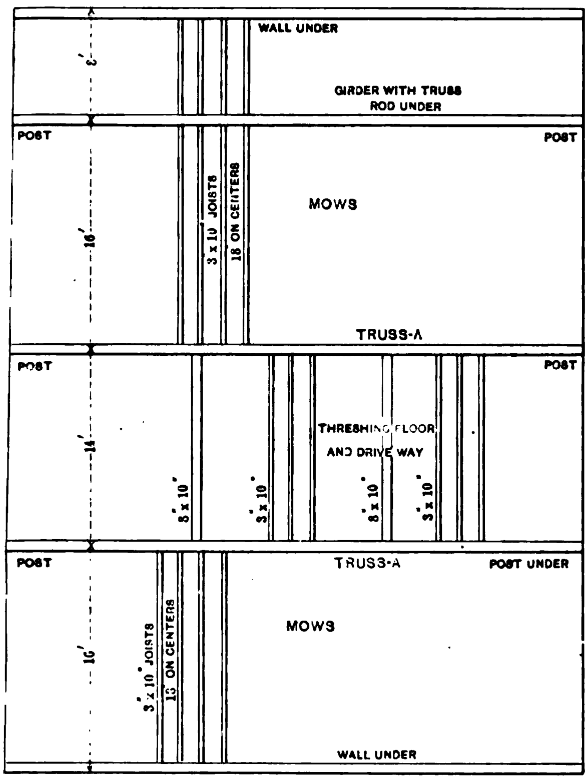


Fig. 1.—Plan of Main Floor of Barn, Showing Position of the Several Trusses.

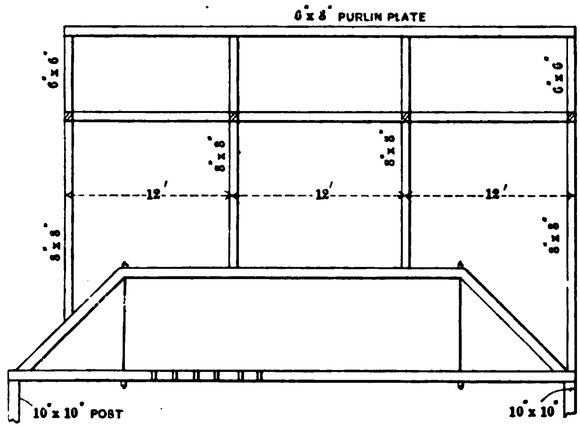


Fig. 2.—View of Bent with Truss Each Side of Driveway

A Question in Barn Construction.

Answer.—In order to support a load of 60,000 lb. on a span of 40 ft. would require a truss built as indicated by the stress and truss diagrams, Fig. 3, of the sketches. It is evident from the author's drawings that he desired to support the roof by means of posts which foot upon each truss. To do this properly each post should be set directly over a joint of the upper chord and be footed on a sole plate, so as to distribute the stress properly.

The type of truss chosen is a six panel Howe truss, as it is simple in construction and will perform good work in such a position.

The stresses are found in a manner easily understood from the following calculations: For the center rod there would be no stress due to the load on the top chord, but the strain from the floor timbers resting on the bottom chord would produce a tension in the rod equal to the assumed lower chord load, *viz.*, 2000 lb. and should be taken care of theoretically by $\frac{2000}{16,000}$ which equals 0.125 sq. in. area. This stress would require the upset end of the rod to be ¾ in. diameter, and the body of the rod to be ½ in. diameter.

For the second rod the stress is equal to $\frac{2000}{2} + 2000 + \frac{10,000}{2}$, which amounts to 8000 lb., and requires 0.5 sq. in. of area. The nearest commercial size of rod for this requirement is a rod of 1¼ in. diameter at the upset end and ⅞ in. diameter for the body of the rod. The first rod has a stress of $\frac{2000}{2} + 2000 + 2000 + \frac{10,000}{2} + 10,000$ lb., which amounts to 20,000 lb. and requires 1¼ sq. in. of area. The nearest commercial size for this requirement is a rod 1¾ in. diameter at upset end and 1 5-16 in. diameter for the body of the rod.

The compression in the first inclined brace, first panel, is greater than in any of the others, and the other braces should correspond to this one. This stress is equal to $\left(\frac{2000}{2} + 2000 + 2000 + \frac{10,000}{2} + 10,000 + 10,000\right) \times \frac{10.11}{7.75}$ which amounts to 39,000 lb.

Considering the material to be spruce, 1 equals 10.11 ft. and assume d equal to 8 in., then $\frac{1}{d}$ equals $\frac{121}{8}$ or 15, which corresponds to an ultimate load of 3217 lb. per square inch, or 804 lb. safe load per square inch. Assume the section to be 8 in. x 8 in., or 64 sq. in., the safe load would be 51,456 lb., which would be ample. For the other inclined braces the calculations show that a section of 6 in. x 8 in. would be sufficient.

The tension in the lower chord would be the greatest in the center panel, and would amount to the sum of the tensions in the two other panels. The tension in the first panel is equal to $\left(\frac{2000}{2} + 2000 + 2000 + \frac{10,000}{2} + 10,000 + 10,000\right) \times \frac{6.5}{7.75}$ which equals 25,161 lb. The tension in the second panel is worked in the same way, plus the tension in the first panel, and the result is 40,271 lb. Working out the tension in the third panel in the same manner and adding the two tensions just found, the tension in the third panel proves to be 45,303 lb.

Spruce in direct tension has a safe value of 800 lb. per square inch, hence $\frac{45,303}{800}$ is equal to 57 sq. in., or ordinarily a section of 8 in. x 8 in. would allow for framing and bolting, but if the floor to be supported is also usel as a threshing floor, and machinery of any kind is to be operated thereon, it would be advisable to make the bottom chord with a section of 8 in. x 10 in. throughout, as drawn in the diagram.

The compression in the first member of the top chord is equal to 25,161 lb., and in the second member of the top chord it is 40,303 lb., and would require a section corresponding to $\frac{1}{d}$ equal to 13, or 841 lb. per square inch, which would amount to a safe load of 40,368 lb., but the difference between this amount and the actual load is too small to allow for imperfections in the timber and the weakening by framing, and therefore it would be advisable to make the top chord throughout of a section equal to 8 in. x 8 in.

The correspondent refers also to a girder with which he wishes to carry one-half of the load in the mow, and that unevenly distributed. A trussed girder of the inverted type has been worked out for this load on the basis of 200 lb. per square foot of area, and the section of the top chord required is so heavy as to be impracticable and would suggest that the author of this inquiry should put in another truss like the one shown, but make the top and bottom chords of a section 6 in. x 8 in., using same size rods as called for in the truss diagram.

C. P. K.

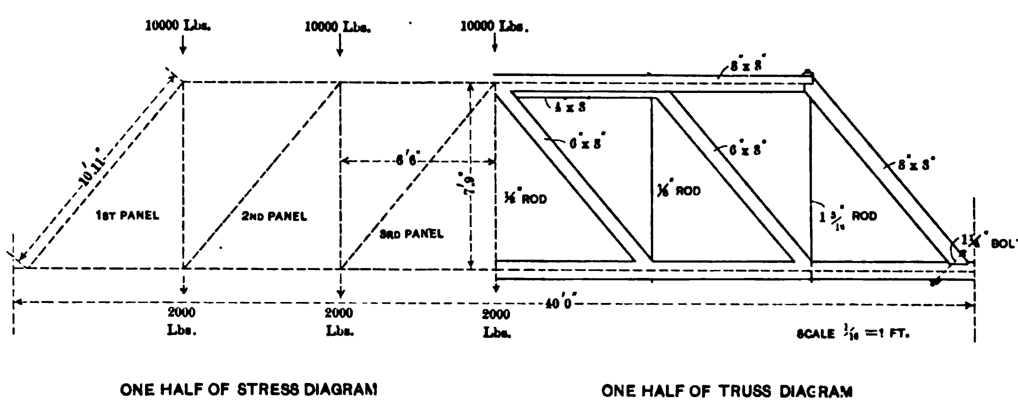


Fig. 3.—Views of Stress and Truss Diagrams.

A Question in Barn Construction.

Fastening in Place Interior Trim in Concrete Block Houses.

From Inglee & Hart, Amityville, N. Y.—In reading the correspondence in the June number of *Carpentry and Building*, we would like to state our experience in answer to the question of "T-Square" in regard to fastening interior trim, &c., in concrete block houses. In all our houses we specified the "Rutty" metal wall plugs placed 16 in. on centers in the joints of the blocks, for nailing furring, trim, &c., as we have found these very satisfactory for the purpose.

From A. E. A., Cranford, N. J.—Answering the question of "T-Square," Sheridan, Wyo., in the June issue, regarding a method of fastening the base, casings and other interior trim to the walls of cement block houses, I should like to recommend expansion bolts as admirably adapted for the purpose. We in the East have many such fastenings to make, and we find that not only can expansion bolts be depended upon to hold securely, but in addition we can usually count on a big saving in time and labor, as the bolts are quick and easy to use. They come in all sizes, and they make a fastening which is clean and neat appearing. I have been using them for three years, and the time and labor they have saved me is very considerable. I therefore recommend them to my brother carpenters.

From J. C. V., New Orleans, La.—In reply to "T-Square," whose inquiry appears on page 202 of the June number of *Carpentry and Building*, I would say that in my opinion the best way to fasten interior trim to walls constructed of concrete blocks without making use of any of the old methods, such as imbedding wood lath in the mortar or drilling holes in the stone and plugging up with wood, is to use the "Rutty" wall plug.

Machinery Equipment for General Woodworking Shop.

From S. M. P., Ouray, Colo.—Referring to the inquiry of "C. W. G.," McCook, Neb., on page 244 of the July issue, I would say that I have a 5 hp. gasoline engine and drive a 16/4 in. combination surfacer and buzz planer, a combination saw table, a band saw, shaper and turning lathe, which meets most of my needs. Were I equipping a new shop and had business to warrant it, I would put in about a 20 in. surfacer, a 16 in. buzz planer, a rip saw with boring table, either on the saw or buzz planer, a cut-off saw table separate from the rip saw, as I do not like combination saws unless they have two arbors, a single spindle reversible shaper, a 32 to 36 in. band saw, a 14 to 16 in. lathe, a mortiser and tenoner, and a 6 in. or 7 in. molder, either three or four side.

This is as little as could be gotten along with if there is much business, and would require about a 10 hp. engine. I would advise the correspondent to secure a two cylinder opposed or vertical engine.

Stucco Work on an Old Brick Building.

From J. C. Valadie, New Orleans, La.—I have been making use of a specification for plastering in connection with brick building which may possibly be of service to "J. O. S.," Terre Haute, Ind., whose communication appears on page 203 of the June issue. It in substance is as follows:

"The contractor shall scrap out the face joints to a depth of ⅜ in. in order to secure a bond for the plaster and shall then apply a cement plaster composed of one part Portland cement to 2½ parts of clean sharp sand. All plastering shall be ½ in. thick and shall be thoroughly smoothed."

In the case of the correspondent in question the plaster should be finished with a stucco or wire brush to give it the desired face. All surfaces that are to be plastered shall be thoroughly dried before any plaster is applied.

A Question in Greenhouse Heating.

From W. H. H., Altoona, Pa.—I am about to build a greenhouse, and come to the correspondence columns in order to ask some of the able readers a few questions as to the best style of house to erect and the best means of heating it. I would like to know what size of boiler will be required to heat a dwelling house 28 x 28 ft. sq. and containing seven rooms; also a greenhouse 40 x 80 ft. in area. I would put the boiler in the cellar of the house and extend it 12 ft. from the house to the greenhouse. If some of the practical readers who have had experience in work of this kind will help me out they will be conferring a great favor.

WHAT BUILDERS ARE DOING.

THERE continues to be a fair amount of building in progress in and about the city of Atlanta, Ga., although there is nothing in the way of large undertakings, which would make them notable in this connection. The volume of work is somewhat in excess of this season last year, and for the six months the showing is most favorable when we consider the general situation the country over during that time. According to Inspector of Building Ed. R. Hays there were 309 permits issued in June for improvements, calling for an estimated outlay of $464,393, whereas in June last year 317 permits were taken out for buildings, costing $419,147.

From January 1 to June 30 there were issued from the office of the Inspector of Buildings 1956 permits for buildings, costing $2,796,724, and in the same period of last year 2118 permits were taken out for improvements, involving an investment of $2,891,411.

The feeling is that the last six months of the current year will show an increase over the corresponding period of last year.

Officials of the Builders' Exchange are rapidly putting the organization upon a working basis, and it is expected that very shortly everything will be running along smoothly, and that its daily meetings will be productive of much good. One of the matters in hand is the preparation of a chart showing the wages in the various branches of the building trades in the important cities of the country.

In order to carry on its work the exchange has appointed the following committees:

Finance.—J. B. Campbell, chairman; Edward L. Moncrief, George Dowman, and D. A. Farrell, ex-officio.

Membership.—W. H. George, chairman; P. G. Hannahan, W. H. Patterson, Jr., and D. A. Farrell, ex-officio.

Legislation.—Sam Venable, chairman; David Woodward and L. H. Beck.

Arbitration.—Charles M. Coyne, chairman; C. A. Alexander, John P. Swan, L. Hunerkoff and B. A. Warwick.

Rooms.—C. P. Murphy, chairman; W. F. Aiken, F. J. Cooledge, J. H. Jennings and I. N. Harris.

Entertainment.—J. E. Hunnicutt, chairman; John W. Zuber, W. E. Austin, J. W. Leroux and J. G. Englehart.

Public Buildings.—A. V. Gude, chairman; W. H. Patterson, Sr., C. E. Sciple, W. W. Griffin and H. L. Anderson.

Baltimore, Md.

Building Inspector Preston shows in his monthly report for June that there was a marked falling off in both the cost of the improvements for which permits were issued and in the number of the improvements planned. This, it is pointed out, has been due largely to the fact that most of the building work is projected during the months of April and May, so that the builders may have the remainder of the season to complete the work. According to the inspector's figures, there were 134 permits issued for improvements, valued at $752,215, and adding 20 per cent. for undervaluation, which is the common practice in this city, makes the total $902,658. Of these improvements permits were issued for 332 two-story brick dwellings, estimated to cost $409,425; for 9 two-story frame dwellings, costing $39,750; for 13 three-story brick dwellings, costing $31,300; for a city hospital, costing $18,234; for one bank building, costing $15,041; for 10 portable schools, costing $15,600, and for four manufactories and warehouses, costing $106,300.

The total cost of the new improvements and additions for the first six months of the current year was $3,000,-799.90, adding to this 20 per cent. for undervaluation makes the grand total $3,600,959.88.

Birmingham, Ala.

The report of Building Inspector W. C. Matthews for the month of June shows 102 permits to have been issued for building improvements estimated to cost $553,895, as against a valuation of only $236,690 in June last year. Permits were issued for 38 frame buildings, to cost $100,100; for one brick business structure to cost $33,000; for two miscellaneous buildings, to cost $407,500, and for alterations and repairs to 38 buildings, to cost $10,500.

Buffalo, N. Y.

Building this season throughout the city is running pretty close to the volume of a year ago, both as regards the permits issued and the value of the improvements. There are no notable operations under way, as the work is made up of dwellings and comparatively small business structures. According to Deputy Building Commissioner Henry Rumrill, Jr., 290 permits were issued by the Department of Public Works in June calling for an estimated outlay of $600,000. In June last year there were 316 permits taken out for buildings costing $676,000.

For the six months ending June 30, 1908, there were issued 1328 permits, calling for an estimated outlay of $2,810,000, while in the corresponding period of last year 1565 permits were taken out, involving an estimated outlay of $4,154,400. The city is about to witness the erection of a Marine Hospital, but this will be done under the charge of the U. S. Government, and the department of Public Works does not issue a permit for it.

Cincinnati, Ohio.

A generally better feeling is indicated among architects and builders in this vicinity, and the belief is expressed that an appreciable improvement in the volume of building operations will be manifested early the coming year. A general tendency toward lower prices is noted in materials entering into the construction of buildings, late bids showing from 16½ to 16 2-3 per cent. reduction in prices, as compared with those prevailing in the summer of 1907. Quite early in the present year builders were impressed with the better prospects in the ranks of labor, and since then conditions have materially improved.

For the month of June the volume of new work has been somewhat greater than that of June a year ago, but the value of the operations is not materially different. According to the figures compiled in the office of the Bureau of Building Inspection, 311 permits were issued for new work and alterations, having an estimated value of $887,875, whereas in June last year 201 permits were taken out, valued at $851,512. When the figures for the half year, however, are considered a notable shrinkage is observed, although the number of operations were somewhat in excess of the first half of last year. From January 1 to June 30 of the current year 1451 permits were issued by the Bureau for building improvements, estimated to cost $2,846,233, these figures comparing with 1269 permits for improvements valued at $4,077,027 in the first half of 1907.

There are a number of important building operations under way in the city, among which may be mentioned a cold storage structure, to cost $200,000; a new home for the Provident Savings Bank & Trust Company, to cost about $250,000; apartments to be erected in Clifton by the W. F. Doepke Estate, to cost $100,000; a brick and concrete structure at Norwood, for the United States Printing Company, to cost $325,000, together with a number of new school buildings, with additions and alterations to others in the city proper. The new Woodward High School and the Hughes High School are each estimated to cost approximately $750,-000, and the new Highland School will cost $105,000. The new Kirby Road School in Cumminsville is to be unique in school construction, embodying principles in lighting, heating and in other respects not heretofore utilized in this character of construction. The building will be of reinforced concrete and fireproof.

Chicago, Ill.

A marked increase in the number of buildings projected, with a small decrease in frontage and cost, as compared with a year ago, are shown by the permits issued during the first half of the current year, when permits were taken out for 5405 buildings having a frontage of 139,388 ft., and costing $29,375,875. In 1907 the number of buildings was 5094, with a frontage of 139,035 ft., and a total cost of $31,032,500. Permits issued during the month of June just closed included 1108 buildings, having 27,103 ft. frontage, and costing $6,161,225. There is less doing in large structures than last year, but more activity in small and moderate sized residence, apartment, warehouse and factory buildings.

Architects and contractors generally agree that building costs on the average from 10 to 15 per cent. less than last year. This reduction is due to the combined effects of decline in price of materials, closer competitive bidding by contractors and increased efficiency of labor; the latter factor being not the least in importance.

Lumber is cheaper, ranging from $3 to $5 per thousand under last year's prices; cement, which in the first half of last year was $1.75 per barrel, is now selling for $1.10; brick can be had from $4.50 to $4.75 a thousand. The recent reduction of $2 a ton in structural steel does not cut much figure in comparative costs, for the reason that it had been discounted in fabricators' prices for a long time prior to its announcement. There has been no appreciable change in labor costs, but owing to the number of unemployed, contractors are able to pick the most efficient workers, and therefore much more work is accomplished for the same money.

Architects and builders are of the opinion that the last half will develop a fair amount of business, but no important increase is expected. The two most important structural jobs now under way are the La Salle Hotel and the University Club, the steel work of the latter being nearly completed.

Cleveland, Ohio.

Building operations in the city showed a slight improvement during the early part of July, as compared with the previous months. More work is being figured on than during the earlier part of the season, and while builders and architects are looking for somewhat greater activity during the last half of the year than during the first half, the improvement is not expected to be very large. During June there were 543 permits issued by the city building inspector's office, aggregating $692,562, as compared with 600 issued during May, aggregating $668,070.

During the first six months of the year the total number of permits issued was 3292 for building improvements, to cost $4,080,079, while in the first six months of 1907 the total number of permits was 4433, and the total amount of the building improvements was $7,267,578. Of the June permits 229 were for frame buildings, to cost $356,947, while 29 were for brick and stone buildings, to cost $242,150, and 285 were for additions, to cost $93,465.

There has not been much reduction in the cost of material entering in building construction as compared with a year ago. Northern lumber has not declined in price, but Southern lumber is somewhat lower. Cement and plumbers' supplies are a little cheaper. Structural steel work is cheaper, owing to the reduction in price of material and the anxiety of fabricators to get work. The wages of common labor have been reduced, but carpenters, brick layers and other skilled labor engaged in the building trades are getting about the same wages as last year, although in some cases slightly less is being paid. Owing to the scarcity of work, however, labor is more efficient and more work is being secured for the same amount of money than a year ago. A large amount of public work is being done, and this helps the local situation materially. In addition to the erection of the $3,000,000 Cuyahoga County court house and the new West Side market house, work has started or will start soon on the Mayflower School, to cost about $70,000, the West Side library, to cost $70,000, the Collinwood School, to cost $75,000, and the city workhouse at Warrensville, to cost about $115,000. Owing to the reduction in the cost of construction and the strong competition among contractors, bids for these public buildings were from 15 to 20 per cent. below the estimates.

Very little new work is in sight in the line of large buildings. Some two and three-story store buildings and a limited number of residences are being built, and the new work that is being figured on is mostly for these smaller structures. While further reduction in the cost of materials might stimulate the local building industry to some extent, and induce the building of residences by home owners, it is not believed that lower cost of material would cause much greater activity in erecting residences, terraces and apartment houses for investment purposes until general conditions materially improve. Largely as a result of the business depression there are many vacant suites in a large number of apartment houses, and until this condition changes there will not be much incentive to erect this class of buildings.

Denver, Colo.

There seems to be no letup in building activity in this city, and improvements are in progress, which are establishing records almost every month. A considerable number of brick residences continue to be erected, with here and there a frame dwelling, although the latter cuts little or no figure in the grand total. In the month of June Building Inspector Robert Willison issued 329 permits for building improvements to cost $1,340,105, as against 241 permits for improvements calling for an outlay of $1,333,570 in June last year. Of the former total $465,600 covered 170 permits for brick residences and $500,000 was for a cathedral projected last month. There were two apartment buildings projected to cost $85,000, one hotel to cost $50,000 and 16 business buildings to cost $40,000.

For the first six months of the current year 1581 permits were issued for improvements to cost $5,194,360, while in the same period last year 1342 permits were issued for buildings, costing $3,591,310, thus showing a gain of $1,603,050—the largest increase in general building for the first half of any year known in the history of the city of Denver.

Des Moines, Iowa.

The month of June has shown an amount of new work projected which is slightly in excess of that started in the same month last year, although May and April of this year show heavy shrinkages in comparison with the corresponding periods of 1907. According to the figures compiled in the Board of Public Works, 38 permits were issued in June for improvements, estimated to cost $68,475, against 39 permits for improvements, involving an outlay of $61,175 in June a year ago.

For the first six months of this year 233 permits were issued for new work, estimated to cost $490,375, while in the first half of last year 296 permits were taken out for improvements, valued at $590,869. The banner months so far this year were March, with 47 permits and a valuation of $165,455, and May, with 46 permits for buildings to cost $133,535. The smallest month was February, when 16 permits were taken out for buildings to cost $13,900.

Hartford, Conn.

Much of the work in progress at the present time consists of buildings intended for dwelling purposes, although, of course, some improvements are in progress in the business section. The value of the work projected in June was a trifle less than in the corresponding month last year, although the number of permits issued was practically the same. According to the figures of Building Inspector Fred J. Bliss, 63 permits were issued in June for improvements, costing $215,185, while in the same month of 1907 there were 64 permits issued, involving an outlay of $271,505.

For the six months of the current year there were 317 permits issued, calling for an estimated expenditure of $881,585, whereas in the first half of 1907 there were 377 permits taken out, involving an outlay of $1,479,165.

Indianapolis, Ind

There is comparatively little that is new in the building situation, and the volume of operations is pretty much on the same scale as June last year, there being a slight increase in the number of permits issued by Inspector of Buildings, Thomas A. Winterrowd. According to the figures compiled in his office there were 394 permits taken out last month, as compared with 361 in June last year, but the value of the improvements for which these permits were issued shows a much greater difference, the figures being $494,731,32 and $1,100,514, respectively. The seeming shrinkage in the value of the figures for June of this year is due to the fact that in June, 1907, a permit was issued for the building of the I. O. O. F., estimated to cost $500,000.

For the first six months of the current year 2016 permits were issued for improvements, costing $3,041,913.32, as compared with 2068 permits for improvements, costing $3,728,094.80 in the first six months of 1907.

Kansas City, Mo.

As the season progresses there is a slight falling off in the volume of new work projected, but this is not altogether surprising in view of the degree of activity which has prevailed for the past few months. According to the figures available, 318 permits were issued in June from the office of the Superintendent of the Building Department for Improvements, estimated to cost $819,438, as against 384 permits for buildings, costing $771,820 in June a year ago. The figures for last month compare with a valuation of $997,595 in May, and $1,659,050 in April, which was the most active of any corresponding month since the Building Department was established some 26 years ago.

For the first six months of the current year 1835 permits were issued by the Department, calling for an outlay of $5,322,128, whereas in the first half of last year 2077 permits were issued for buildings, calling for an expenditure of $4,884,670. From this it will be seen that while the number of permits issued was less this year than a year ago, the value of the improvements shows a gain of nearly $500,000.

An important addition is being erected to a candy and cracker company's plant, which is estimated to cost $182,000, and the Midland Building Company is altering the Midland Hotel into an office building at an estimated cost of $100,000.

Los Angeles, Cal.

While the number of building operations projected in the month of June was nearly the same as for the corresponding month last year, the value of the improvements for which the permits were issued was only about half what it was a year ago, all of which indicates the construction of less pretentious buildings. The figures compiled in the office of J. J. Backus, Chief Inspector of Buildings, shows 626 permits to have been issued in June for buildings valued at $757,856, while in June last year 653 permits were issued for improvements having a valuation of $1,516,516. The banner month this year was March, when the valuation of the buildings for which permits were issued was a little more than $1,000,000; in April the valution was $665,000, and in May it was $830,320. Last year every month except January showed a valuation of over $1,000,000, March running over $1,250,000 and April about $1,500,000.

For the six months of the current year 3553 permits were issued for buildings, valued at $4,304,035, whereas in the corresponding half of last year 3784 permits were issued for buildings, valued at $7,261,238.

Louisville, Ky.

A number of old buildings are being cleared away to make room for a new seven-story hotel in the business section of the city, and it is probable that within the next few months work will be commenced on a new theater of first-class construction in all respects. In the month just closed 277 permits were issued from the office of Building Inspector John Chambers for improvements to cost $198,178. In June last year 271 permits were taken out for improvements, costing $428,008, thus showing that the work now under way is of a much less pretentious character than was the case a year ago.

For the first six months of 1908 there were 1519 permits issued for buildings to cost $1,256,854, these comparing with 1508 permits for building improvements, costing $1,976,760 in the first six months of last year.

Memphis, Tenn.

Most of the work for which permits are at present being issued is for small buildings, and the outlook is regarded as very promising. According to Building Commissioner Dan

C. Newton, there were 248 permits issued in June for building improvements, estimated to cost $354,855, while in June last year 263 permits were taken out for buildings, costing $605,741.

For the first six months of the current year 1254 permits were issued for new buildings and alterations, involving an cutlay of $1,620.555, as compared with 1427 permits in the first half of 1907 for building improvements, costing $3,177,-213. In the first half of the current year, however, the volume of business has, broadly speaking, been greater than was the case a year ago, notwithstanding the figures given above. The reason for this is that in the first half of 1907 there was issued a permit for the Shelby County Court House to cost $750,000, and another permit for the annex of the Peabody Hotel, amounting to $500.000. This, Mr. Newton points out, fully accounts for the difference between the six months' totals presented herewith.

Milwaukee, Wis.

One of the notable features of the building situation has been the remarkable increase in the number of two-family houses erected in various sections of the city. The rapid growth of this class of structure has been due in a large measure to the repeal of the Tenement House law, and also to the increasing demand for this kind of building in the city. The operations for the month of June have reflected this condition to some extent by the number of permits granted, and also by the increase in the cost of the improvements as compared with the same month last year. According to Edward V. Koch, Chief Inspector of Buildings, there were 468 permits taken out in June for building improvements, estimated to cost $1,250,442, and in the corresponding month of 1907 the number of permits was 357, calling for an outlay of $765.187. When it comes to a consideration of the figures for the six months of the year already past, the showing is a trifle less favorable when compared with the corresponding period a year ago—that is, so far as concerns the estimated value of the improvements projected.

The number of permits granted for the six months ending June 30 of the current year was 2157, calling for an outlay of $4,165,521. In the same period of last year 1881 permits were issued from the office of the Inspector of Buildings for improvements, valued at $5,646,343.

Minneapolis, Minn.

No unusually large operations are under way at the present time, and matters seem to be running along the even tenor of their way. The value of the work in progress is not quite up to that of last year, although the number of permits granted in June is larger than in the same month last year. Inspector of Buildings James G. Houghton states that last month there were 560 permits taken out for buildings, estimated to cost $877.020, whereas in the same month last year 488 permits were issued, but these called for an estimated outlay of $1,002,025, thus indicating what seems to be quite common conditions in other sections of the country—that is, more buildings for less money per structure.

For the first six months of the current year 2836 permits were taken out for improvements, costing $4,368,125, which figures compare with 2549 permits in the first six months of last year for improvements, costing $5,060,405.

New York City.

The most striking feature of the local building situation the past month is found in the figures covering operations since the last day of May, wherein is shown an increase of appreciable proportions over June of last year in the value of the work for which permits were issued. This is due in a measure to the filing of plans for important undertakings, involving a considerable investment of capital, such, for example, as the proposed $10,000,000 skyscraper, 62 stories high, for the Equitable Life Assurance Society on Broadway. While only 72 permits were taken out in June in the Borough of Manhattan for building improvements as compared with 131 in June of last year, the estimated cost of the current improvements totals $15,593,340, as against $10,289,-000 in June a year ago. In the Borough of the Bronx 184 permits were taken out last month for new buildings, estimated to cost $1,630,160, as against 218 permits for improvements, involving an estimated outlay of $1,921,000 in June, 1907.

For the first six months of the current year there were issued by the Bureau of Buildings in the Boroughs of Manhattan and the Bronx 1083 permits for new buildings and alterations, amounting to $52,689,180, while in the corresponding six months of last year 1787 permits were issued for building improvements, estimated to cost $72,102,520.

In the Borough of Brooklyn the check to building operations noted for the past few months appears to continue, for during the month of June only 416 permits were taken out for new buildings to cost $2,647,530, as against 920 permits in June last year for buildings, costing $9,121,840. For the six months of the current year 2279 permits were issued by the Bureau of Buildings, calling for an outlay of $13,121,-120, while in the first six months of last year 5442 permits were issued, calling for an outlay of $40,762,555. These figures do not include the amount expended for alterations during the periods named, which were respectively $2,681,-300 and $3,462,205.

Newark, N. J.

There was a decided falling off in the amount of new building projected in June as reflected by the permits issued by the Building Department, and the value of the improvements for which the permits were taken out. As compared with last year there was a decrease of $310,918, and for the six months the total decrease, as compared with the corresponding period of 1907, was $1,665,697.

The total number of permits granted up to July 1 of this year was 1253, calling for an outlay of $4,901,596, while in the first six months of last year 1114 permits were issued for building improvements estimated to cost $3,235,899.

Philadelphia, Pa.

An analysis of the building conditions during the first half of the year is not so discouraging when the conditions surrounding the trade are taken into consideration. With the depression of the fall of 1907 building operations at the close of the year fell to a very low level, and with a continued dullness in the general industrial activity of the country any marked improvement could hardly be expected. There has, nevertheless, been a slow, steady improvement, which is all the more creditable in the face of disturbed financial conditions and lack of confidence in the general prosperity of the country.

During the month of January building operations, which amounted to $954,510, showed a slight improvement over the month of December, 1907, which was the low month of that year. February showed a further gain, with a total of $1,217,980. The March total was $2,489,940. April showed a gain, with operations at an estimated cost of $3,178,535. While May showed a slight decrease, with $2.909.500, June made a slight gain over May, with a total of $3.017,045.

Taken as a whole, the first half of the year of 1908 represents a decrease of $9,007,495 in the value of work begun, when compared with the same period last year, or an average decline of about 39 per cent. An analysis of these figures shows that the falling off in the building of two-story dwelling houses has been most marked. During the first six months last year 626 permits were issued for work of this class, covering 4444 operations, at an estimated expenditure of $8,128.780, while for the same period during 1908 the records show 483 permits for 2520 operations, at an estimated cost of $4.655,310, a falling off of $3,473,470. The same proportional decline is to be noted in connection with three and four story dwelling operations.

The falling off in connection with industrial building, owing largely to decreased industrial activity, was also very heavy. Where $2,039,655 was expended for work of this class during the first six months of last year, the amount during the same period this year reached but $300,000. Estimated expenditures for office buildings, during the six months, lose over $1,660,000 when compared with last year, while in most the usual operative lines a greater or less decline was to be noted. In work of a miscellaneous character, including municipal work, there was a gain amounting to about $1,000,000, of which the new Hammerstein Opera House contributed $750,000.

As far as the month of June individually is concerned, the records of the bureau show that 787 permits for 1286 operations were issued, the estimated expenditure being $3,017,045, while for the same month last year the value of new work was $3,186,365, which is considered quite satisfactory. Although no particular increase is expected during the summer months, it is hoped—in view of the fact that business has been more stationary during the past few months—that the same relative proportion of work will be maintained, and although July and August are usually slow months in the building trade, it is believed with the slow moderate improvement which is to be noted in the industrial trades and steadily improving finances that there will be a better feeling, which should not be without beneficial effect on the building trade.

Pittsburgh, Pa.

The result of the building operations for June seems to have reversed the statistics for the month before, as compared with the corresponding periods last year, for in June 375 permits were issued by S. A. Dies, superintendent of the Bureau of Building Inspection, for improvements costing $938,149, while in June last year 434 permits were taken out for buildings estimated to cost $1,781,800. It will be recalled that in May last the value of the improvements for which permits were issued amounted to over $2,000,000, as against about $900,000 in the same month the year before. There seems to be no notable operations under way, and the business maintains a rather steady dullness at present.

Considering the six months' figures, however, the disparity is not so great, there having been taken out 1853 permits from January 1 to June 30 of the current year, calling for an outlay of $5,441,532. These figures compare with 2053 permits for the first six months of last year calling for an outlay of $5,901,165.

Portland, Ore.

Permits have recently been issued from the office of Building Inspector G. F. Dobson, for quite a number of building operations now under way, these including a 10-story steel structure for Meier & Frank, an eight-story reinforced concrete and steel building for the Y. M. C. A., a five-story building of "mill construction" for business purposes, the Good Samaritan Hospital, which will be of brick, and five stories high, and two-story, three-story and four-story "mill construction" buildings.

The amount of new work projected in June was practically the same as that for the corresponding month last year, the figures being 385 permits with a total valuation of $841,065, and 382 permits with a total valuation of $865,250, respectively.

For the first six months of the current year 2590 permits were issued from the office of the building inspector for improvements valued at $4,887,610, while during the same period in 1907 there were 2043 permits issued for buildings valued at $5,695,912.

Rochester, N. Y.

There was an appreciable falling off in the number of permits issued from the office of the Bureau of Buildings and Combustibles during the month of June, but this was not at all surprising considering the general conditions which have prevailed throughout the country for months past. There were 159 permits taken out for buildings, estimated to cost $485,950, which figures compare with 180 permits for buildings, costing $538,920, in the same month last year.

For the six months ending June 30, 1908, there were 745 permits issued by the bureau, involving an outlay of $2,130,533, and in the corresponding six months of last year there were 958 permits taken out, involving an outlay of $3,511,196.

San Francisco, Cal.

Much was accomplished in this city during June in the construction line, and many new buildings were completed, says our correspondent, writing under date of July 3. Work was commenced on a number of new structures, including large business blocks, as well as and more or less pretentious dwellings. More steel frame buildings have been started of late, although the total number now erecting is small. The total valuation of new buildings for which permits were issued during the month of June was $2,351,211, showing a decrease of $358,520, as compared with the figures for May, but the number of the permits for June was 638, an increase of 40. The total valuation has averaged about $2,250,000 for the past three months, which approximates the figures for the months in 1906 just preceding the fire.

Notwithstanding the great number of buildings erected and started during the present year, there are still a good many mechanics and laborers in the building trades who are out of employment, and some have had very little work this season.

Prices of building materials are still very low, as compared with one or two years ago. Lumber prices have not advanced, and dealers are still underbidding and taking whatever they can get for orders. With the exception of two yards, stocks of lumber are not large, as receipts of lumber by sea have not been heavy during the past month. The Interstate Commerce Commission's decision forcing the railroad companies to withdraw their advanced freight rates on lumber going East and South will permit southern Oregon lumber to flow into the interior of California again which will weaken prices further. However, when the saw mills on Puget Sound and the Columbia River get to making large shipments of lumber East again it may prevent the necessity of dumping their surplus lumber in San Francisco to the demoralization of the market. The local lumber dealers who were almost discouraged are now more hopeful, and a movement to advance lumber prices would not be surprising after August 15, when the new decision becomes effective.

Cement, both foreign and domestic, is low priced and plentiful, with the production of Portland cement in California slightly increased by the operation of new mills. The supply of brick has increased, although, on account of the accumulation of common mud brick, some of the plants are not operating now. The demand for face brick continues, with prices a little firmer perhaps. There is still a good demand for white glazed brick at about $80 per 1000.

Sand, gravel and crushed rock are in good supply and very reasonable prices prevail. Everything in the line of materials favors active construction, and there is a good demand for buildings in the burned district. Only lack of money prevents a building boom. The unusual tightness of money that existed last month was somewhat relieved by the disbursing of about $10,000,000 in this city July 1 in the semiannual payments of dividends, &c., by savings banks, trust companies and other financial institutions. A real improvement in the money situation is expected by many in the fall. There is no question that many more good buildings can be readily rented if erected during the next few months. Plans have been completed for seven new fire engine houses, and $180,000 is available for construction work this year on them.

Mayor Taylor vetoed the amended tenement house and building ordinance, which had been passed by the Board of Supervisors, exempting owners of corner lots less than 100 ft. deep from the provision that requires them to leave a 10-ft. areaway at the rear of each lot when erecting a building thereon.

Salt Lake City, Utah.

The rapid growth of the city is being forcibly demonstrated by the amount of building which is in progress in various sections. The report of Building Inspector A. B. Hirth for June shows that permits were issued for buildings estimated to cost $194,900, most of this amount representing residence and small office buildings ranging in value from $5000 to $20,000 each. Although the total is lower than that of June last year, the figures are on the whole gratifying, as last June many permits were taken out for big office buildings.

The total value of the improvements for which permits were issued the first half of the current year is placed at $1,795,860, which figures compare with $2,198,250 in the corresponding period of last year. This difference is in part accounted for by the permits issued for the Newhouse, Boston and Judge buildings. Eliminating these the first six months of the current year would show nearly $1,000,000 ahead of last year.

Seattle, Wash.

In spite of the depression caused by the dullness of the lumber trade building operations are maintained upon a scale which compares most favorably with the situation a year ago. According to Francis W. Grant, superintendent of buildings, 1088 permits were issued from his office for buildings aggregating an estimated value of $1,280,033, which is nearly $300,000 more than for the month of May, and compares with 898 permits for improvements estimated to cost $1,249,203 in the month of June last year. A classification of the permits issued this last month shows 407 to have been for frame buildings costing $673,720, while nine were for brick structures costing $340,500. There were three permits issued for concrete buildings, one being for a six-story structure, all having a total valuation of $49,100, while 513 permits were for alterations and repairs involving an outlay of $129,459. There were 63 permits for miscellaneous buildings estimated to cost $83,951.

Superintendent Grant states that the indications point to a valuation of improvements for July which will exceed that for June. At the time of writing, July 7, there were on file in his office plans calling for work aggregating an outlay of $750,000, the expert examination of which had not then been commenced. The character of this work is of a higher class than that included in June permits, as it includes buildings having a contemplated hight of as much as 18 stories.

The figures for the first six months of the current year show 6102 permits to have been issued calling for an estimated expenditure of $5,385,040, while in the first six months of last year 4360 permits were taken out for buildings costing $6,358,938.

Spokane, Wash.

The number of building permits issued in June was 322, involving an expenditure of $504,203, as compared with 175 permits and an expenditure of $1,090,245 for the corresponding month of 1907. For the six months ending June 30 there were 1625 permits issued for an estimated expenditure of $3,032,373, while for the six months ending June 30, 1907, there were 917 permits issued, calling for an estimated expenditure of $3,602,562. The Federal Building at $600,000 and the Paulsen Building at $750,000 were included in the 1907 figures.

St. Louis, Mo.

According to the report of Building Commissioner Smith the total value of building operations for which permits were issued during the month of June was $1,942,736, against $2,015,510 in the same month last year. From this it will be seen that operations very closely approximate to this season a year ago, fully half of the decrease being due to the falling off in the construction of new brick buildings.

For the first six months of the current year, 4568 permits were issued for improvements estimated to cost $10,477,121, as against 4578 permits for buildings estimated to cost $12,823,792 in the first half of last year.

Toledo, Ohio.

According to the figures furnished by B. E. Weber, assistant building inspector, there were 107 permits issued for building operations in June, having a valuation of $186,260, as compared with 109 permits for improvements valued at $409,160 in the corresponding month of last year. For the first half of the current year 486 permits were taken out for improvements estimated to cost $870,362, while for the same period of 1907 there were 636 permits issued for improvements valued at $1,980,134.

The total value of the building permits issued in Montreal, Canada, during the month of June were 191 in number, calling for an outlay of $559,952, these figures comparing with 234 permits issued in June last year for building improvements valued at $982,396.

The report of the Bureau of Building Inspection for the month of June in Scranton, Pa., shows that 89 permits were issued for improvements valued at $171,000. This is a decrease in the number of permits issued as compared with May, but an increase of $29,000 in the value of the improvements projected. There are 35 buildings in course of construction in the city at the present time for which no permits have yet been issued.

Building permits issued by the City Engineer of Lincoln, Neb., during the month of June show that building has decreased considerably when compared with June a year ago. There were 42 permits issued calling for an outlay of $74,525, while in the same month of 1907 the 66 permits issued amounted to $107,800.

Faults in Building Construction.

The State Fire Marshal of Minnesota points out some of the commoner faults in buildings which invite conflagration, as the following:

Open stairways and elevator shafts.

Internal openings in brick dividing walls.

Absence of fire shutters, or metal sash with wired glass.

Low parapet walls.

Shingle roofs.

Hot air and steam pipes too near wood.

Unprotected metal floor supports.

Chimneys less than one length of a brick in thickness and unlined by burnt clay or terra cotta pipe.

Each of these errors in building, except the chimney, can be corrected for a sum, the interest of which would be much less than the saving that would result from a reduction of the insurance premium, for each of the above mentioned defects is charged for.

The vertical opening is the greatest producer of total losses because it furnishes an inflammable flue for flames.

Openings in dividing walls should be furnished with automatic iron doors or filled with brick.

Either metal sash with wired glass or tin clad shutters should be placed in exposed windows. A wooden shutter covered with tin will not warp from heat so as to let in sparks, as an iron shutter may.

Parapet walls should be built up to 3 ft.

Stairways, if inclosed, should be fitted with spring doors; if not inclosed they should have trap doors. Elevator shafts should be inclosed or have a trap door at each floor.

The shingle roof adds so much to the insurance rate that one cannot afford to let one remain on an expensive building.

Wood should be cut away from hot air and steam pipes. Either may become red hot. Against wood they convert the surface into charcoal and then fire it.

Metal pillars or joists, if not protected by some burnt clay product or concrete, spring when heated and let down the ceiling of the burning room.

Another cause of conflagration is pointed out in the immense size of the rooms in wholesale and department stores. A partition will ordinarily hold back a fire until the firemen can get water to it. Such rooms should have sprinklers.

It is intelligence rather than expense in building that secures the lowest insurance rate. One about to build should gather information as to the influence of material and detail of architecture on the fire danger and the insurance premium. The threatened exhaustion of the timber supply is an ill wind, to be sure, but it blows in one good by making lumber so expensive that it is economy, all things considered, to use fire resistive material for nearly all buildings.

Ordinary joist construction costs about 11½ cents for each cubic foot. Slow burning or "mill" buildings, in which floors are thick enough to resist fire until the fire department has ample time to get to work, costs 14 cents. Reinforced concrete with external walls of brick costs 18 cents. Fire resistive construction with steel skeleton and brick curtain walls costs about 20 cents a cubic foot. Since the San Francisco conflagration the term "fireproof" has given way to "fire resistive construction," in the vocabulary of the architect.

American Teachers Going to England to Study Industrial Drawing.

The propaganda of the National Society for the Promotion of Industrial Education is likely to be greatly stimulated by the meeting in London from August 3 to 8 of the Third International Congress for the Advancement of Drawing and Art Education. Much of the time will be devoted to industrial drawing in its various phases, particularly to mechanical drawing. The United States will send about 250 delegates, representing every section of the country. The Director of Art and Manual Training for the Boroughs of Manhattan and the Bronx of New York City, Dr. James P. Haney, will attend, as will also five of his assistants.

Dr. Haney takes to London a very important contribution from the American Official Committee of the Congress, in the shape of a conspectus on "Art Education in the Public Schools of the United States," a handsome book of 432 pages, with over a hundred full page illustrations of the art work done by children and also by students in the Normal Art schools.

The United States will show a composite exhibition, arranged by grades, of work done in the public schools of nearly all the large cities. The conspectus will serve to explain the meaning and relation of the different phases of the work, and will be a permanent record of the art education being carried on in this country to-day.

Builders' Wages in London and New York.

An interesting comparison of wages and hours in the principal building trades between the metropolis of the Old World and the new is furnished by *Derrick's British Report*. Although the labor unions are thoroughly organized in London their members receive only a third to a half the wages paid in this city and the hours are 12 per cent. longer. Such a scale as is in force here, for example, $5.50 a day for union stone setters and ornamental plasterers, $5 a day for carpenters and plumbers and 70 cents an hour for bricklayers and masons, is unheard of in England.

The figures given by *Derrick's* in shillings and pence are:

	London.		New York.	
	Wages.	Hours.	Wages.	Hours.
Bricklayers	43s. 9d.	50	119s. 2d.	44
Carpenters	43s. 9d.	50	97s. 0d.	44
Plasterers	45s. 10d.	50	124s. 9d.	44
Cabinetmakers	43s. 9d.	50	81s. 8d.	47

Definition of "Bungalow."

The following from an English building journal will be of interest: What is a bungalow? The term used to be applied to a simple one-story structure of a more or less temporary character. "The bungalow of to-day," says the *Tatler*, "is a very luxurious affair. Except that all the rooms are kept on one floor, it is quite as substantial as the average country cottage or house, and even in the matter of rooms on one level many bungalows have now one or two bedrooms on an upper floor. In fact, the modern bungalow is distinguished from the average house more by the studied rusticity of appearance, which consorts admirably with its surroundings, than by any material difference in its accommodation. And allied to other advantages it is comparatively cheap." This strikes us as an unnecessarily loose use of the word, for according to this definition, nearly all modern country houses are bungalows. And "comparatively cheap" is not the distinguishing mark of the £3000 house near Norwich, which is illustrated on the same page of the *Tatler* as contains the passage quoted above.

Construction of a Ballroom Floor.

Inquiries occasionally received relative to the best manner of constructing a ballroom floor—that is, one which possesses more or less elasticity or spring and at the same time make it more or less sound proof—render interesting some comments which appeared in a recent issue of one of our London contemporaries touching English methods of constructing ballroom or dancing floors. The first illustration represents a section through a floor and ceiling, clearly indicating the method adopted. The floor boards, instead of being secured directly to the main joists, are fastened to auxiliary joists placed intermediate of the main joists, these being supported by spring steel bars extending transversely of the main joists and placed over rubber blocks. The latter and the steel bars are fitted on and under the joists by screws. It is stated that the floor will yield under live loads, while the main joists will remain rigid and prevent transmission by un-

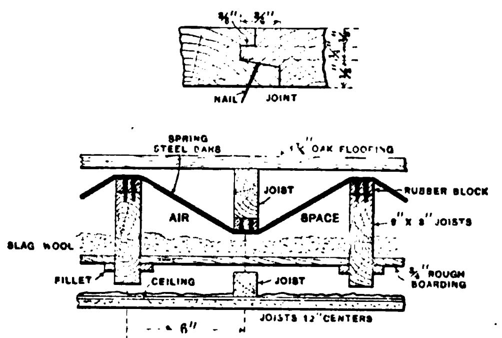
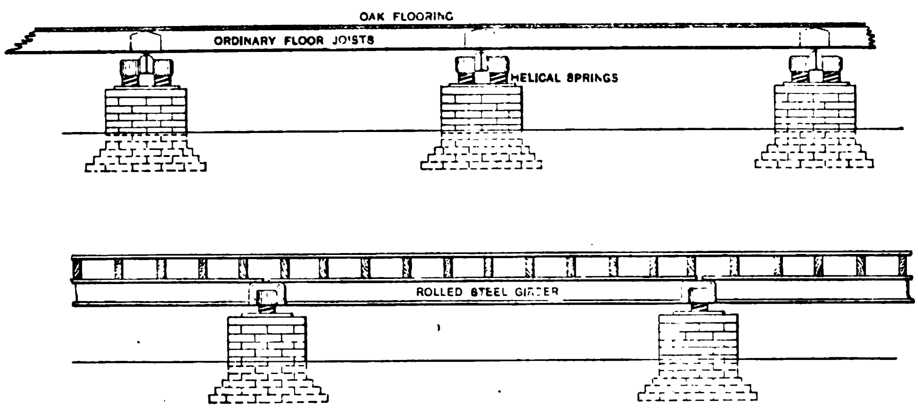


Fig. 1.—One Method of Constructing the Floor.



Figs. 2 and 3.—Method of Constructing a " Spring " Floor.

Construction of a Ballroom Floor.

due stress. The flooring in this particular case is referred to as being of oak or Italian walnut of good quality, laid in narrow widths, with a tongued and secret nailed joint, as indicated in the detail directly above the section.

The second and third illustrations represent respectively cross and longitudinal sections of another form of floor construction. This is referred to as an excellent method for a spring floor, as it differs essentially from the generality of spring floors as ordinarily constructed, the latter being dependent for their resilience upon the lightness of the supporting timber joists, thus rendering them a positive danger in case of a crowded room. The drawback, it is pointed out, is entirely overcome by following the method here indicated. The entire floor is supported by helical steel spring fitments, held in position by metal casings and secured to steel girders. The latter are placed in three rows longitudinally, one through the center of the room and one at each side, and are placed about 9½ ft. apart, with a span of about 12 ft. 3 in. Across the girders and bearing on them are laid fir joists, placed about 1 ft. 2 in. apart, to carry the flooring.

From this construction it will be seen that as far as the timbers are concerned they are perfectly rigid, while elasticity with perfect security is obtained from the springs, the smoothness of the helical acting being the greatest obtainable with ordinary materials. It would be preferable that the springs should rest upon brick piers rather than upon an existing floor, so as to secure a solid bearing.

Cost of Building Now and in 1907.

In view of the discussion as to the tendency of building operations in various sections of the country and the decreasing cost of materials and labor in this branch of industry, the following comments which appeared in the *American Lumberman* of June 13 may not be without interest to a large number of our readers:

Present day commerce is based upon the idea of specialization. One man raises produce, another builds houses, another makes clothes; others engage in transporting various commodities; still others work in factories, shops, foundries and mills. The men who build houses cannot consume all the potatoes raised by the farmers. The farmers cannot give all the carpenters, masons and plasterers steady employment. When the artisans are out of employment they cannot secure the means of purchasing for their requirements, and the result is a lighter demand all along the line. Start one faction to work and you start them all.

When the call for carpenters is greater than the supply men unskilled in the work can secure employment at high wages and skilled workers can command special prices. Here enters and becomes active the law of supply and demand, which may not be reversed or defied with impunity.

When the supply of labor is greater than the demand workmen can be secured on better terms and will give greater and better service. This is the logic of the law mentioned and of human nature.

Labor is cheaper now than it was a year ago, although nominally wages are the same. It is cheaper because it is better.

Materials are cheaper than they were a year ago, not for the same reason that labor is cheaper, but in the actual prices that must be paid.

Last year the majority of the dealers in building material had all the trade they could handle. This year business has been fair, as shown by the building records, but there is room for a very considerable improvement.

The one great reason why building operations should be undertaken now or why contracts for supplies should be entered into is that they can be made on more advantageous terms.

Materials can be secured for lower prices, will be delivered more promptly and in a more satisfactory manner than during either 1906 or 1907.

As a general proposition lumber is now being sold for 10 to 15 per cent. less than during last year. In some cases, where the trade is supplied with special woods, a reduction to that extent has not been made. However, 10 per cent. probably represents about the general decline in the retail price of building material.

A Cleveland operator has supplied some specific information showing the relative cost of building in 1907 and 1908, which is reproduced herewith:

	1907.	1908.	Per cent. of decrease.
Masonry and grading	$1.329	$944	29.0
Plastering	585	313	46.8
Plumbing	640	500	21.9
Heating	730	570	22.0
Painting	530	400	24.5

Lumber, $4 to $6 a thousand less.

The foregoing comparative values represent actual figures secured by a gentleman who wished to build. The 1907 prices were made during the latter part of that year and the 1908 prices this month.

It is high time the general public informs itself of this condition of affairs and profits by the opportunity now presented, one which probably will not long be available.

No uniform reduction in the retail prices of lumber has been made by the dealers of the country. Some have very materially reduced their prices and claim to have encouraged building by this policy. In other sections, however, cheap lumber now being offered has to be transported such great distances that the freight rates put a high value on the products. This particularly is true throughout the eastern section of the country and to a more limited extent in the northern territory where local supplies are inadequate.

Referring again to the comparative schedule of values submitted, it will be seen that the total cost in 1907 would have been $3814 for the items mentioned. For 1908 the bids put in represented a cost of only $2727, a saving of $1087 on the building for which prices were secured, representing a decrease of 28.5 per cent. This reduction possibly may be out of the ordinary. It scarcely is possible that building could be done for a third less now than in 1907, but the figures given represent estimates made by contractors during the two periods.

This showing is sufficiently strong to warrant every prospective builder or every one who is in a position to build in taking this matter up and making a thorough investigation of the subject.

Conditions in different parts of the country vary. What is said of one town may not be applicable to another, and probably would not be applicable to all the country, but in every city and every village in the United States it is a comparatively easy matter to determine the relative cost this year and last, and beyond question it will be found that buildings can be put up this year at a saving of anywhere from 10 to 25 per cent. of the cost in 1907.

In its issue of June 20 the *American Lumberman* had the following comment in regard to the prices of lumber:

Values necessarily will show fluctuations in the future. Sale prices will move up and down in response to heavy demand or its temporary restriction. The lumber trade of the country and the lumber consumers of the country should remember, however, that a steadily increasing demand is being filled from a constantly decreasing supply of timber. The inevitable outcome of these forces working one upon the other will be a higher price level. The history of years past shows that each decade has its high and its low prices, but the low prices of 1900 to 1910 will be about in line with the high prices of 1890 to 1900. There are possible exceptions, but few people have the opportunity to profit by the exceptions which in substance mean the sacrifice of some one's else property to satisfy pressing claims.

Lumber, brick, stone and other materials necessary to the construction of buildings, purchased and put into place at this time, will be worth in the new relation they bear one to the other a great deal more a year or two from now than the present cost. Furthermore, such structures will be ready for use.

By diffusing the efforts of workmen over a broader period a twofold advantage is gained; one is, the work is done without undue haste and more attention is given to the perfection of details than where speed is essential. The other advantage is that by keeping a majority of the people of the country constantly employed the dregs of depressed times are not tasted and it is possible to pass through such periods without undermining or seriously impairing the credit and real interests of the country.

New Publications.

Reinforced Concrete.—By Ernest McCullough; 128 pages. Sizes 5 x 8 in. Illustrated by 28 line drawings and numerous tables. Bound in board covers. Published by Cement Era Publishing Company. Price $1 postpaid.

This book has been prepared to meet what has appeared to the author to be a distinct demand for a working manual full of practical helps and with as little as possible of theoretical discussion. It has been written for men not technically educated, and for those who are desirous of acquiring a knowledge of the practical side of reinforced concrete work—a form of construction which just at present is very popular with architects and builders and which is rapidly increasing in use the world over. The author has personally supervised the erection of many of the buildings he has designed, thus giving him a broad practical experience and eminently fitting him to treat the subject embraced within the covers of this book.

Nearly all the matter is referred to as being original—not compiled—and the author tells how to do the work in accurate and comprehensive language, readily understood by the average builder. He also points out that it has been his intention in the sections on design to keep within the usual requirements of the ordinary conservative building ordinances of American cities, and this explains the use of the straight line formulas for stress and the limitations imposed by the employment of working stresses. The ambitious designer who is anxious to learn more of the theory of the subject and of the design of higher structures must needs go to the larger standard treatises.

The little work under review is comprised in eight chapters, in the early ones of which attention is given to the strength of beams and their loads, after which columns of various kinds are considered, this including different formulas for strength and stiffness, increase of strength with added steel, a comparison of steel and of steel and concrete, methods of working, &c. In the fourth chapter the author takes up the subject of plain and reinforced concrete walls and at the same time touches upon the construction of tanks, chimneys, footings, &c. The next chapter deals with design and cost, in the course of which reference is made to different methods of design, various "forms" necessary for use and an approximate method of estimating costs. The following chapter is devoted entirely to "forms" showing the material required, method of constructing the forms, kind of lumber required and some extended comments on special forms. In an important chapter on the "conduct of work" the author deals with the mixing of concrete, the proportions and general method of carrying on operations in concrete. Contrary to the usual practice in connection with many of the technical books the tools required for use are considered in the closing chapter.

"Slow Burning" or Mill Construction.

In the advancement of the science of fire protection engineering the Boston Manufacturers' Mutual Fire Insurance Company, 31 Milk street, Boston, Mass., has found it advisable to revise and enlarge the treatise of its Insurance Experiment Station on the subject of "Slow Burning or Mill Construction," and this treatise has now been issued as Report No. V in such shape as to be of great value, not only to the members of the company, but to others who may be interested in the subject indicated. In this third edition the older plates have been revised and new ones substituted to accord with the accepted practice of to-day.

The continued succession of heavy fire losses throughout each year is but the penalty which the country is paying for the erection of light, cheap and poorly designed buildings, and in the introduction to the report reference is made to several matters which should be given careful consideration by those who are about to erect manufacturing establishments, as well as by owners of existing ones who are desirous of equipping them to accord with the company's standards. Individuals and the public as a whole are slow in adopting needed remedies and in reforming methods. The consequence is that factory properties, schoolhouses, churches, public halls, mercantile buildings and tenements are still being built which often are veritable fire traps. Even when buildings are of incombustible material or of other good types, consideration has not always been given to the need of separating one floor from another or providing adequate means for the extinguishment of fire.

The increasing cost of heavy timber and, in fact, of all lumber together, with the lessened cost of erection of the so-called fireproof types entirely of reinforced concrete or with protected steel frames and incombustible floors, also the obvious advantages of more fire resisting construction, especially in the congested sections of cities, is bringing these types into more general use, and a few illustrations and suggestions in regard to them are presented within the covers of the report under review. The company points out, however, that the plans are only intended to give general directions for slow burning or mill construction, and that competent engineers or mill architects familiar with this class of work should always be employed to adapt them to the special conditions of each site and of each art for which the buildings are to be used.

The standard mill, it is pointed out, was planned with heavy beams 8 to 11 ft., on centers of continuous spans from wall to post, or post to post, of from 20 to 25 ft. In computing the size of timbers regard must be given not only to the weight which is to be carried, but also to the character of the mechanism which is to be operated upon the floor. Beams of sufficient strength to support the weight may be caused to vibrate or deflect under the action of machinery, therefore, the three factors of weight, deflection and vibration must be considered in determining the size or depth of the beams that may be used. There is no part of a mill where good work is more essential than at the columns, and the claim is made that timber posts offer more resistance to fire than either wrought iron, steel or cast iron pillars, and in mill construction are preferable in many respects. Experiments made by the company on the testing machine at the United States Arsenal at Watertown, Mass., show that sound timber posts of the proportion customarily used in mill work yield by direct crushing and not by crippling, the strength being directly as the area of cross section at the smallest part. Square columns are one-fourth stronger than round ones of the same diameter and do not interfere to any greater extent with the floor space.

It has long been the practice of the company to give its members without charge information on any point which can rightly come under its supervision, and to offer for consultation the services of its experts who are familiar with the various hazards common in industrial plants. Report No. V contains a large amount of matter which will be found of service to those connected with industrial undertakings, and the company has placed a nominal price of 25 cents upon it, the idea being to limit requests for copies of the report simply to those who can make use of it to good advantage and will therefore value it. It is presented in the hope that it may help to promote the practice of intelligent construction and fire protection, especially in relation to factory plants.

Baron de Hirsch Trade School Exhibit.

The work of the twenty-seventh class of the Baron de Hirsch Trade School was on exhibition Wednesday, July 8, 1908. The school has courses in carpentry, electrical work, plumbing, painting and machine work. A notable feature of the work of the school and one which has been made more of during the last year is the course in drawing and shop arithmetic.

The course of drawing includes the use of instruments, and after that the preparation of plans and drawings for actual work, the student being gradually led up to working in two planes of projection and actual working plans for work in buildings. This not only teaches the student to read plans properly, but also gives him an idea of drawing so that he may lay out intricate work for himself and so solve difficulties on paper without going to the trouble of fitting on the actual job. While the pupils are encouraged to be neat draftsmen, the idea of drafting for the sake of drawing alone is discouraged the argument being made that they do not intend to make draftsmen at this school but artisans.

The course in arithmetic includes ordinary problems, such as the pupil is likely to encounter in his actual work. A feature of the instruction at this school is the presenting to the pupils of good deportment, a set of working tools in the trade which they intend to follow. In the plumbing class this set includes about 30 tools, such as soldering irons, bending pins, dressers, calking irons, hammers and miscellaneous hand tools of that character. The earnestness of the pupils in the work is witnessed by the fact that but two sets of tools were withheld owing to lack of proper deportment.

A FIREPROOF town will rise on the ashes of Thornton, Iowa, which was practically destroyed a short time ago. The business men who met losses have decided to rebuild and to use cement blocks instead of wood. This will make the buildings absolutely fireproof. Other buildings to be erected this season will be of the same material.

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RESIDENCE OF MR. F. N. MASON, ON FERGUSON AVENUE, PORT JERVIS, N. Y.

C. A. WAGNER, ARCHITECT

VIEW IN REAR PARLOR AND DINING-ROOM IN RESIDENCE OF MR. F. N. MASON, FERGUSON AVENUE, PORT JERVIS, N. Y.

C. A. WAGNER, ARCHITECT

Carpentry and Building

New York, September, 1908.

A Brick and Stucco Dwelling for Two Families.

THE house which we have taken for consideration this month is a brick and stucco dwelling designed for occupancy by two families, one having the first floor and the other the second floor, with the attic space divided between the two families. It is intended to be erected in the suburban section of a city, and since there is a decided objection on the part of adjoining property holders to the construction of apartment buildings in these localities, the aim of the authors has been to make the house appear as much as possible like a single dwelling. The arrangement of the interior, however, is such that the tenants are entirely independent of each other, each apartment having its separate entrance, separate heating apparatus, separate systems of electric wiring and gas piping, with separate cellars and provision for separate servants' rooms and storage space in the attic. The laundry and drying room is used in common, but is arranged with two systems of electric wiring, so that each tenant uses his own light. The hot water for laundry purposes is supplied through the medium of a combined laundry stove and water heater, with a boiler located in the laundry. By this arrangement the fire used to heat the irons is also utilized to heat the water in the boiler.

The hot water supply for general use is obtained by inserting in the furnaces a pipe coil which is attached to the hot water tank located in the basement belonging to each apartment. This supplies during the winter months a sufficient quantity of hot water at no additional expense. During the summer months it is the practice in the authors' locality to install separate automatic gas heaters.

The front entrance door of the second story apartment is controlled by an electric door latch, and there is an electric bell and speaking tube at this entrance, making it unnecessary for the second story tenants to descend the stairs in order to open the door.

All household supplies are taken in at the kitchen door, the service stairs extending from the first floor to the attic, the latter being shut off by a door at the foot of the attic stairs, to which only the tenants and their servants have keys.

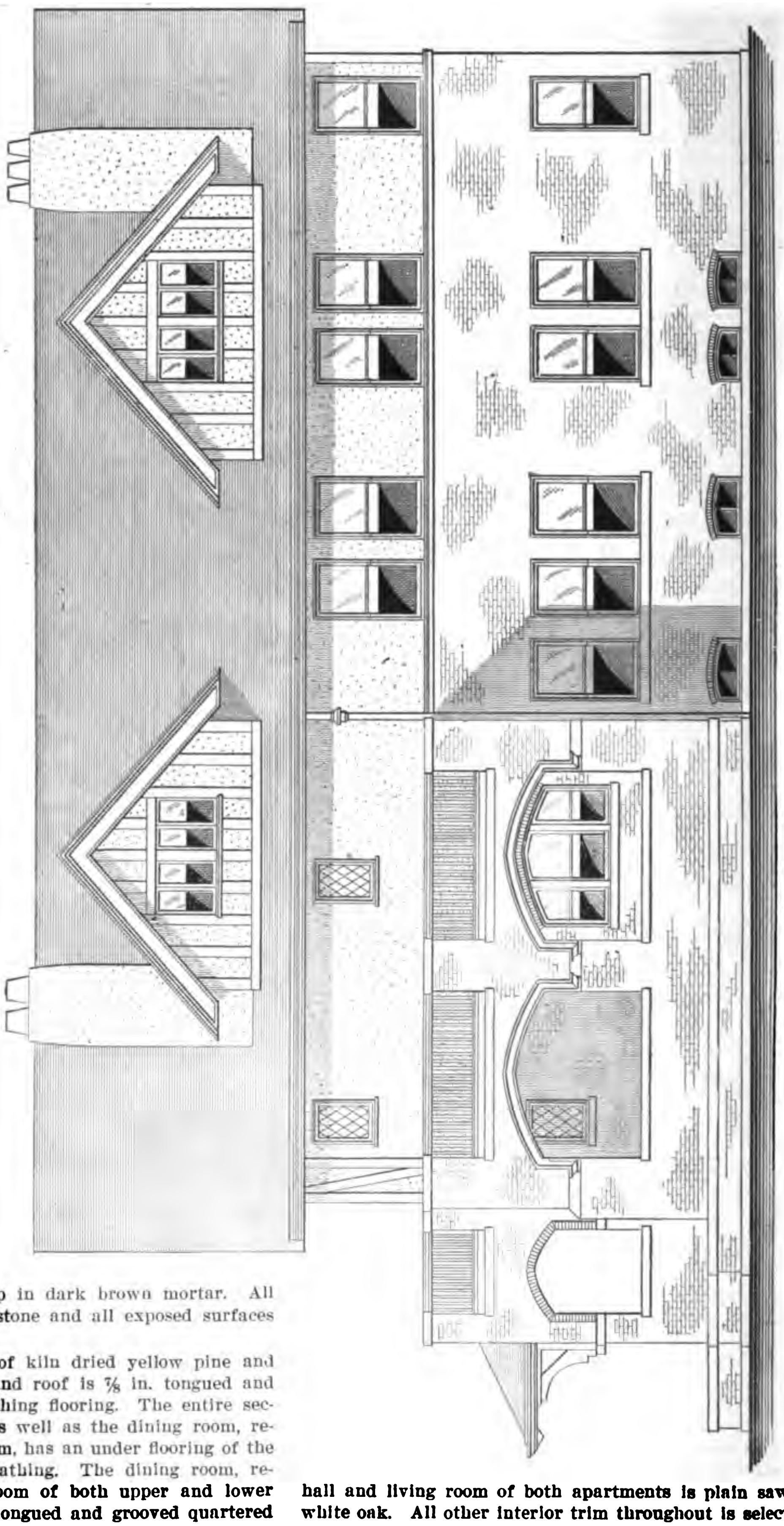
Front Elevation.—Scale, ⅛ In. to the Foot.

*A Brick and Stucco Dwelling for Two Families.—**Rapp, Zettel & Rapp, Architects, Cincinnati, Ohio.***

The exterior of the building is designed for a modified English style, using brick in the first story and stucco on metal lath above the second story window sills. The construction is that known as "brick veneer," in which there is used a complete wood framework for the outer walls, sheathed and covered with building paper, over which is placed a 4 in. brick facing, the bricks being anchored to the framework by means of metal wall ties held in place by long nails driven into the studding.

The surfaces shown plastered on the elevations are lathed with painted expanded metal lath and plastered with two heavy coats of Portland cement mortar, the first being mixed with long plastering hair, and the final coat having a rough "stippled" finish.

All sloping roofs are covered with black Virginia slate, while the balconies are covered with extra heavy duck roofs heavily painted and sanded. All flashings are of tin, painted on both sides, the deck roof being of best charcoal plate.



A Brick and Stucco Dwelling for Two Families.—Side (Right) Elevation.—Scale, ⅛ In. to the Foot.

The architects point out that this type of construction is somewhat cheaper than solid brick walls and has the advantage over the latter in being perfectly dry, while at the same time it is warmer in winter and cooler in summer by reason of the insulation given by the air space between the studding.

The kitchen is arranged for the use of fuel gas, although a flue is provided which could be used for a coal stove, but in the present instance it is utilized as a ventilating flue. The pantry has a "built in" china case with glass doors above and drawers and cupboards below a main shelf. The only connection between the dining room and the kitchen is through this pantry; which is equipped with double acting doors. By this means the odors of the kitchen are excluded from the dining room and the remainder of the house. In the pantry provision is made for an ice chest, under which there is a permanent drain to carry off the water.

According to the specifications of the architects, all brickwork except that used for exterior facing is of hard burned bricks laid up in lime mortar. The face bricks used for the brick veneer of the first story are of "second quality vitreous flashed" pressed bricks of mixed shades, varying from dark yellow to light chocolate, and are laid up in dark brown mortar. All cut stone work is of freestone and all exposed surfaces have a rubbed finish.

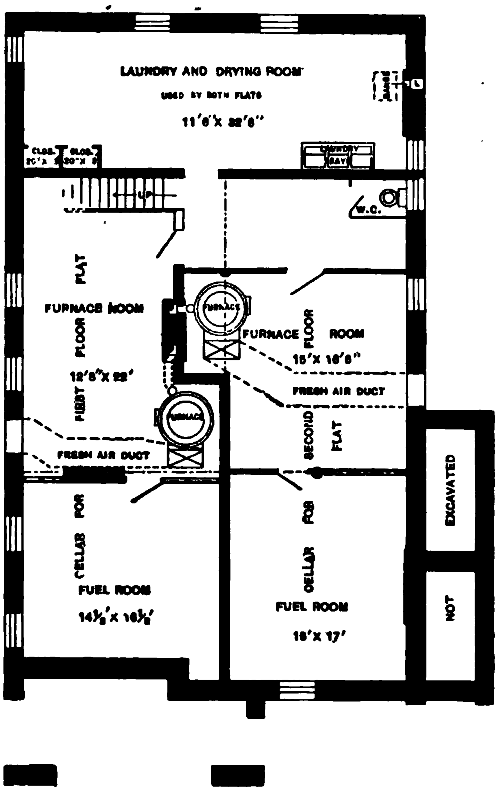
The rough lumber is of kiln dried yellow pine and the sheathing for walls and roof is ⅞ in. tongued and grooved yellow pine sheathing flooring. The entire second floor and the attic, as well as the dining room, reception hall and living room, has an under flooring of the same material as the sheathing. The dining room, reception hall and living room of both upper and lower apartments have a ⅝ in. tongued and grooved quartered oak floor, with corners butt mitered in a 30 in. border and the centers plain, all laid on heavy felt paper. All other rooms throughout the first and second stories have 2¼ in. face, ⅞ in. tongued and grooved edge grain yellow pine. The entire attic is covered with "B" quality tongued and grooved flat sawed flooring, with 3¼ in. face. All finish floors, except in the attic, are laid over heavy felt paper.

The exterior woodwork of the dwelling is selected cypress, while all interior trim of dining room, reception hall and living room of both apartments is plain sawed white oak. All other interior trim throughout is selected long leaf yellow pine. The doors have white pine stiles and rails and yellow pine panels.

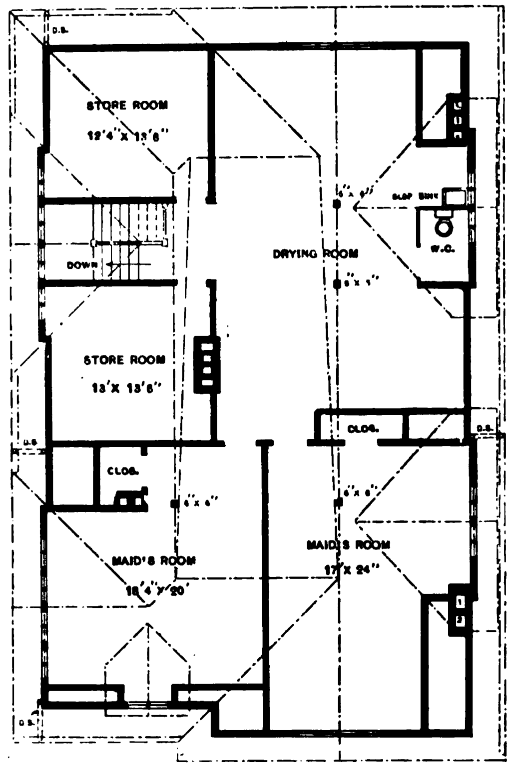
The front stairs are of white oak, while the service stairs from basement to attic have ⅞ in. risers and 1⅛ in. treads, with moulded nosing and scotia. The flight from the first to the second floor has 1¾ in. turned balusters spaced two on each tread. The attic flight is enclosed with ⅞ in. beaded board partition, which also forms a rail around the stairs in the attic.

bined escutcheons with iron knobs, while in the attic the doors have black mineral knobs.

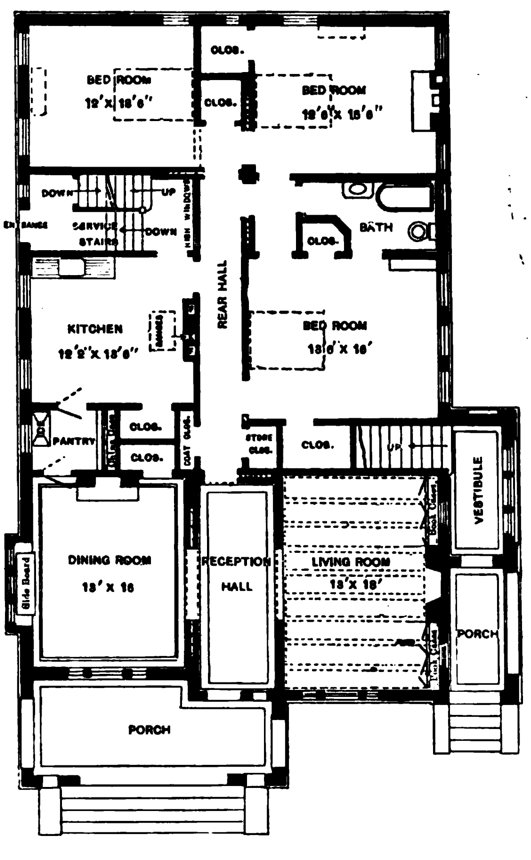
All exterior finished woodwork, except windows and doors, porch floors, ceilings and soffits, are stained two coats of oil of dark umber (walnut) color. The porch



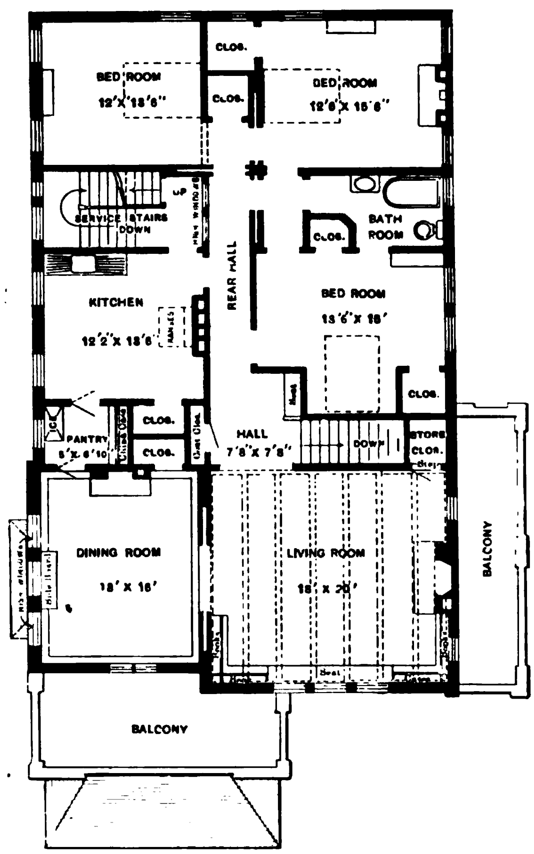
Foundation.



Attic and Roof.



First Floor.



Second Floor.

A Brick and Stucco Dwelling for Two Families.—Floor Plans.—Scale, 1-16 In. to the Foot.

The hardware for the exterior side of the front entrance doors is cast bronze. The bathroom hardware is nickel plated brass, and all other hardware black iron with 16 in. combined escutcheons, with bronze knobs outside. All other doors except in the attic have 9 in. com-

floors are painted three coats of lead and oil, while the porch ceiling and all beaded yellow pine soffits have two coats. The outside of all window sashes and doors is painted three coats of lead and oil, the sash being black and the doors dark brown, to match the stained work.

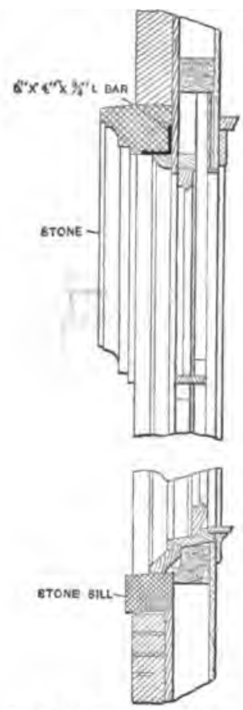
All interior woodwork, such as doors, windows, trim and the ceiling beams showing in the living room, reception hall and dining room on both first and second floors, is stained dark brown and finished two coats, the last coat being finished without gloss. All other rooms and halls throughout the first and second stories are finished three coats. The oak floors in the upper rooms as well as the yellow pine floors in the bedrooms have three good coats of floor finish. The kitchen and pantry floors are oiled two coats. The bathroom wood trim and doors are painted white, four coats, also the bathroom walls above the tile wainscoting.

The interior rooms and halls throughout the first and second stories are plastered three coat work on all studded walls and two coat work on brick walls. The entire attic is plastered two coats. The living rooms, dining rooms and reception halls of both apartments have a sand finish, while all other rooms have a hard white finish.

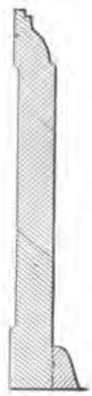
The house is wired throughout for the use of incandescent electric lights, all wiring being done in accordance with the rules of the National Board of Fire Underwriters. There are electric bells from each entrance door to the kitchen of their respective apartments, also from a point in the passageway of each flat to the servant's room of that flat, also electric bells of different tone ringing in each kitchen and operated by separate pushes for each flat at the service entrance. There is also a buzzer in each kitchen operated by a push button secured to the under side of the dining room table.

The bathrooms have a tile wainscoat 4 ft. 6 in. high of 2 x 6 in. ceramic blazed tiles with cap mold and sanitary base. The bathroom floors are covered with ¾ x ¾ in. white vitreous ceramic tiles, with a neat fret border in one color. The water closets are of vitreous porcelain with low down tanks of porcelain enameled cast iron. The basins are of the one piece type, having slab, splash and bowl in one casting and all enameled, giving the effect of a solid porcelain fixture. The bathtubs have 3 in. roll with white enamel paint, factory finish outside. All exposed pipe and fittings throughout the first and second floors are nickel plated polished brass. Each apartment has an automatic water heater of the Monarch or Pund type, properly connected with the systems of hot and cold water supply.

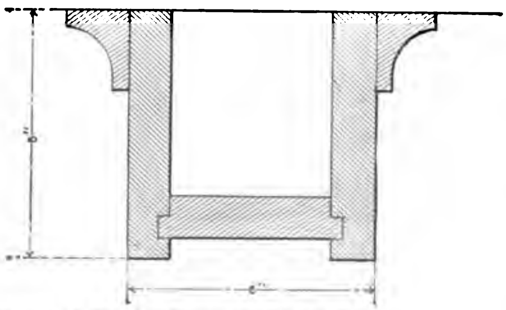
The fireplaces as well as each kitchen are piped for



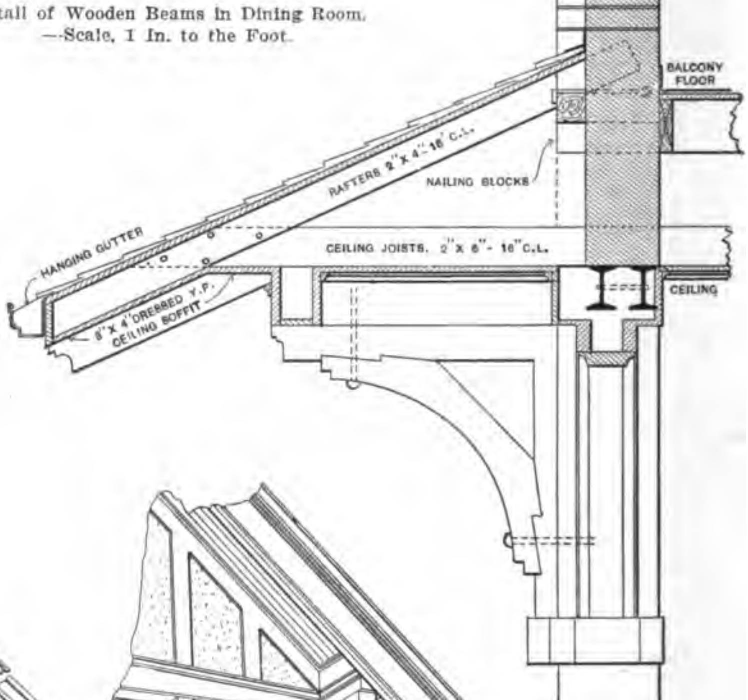
Section Through Triple Window.—Scale, ½ In. to the Foot.



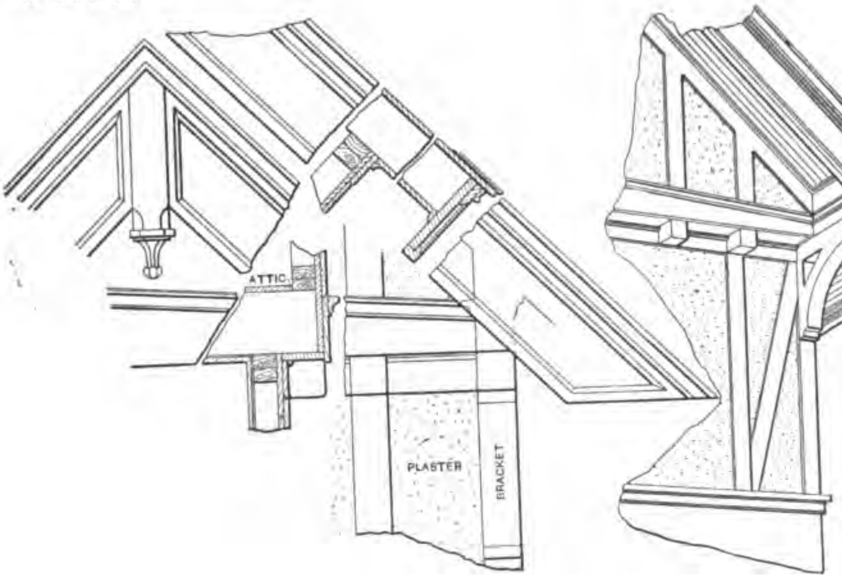
Section of Base.—Scale, 3 In. to the Foot.



Detail of Wooden Beams in Dining Room.—Scale, 1 In. to the Foot.



Details of Front Porch Cornice, &c.—Scale, ½ In. to the Foot.



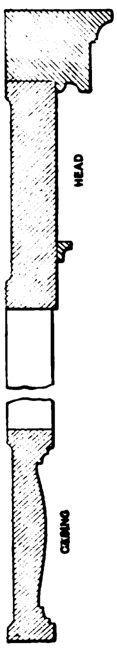
Details of Front Gable.—Scale, ⅜ In. to the Foot.

A Brick and Stucco Dwelling for Two Families.—Miscellaneous Constructive Details.

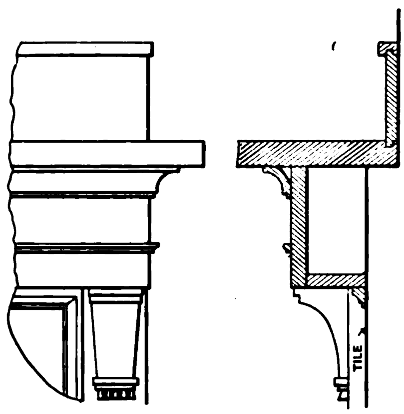
fuel gas, with a separate outlet in each cellar for furnace and water heater. The furnaces are connected with fresh air ducts of galvanized iron suspended from the cellar ceiling and having proper screen chamber with burlap and cheese cloth covered removable air screens. The air pipes in the cellar and partitions are of heavy bright tin and covered with heavy asbestos paper.

A little less than a year ago the architects' estimate of cost was $9200, of which the principal items were: Excavation and masonry, $823; brick work, $630; cement work, $125; tiling, $150; plastering, $850; carpenter work, $4500; plumbing, gas fitting, &c., $750; heating, $280; painting and glazing, $375; roofing, $425, and electric work, $125.

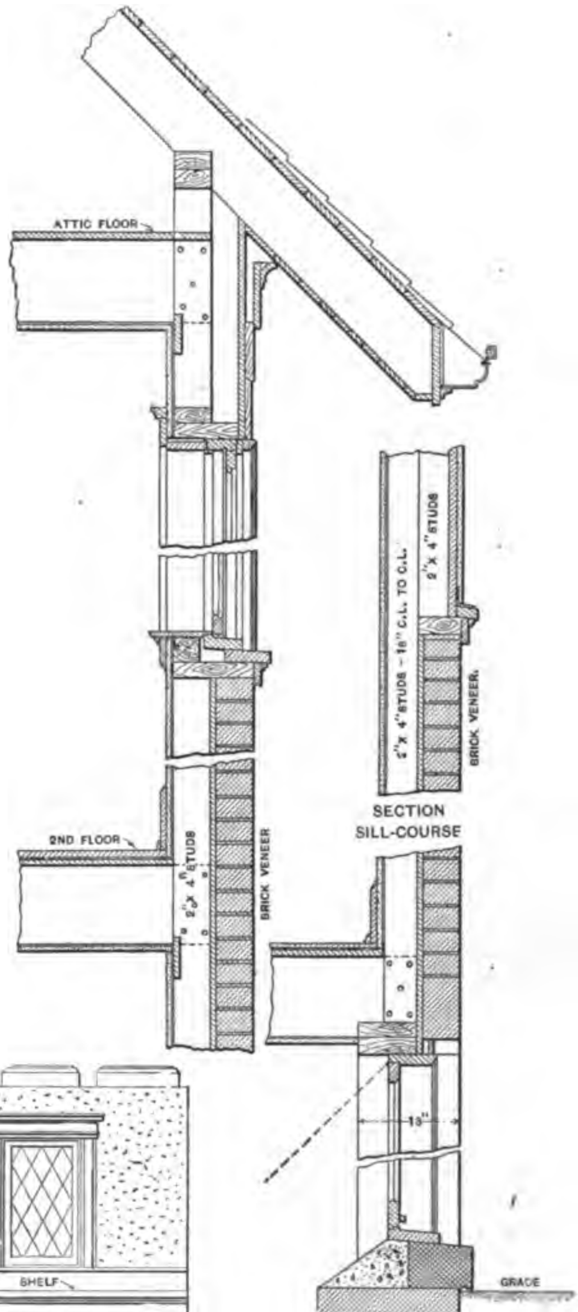
The house here shown was designed by Architects Rapp, Zettel & Rapp, with offices in the Johnston Building, Cincinnati, Ohio.



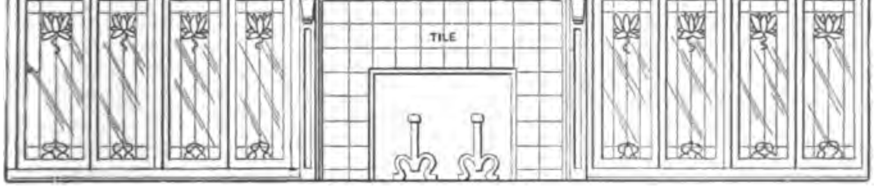
Details of Interior Trim.—Scale, 3 In. to the Foot.



Details of Mantel in Living Room.—Scale, 1 In. to the Foot.



Section Through Exterior Wall.—Scale, ½ In. to the Foot.



BOOK CASES BOOK CASES

Elevation of Living Room Fireplace and Bookcases.

A Brick and Stucco Dwelling for Two Families.—Miscellaneous Constructive Details.

Another New Building Scheme.

Among the more recent schemes of building construction to which public attention is being invited is that of an architect in western Pennsylvania, who has prepared plans for what he claims to be an entirely new style of dwelling. The scheme calls for a steel frame, securely bolted together, and on this is to be placed the wooden floor joists and rafters, the window frame being supported by steel angle bars securely bolted to the balance of the steel frame. The entire frame is then to be imbedded in concrete. The wall is to be plastered on the outside and finished in any style desired. The inside will be furred, lathed and plastered, so as to form a dead air space in the outside wall, thus making, it is claimed, a warm house in winter and a cool one in summer, while insuring a dry house at all times. The idea is to have the roof covered with a composition made of asbestos and Portland cement.

The proposed Ives Memorial Library Building to be erected at the corner of Temple and Elm streets, New Haven, Conn., will be in accordance with plans submitted by Architect Cass Gilbert of New York City. The cost is estimated at about $300,000.

WHY CONCRETE SHOULD BE WATERPROOFED.

IN the many forms of construction work to which concrete is so admirably adapted, its use brings with it one inherent fault—a fault for which remedies have long been sought, but which until recently have not been found in a practical form suited to all the many needs of construction work. This striking fault of concrete work is its great thirst for water, a fault which varies in its gravity according to the nature of the structure, frequently being the cause of extremely serious difficulty. Of all the opposing forces which constructors have had to combat from time immemorial, none has exceeded in its power for evil the unwelcome intrusion of water, and materials which in their nature favor such intrusion must suffer in value to the extent of such permeability or absorptive power.

The fact that ordinary concrete is very porous and permeable has been one of the leading checks in its rapid development. Volumes have been written on how the ingredients might be mixed to produce a watertight concrete, but we might as well seek to solve the problem of perpetual motion as to try to mix cement, sand and stone so as not to absorb water, says Myron H. Lewis, C.E., in a recent issue of *Waterproofing*. All the experiments that have been made and all the papers that have been written have only served to emphasize the fact that ordinary concrete is porous, and when dry will drink in water with avidity. And why should it not do so? Can ever-changing ingredients be so proportioned that every minute void in the hardened mass is filled?—so that the concrete becomes a solid, impervious body? No; in the act of mixing, enough air clings to the materials to render the mass full of innumerable minute blow holes; minute to us but not so to the still finer, freely moving molecules of water, which, with infinite patience, look for an opportunity to move and do so, if the movement is in the slightest degree possible. If we could examine a section of concrete under a powerful microscope, it would appear to us like an immense sieve through which fine particles of water flow without hindrance.

We have seen water rise up through concrete walls for many feet, and it will rise until the weight of the water absorbed is equal to the attracting force.

Rich and Wet Mixtures

We have often heard the statement made that concrete is water-tight, and frequently it comes from those who should know better. It is often stated that if concrete is mixed rich, and mixed wet, impermeability can be secured. Both of these statements are against the very logic of things. Mixing rich may impose some greater barriers to the passage of water; mixing wet may minimize the formation of blowholes by displacing much of the extrained air, but neither mixing rich nor mixing wet destroys the "capillary positive" property of the concrete mass. Its absorptive capacity may have been decreased, but its attraction for moisture has not been eliminated; thus the water tightness secured by rich and wet mixtures, however theoretically correct the proportions might be, is one of degree only, a degree sometimes approaching ideal but never reaching it. We cannot expect that a mixture made of cement and stone, each of which is in itself "capillary positive" or water attracting, can become absolutely proof against the passage of water by the mere act of mixing, unless, indeed, the operation had produced some phenomenal change in the very nature of the constituent materials. A mixture may be produced which is sufficiently close-grained to prevent the free transmission of water, prevent it sufficiently, in fact, to be all that is required in many forms of construction work. But where water absorption, besides water penetration, is to be prevented, no degree of mixing, no richness of mixture, will altogether answer the purpose; and yet in many of the forms in which concrete enters our modern buildings, it is resistance to water absorption that is required. Not merely water-tightness in the ordinary sense of the word, but resistance to the ceaseless endeavors of atmospheric moisture to find its way by capillarity through porous bodies. Some counteracting influence to this tendency of ordinary concrete to take up water by capillarity, is, therefore, what is required, particularly in superstructural work.

It is true that concrete exposed to the free passage of water becomes after a time so clogged up by the fine silt present in the water that the permeability is greatly reduced; and Hagloch states that concrete block buildings exposed to the weather become water-tight in from three to 12 years, a fact which we must likewise ascribe to the clogging of the surface of the blocks by atmospheric dust deposited by rain, and which remains after evaporation.

Modern engineering or architectural practice should certainly not sanction a practice of waiting for the erratic and uncertain hand of time to secure water-tightness in concrete structures, and in the meantime to incur the annoying consequences that always accompany damp and leaky structures; and yet this is precisely what is being done in numberless instances by those who refuse to realize the importance of water-tightness in concrete work, or, while realizing it, are willing, through motives of false economy, to gamble with the future—nearly always at their loss.

The number of mistakes made by inadequate provision for waterproofing, and their costly consequences, running into millions of dollars, should serve as object lessons to those who have the design of concrete work in hand; object lessons which should serve to prevent repetition of mistakes made by less fortunate predecessors.

The subject of waterproofing concrete could not be justly treated without some mention of the difficulties to be apprehended by the failure to obtain water-tightness: difficulties which would seem to be obvious, but which, as we have already said, are so often lost sight of.

Concrete Blocks.

Concrete blocks are usually made very porous, and have an intense affinity for water. Buildings therefore built of untreated blocks are damp, cheerless and cold, and bring with them the discomforts and dangers to health that usually accompany damp buildings. Perhaps the only exception is the independent two-wall system with unbroken air spaces throughout. Plaster can never be safely applied upon their inner surface without furring and lathing. Furthermore, the face of the blocks are soon disfigured by the deposit of soluble salts of efflorescence washed out from the cement. Some method of protecting the interior plaster from destruction by dampness becomes a necessity, otherwise the structure, instead of being a pleasure to the owner, becomes an eyesore. In addition to the unsanitary condition and the accompanying disfigurement, there is also the question of durability to consider. Any material that absorbs large quantities of water is subject to enormous strains when freezing occurs, and is liable to be destroyed in the course of years.

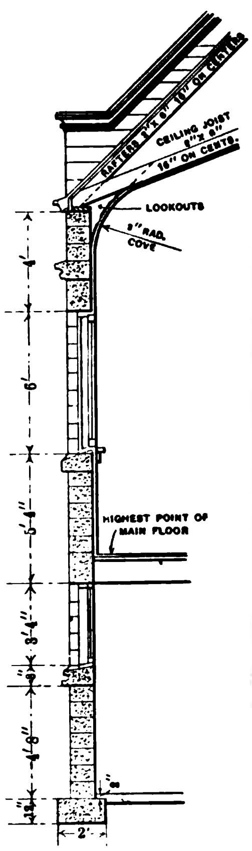
Reinforced Concrete.

In reinforced concrete work, particularly in the superstructure of buildings, all the above objectionable conditions resulting from lack of water-tightness apply equally, and in addition we have the danger of corrosion of the embedded metal. Ample experience seems to indicate that metal thoroughly encased in concrete is protected from corrosion by the latter, provided that water in sufficient quantity cannot work its way to the metal and begin corrosion. Concrete work, however, is subject to checking and cracking from a multitude of uncontrollable causes, and should through any such means rusting be made possible, its progress cannot very well be checked. Rusting, which is the conversion of the metal into its oxide, is accompanied by expansion, which produces enormous strains in the encasing material, strains akin to that produced by water in freezing.

IN these days of increasing use of concrete for building purposes, it is interesting to recall the fact that the Pantheon, in Rome, about 2000 years old, is covered by a dome over 142 ft. in diameter, which is cast in concrete in one solid mass.

A CONCRETE BLOCK CHURCH AT CENTRAL CITY, KY.

AN interesting example of the application of concrete blocks to church construction is found in an edifice just erected at Central City, Ky., and of which elevations, plans and details are presented herewith. Architecturally, the building is of attractive exterior, and the design is one well adapted for execution in many sections of the country. An examination of the plans shows a well disposed auditorium, having a seating capacity of about 500, the rostrum being in one corner with choir and baptistry so located as to be in full view even to those in remote parts of the room. The robing rooms are conveniently placed, to both choir and baptistery. The Sunday School room is in the basement, and is reached from a flight of stairs from the auditorium placed near the main entrance to the building.



Section.—Scale, 1/8 In. to the Foot.

· Broad Street Elevation.—Scale, 3-32 In. to the Foot.

Concrete Block Church, at Central City, Ky.—Architect, Henry Wittekind, 85 Dearborn Street, Chicago, Ill.

According to the specifications of Architect H. Wittekind, 85 Dearborn street, Chicago, Ill., the footings of the foundation walls are solid concrete composed of one part Portland cement, three parts clean, sharp sand, and five parts broken stone. The walls of the structure consist of hollow concrete blocks made of one part Portland cement and four parts Torpedo sand, all laid in lime mortar tempered with 10 per cent. cement.

The roof is covered with cedar shingles, laid 4½ in. to the weather, with narrow open valleys and with a capping course of galvanized iron shingle tin. The shingles are laid upon 1 x 8 in. sheathing boards, placed 1½ in. apart.

The cellar floor is of concrete, the foundation being 3 in. thick, made of one part Portland cement, three parts Torpedo sand, and five parts broken stone, on top of which is a dressing of cement mortar ½ in. thick composed of one part Portland cement and one and one-half parts of sand.

In the Sunday School room the floor rests upon 2 x 4 in. sleepers, laid flatwise on 2 in. of concrete, the same material being used to fill the spaces between the sleepers.

All timbers are of hemlock, and all joists are double under partitions. All studding is 2 x 4 in., placed 16 in. on centers, and all openings are trussed. All floors are double with deafening felt between. The trusses for the roof are constructed in accordance with the detail presented upon a following page.

The trim in the Sunday School room and the entire first story is of Georgia pine. The top floor in the Sunday School room and in the entire first story is of ⅞ x 2¼ in. dressed and matched maple. The basement doors are of the four panel variety, 1¾ in. thick, while the interior doors in the first story are of the six cross panel variety, with Georgia pine panels and white pine stiles and rails.

The outside doors are of white pine, 2¼ in. thick. All exterior doors and transoms are glazed with double strength glass, while others have obscure and leaded glass. Where the walls are lathed they are plastered two coats, the second one being plaster of Paris hard finish. The outside walls in the Sunday School room and the entire first story are plastered two coats applied directly to the concrete blocks.

All exterior woodwork has two coats of white lead and linseed oil and all sheet metal work has one coat of pure mineral paint and two coats of lead and oil. Maple floors have two coats of boiled linseed oil well rubbed in. All Georgia pine trim has one coat of hard drying coater and two coats of varnish.

IN the reconstruction of the old Custom House on Wall Street, Borough of Manhattan, New York, for the National City Bank, 12 girders each weighing 24 tons are being used. The girders are over 70 ft. long, and were brought on lighters to Pier 11 from the plant of Milliken Brothers on Staten Island. The girders were then hauled through the streets, requiring a string of 12 horses to move a girder. Placed around the interior court of the building will be four 30-ton trusses, but these have been transported in sections. The progress of the trucks through the streets attracted a great deal of attention, and traffic was temporarily suspended when the turn was made from Broadway into Wall Street.

Proper Treatment of Cement Surfaces.

Among the many interesting papers read at the seventeenth annual convention of the Ohio State Association of Master House Painters and Decorators, held the last week in July, was one by P. W. Nelson on the above subject, from which we quote the following:

It is only in comparatively recent years that cement has come into more extensive use as a building material, and it is but natural that the majority of us are as yet undecided about how to proceed in the painting over cement, because we have not had sufficient time in which to make our experiments, note the results and arrive at a positive conclusion. A great many experiments have, of course, been made, but most of them without a trace of scientific reasoning back of them. As an example, I will relate what an Eastern painting contractor told me recently in regard to painting on cement.

He said he always had more or less trouble with cement surfaces until he found a method which he could rely upon. His method was to give the surface a coat of strongly glued calcimine before applying the oil paint; this might have helped him out at the time, but it is certainly no method which can be safely recommended.

Many hastily conducted experiments have led to wrong conclusions, and it has even happened that two men, experimenting along the same lines, have come to opposing conclusions. The reason for this is that there is a difference in cement and cement surfaces, and our aim is to find, if possible, a method which will give satisfactory results in all cases.

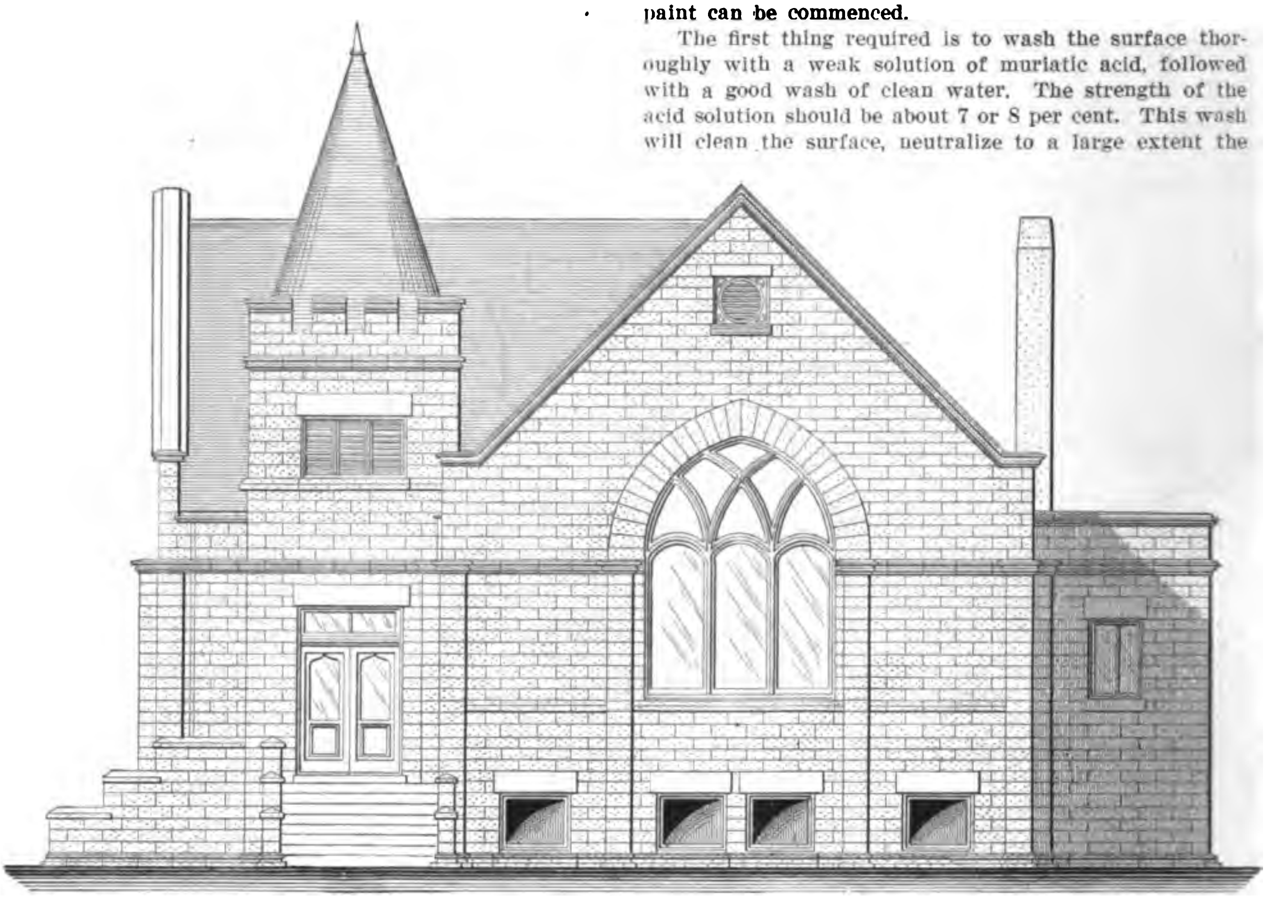
It has long been the popular opinion that linseed oil was hurtful to cement and also that no oil paint would endure if applied direct to the cement. I believe both of these opinions to be wrong.

One of the foremost authorities on cement assures me that he has been painting with oil paint over cement for many years with the best results.

It is true, however, that all nondrying oils are more or less destructive to the cement, and if the cement wall should be saturated with raw linseed oil there is no doubt about the outcome, as the oil would slowly disintegrate the cement. But for painting we do not use nondrying oil and our oil paint will dry on the surface without affecting the cement, a fact which has been fully demonstrated. As for the cement affecting the oil paint, so is that more apparent than real. It is held by experts that cement surfaces properly executed, clean and dry, are no more dangerous to oil paint than the modern wall plasters.

Undoubtedly most of the trouble is caused by the painting being done before the cement is dry. Cement dries very slow. The opinion of men who are experts in the use of cement say that a cement wall must stand at the very least over one summer before painting with oil paint can be commenced.

The first thing required is to wash the surface thoroughly with a weak solution of muriatic acid, followed with a good wash of clean water. The strength of the acid solution should be about 7 or 8 per cent. This wash will clean the surface, neutralize to a large extent the alkali, and thus make on the the smooth cement surface enough of an impression to give the paint a proper hold. The surface must then be given time to dry perfectly.



Concrete Block Church, at Central City, Ky.—Fourth Avenue Elevation.—Scale, 3-32 In. to the Foot.

In painting, it is well to use considerably more turpentine than is ordinarily the case and very little dryers. In fact, boiled linseed oil is considered preferable to raw. For priming, the paint should be used thin, and contain so much turpentine that it is almost flat, increasing the amount of oil for succeeding coats. Each coat must be given ample time to dry before the next one is applied.

For water color or calcimine, washing with muriatic acid solution, followed by clean water, should be done if first-class work is to be expected. When the surface is thoroughly dry it should be given a coat of alum size, or, still better, a coat of flat paint, and when the size is dry the surface is ready for calcimining.

One painting contractor, who does a great amount of work in our Eastern skyscrapers, tells me that he makes a size of equal parts of acetic acid and alum. His formula is one pound of acid, one pound of alum and two gallons of water. I have not tried this size, so I give it for what it is worth.

If the treatment suggested should prove not to be all we expect, it is at least the best I have, through diligent search, been able to obtain and one that I believe is the best so far put forward.

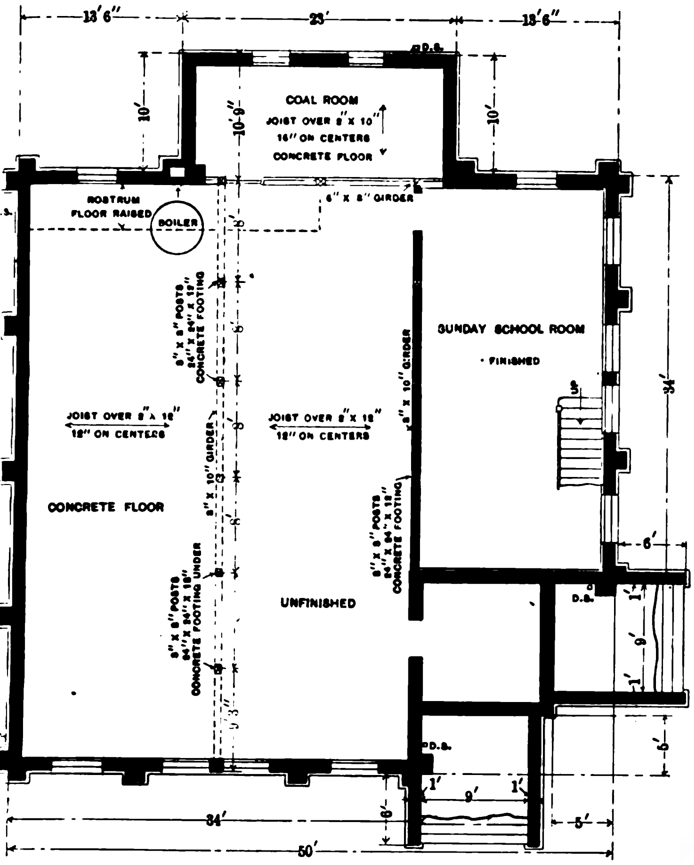
So far so good, but in this method there is one thing which nearly everybody is opposed to using in paint nowadays, namely, time. Time is the great Sesame for all painting. Give the surface time to dry and let one coat dry thoroughly before another is applied and we will have far better work than is usually the case.

In our modern rush the painter is, however, often forced, against his protest, to paint over a surface long before it is dry enough to receive the paint. This is true not only of cement but also of plaster and sand finish. We all know there will be trouble when painting is done over a wet surface, and with cement the main difficulty is that it dries so very, very slow that it is invariably painted before it is half dry. It may appear dry on the surface and still contain a large quantity of moisture.

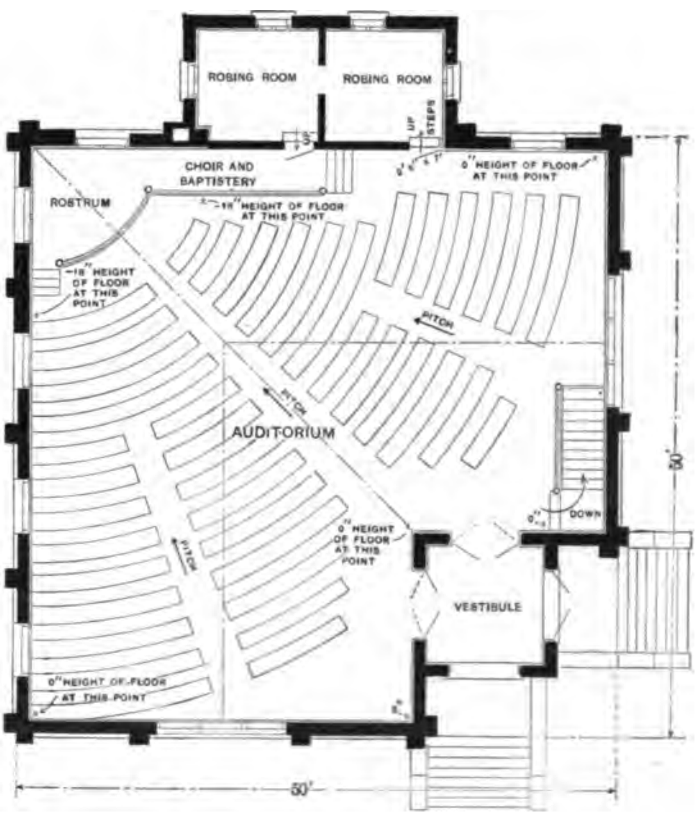
To meet this demand for rush inventive minds have set to work to make a paint which can be applied over cement as well as plaster surfaces while the same are still damp. There are a few such paints on the market to-day, but without a doubt the Muralo Company's "Irono Dampproof Paint" is superior to all others, as has been proven from time to time by impartial persons in comparative tests. This paint is manufactured in paste form to be thinned down with turpentine and benzine. It dries out perfectly flat, has great covering power and will adhere to the damp cement or plaster by virtue of the fact that it will permit the moisture in the wall to evaporate through.

It must be plainly understood that ordinary oil paint or enamel cannot be applied over Irono until the wall is thoroughly dry, because such coating will close up the pores of the wall, so to speak, prevent the moisture from escaping and force it to accumulate behind the paint, causing the paint to blister and come off.

The Irono Dampproof paint is being very extensively used for coating tunnels, vaults, &c. On new cement or concrete walls, as well as on plaster walls, this paint is an excellent material to use for sizing purposes preparatory to calcimining. It dries in a few hours and both sizing and calcimining can be done in the same day.



Basement, Showing Position of Sunday School Room.—Scale, 1-16 In. to the Foot.



Main Floor, Showing Auditorium, Robing Rooms, &c.—Scale, 1-16 In. to the Foot.

Concrete Block Church, at Central City, Ky.

Estimating Cost of Concrete Work.

One is frequently called on to estimate the cost of various kinds of concrete work, or at least is asked how much a certain job will cost; either for the cement alone or for the entire job, including all material and labor. In figuring on a concrete floor or wall one must know something of the conditions. It is evident that a barn floor which is to support heavy loads will require different figures from those needed for a hen house or dwelling house cellar floor.

Again, the cost of material other than cement varies greatly in different localities. Sand and gravel may cost a few cents per load and need to be hauled but a few rods, or, owing to either its first cost or the distance it must be hauled, it may be quite a large item in the expense. It is desirable that the concrete worker be able to make at least a reasonably close estimate on the cost of any given piece of concrete work. He should at least be prepared to figure out about how much cement will be required.

The expense for labor when using concrete need not be as great as for some other methods of construction since much of the work can be performed by common, unskilled labor under a competent overseer. One need not figure on the entire cost of the lumber used for the forms, as much of this can be used again for some other purpose, unless it is all cut up into short lengths. Again, the cost of erecting the forms may vary greatly on different jobs. I remember, says John Upton, in the *National Builder*, one job where some one kept track of this item and it figured up about 50 cents per cubic yard of wall. This was where carpenters were paid $3 per day. The walls were 18 and 20 in. thick, from 12 to 15 ft. high and from 50 to 100 ft. long. It was necessary to do considerable bracing and also to build runways for wheeling the concrete. While this job had some unusual conditions, there were about as many things to help toward a low cost for labor as there were to make this a large item, so this price, 50 cents per cubic yard, can be taken as a safe guide for the cost of erecting forms for plain foundation walls, though in some cases it might be too much; and for a high wall having pilasters, too small.

If some forms of patented plank holders were used the cost of building forms might be lessened, but as these few plank would need to be handled over many times there should be some allowance made somewhere for the labor. Of course, if but a few plank were used there would not be any large expense for lumber to be figured on. The expense of mixing and handling the concrete is another item, subject to considerable variations, but it is always a factor to be reckoned on. For walls it generally bears a certain relation to that of erecting the forms, since for high, thin walls both these items would be more than for the same quantity of concrete in lower and thicker walls. Some authorities estimate this item at 3 cents per cubic foot of finished work, and it would seem that this was a fair average.

This gives us 5 cents per cubic foot as the cost of the labor for such work as walls, cisterns, foundations, steps, &c. Let us see what the material is likely to cost. The following figures and estimates are gathered partly from experience and partly from the estimates made by others as a result of their own experience, these latter being largely borne out also by personal experience. After even a little experience one will not expect to have as many cubic feet of concrete as the combined bulk of the different ingredients. The finer materials simply fill the voids between the coarser ones, so the amount of concrete will in no case be much greater than that of the coarser aggregate, and in some cases even less. In a mixture of, say, 1 part of cement and 4 or 5 parts of sand, or 1 part of cement, 3 of sand and 9 of aggregates, the resulting concrete will be a little less in both than the sand or aggregate, owing to the fact that the materials can be and are packed into a smaller bulk after being wet than they make when measured dry and loose.

We will figure that sand or other material to be mixed with the cement will cost 4 cents per cubic foot, delivered where wanted. As cement can be bought for $1.60 per barrel in most localities, we will figure on this basis:

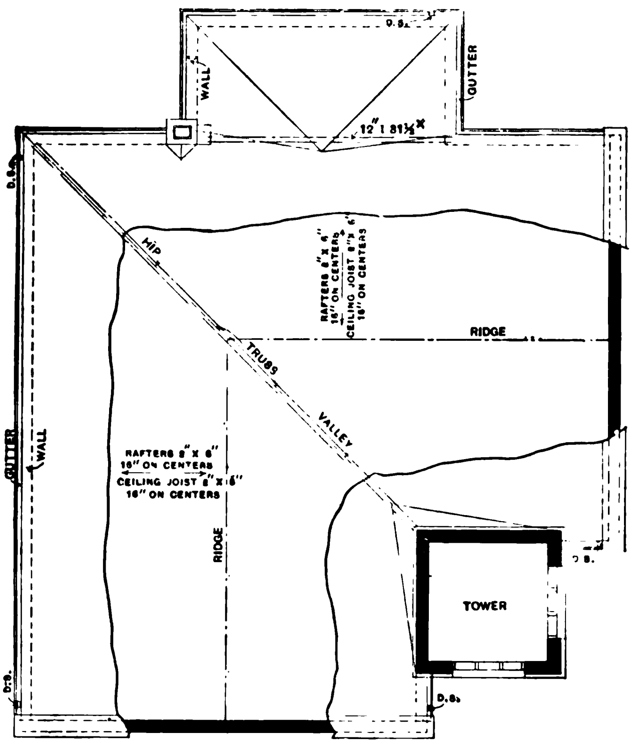
One cubic foot of cement costs 40 cents, as there are nearly 4 cu. ft. in a barrel, or 1 cu. ft. in a bag. So we have the following figures for material: Cement, 1; sand, 1; costs, 44 cents. This will make 1½ cu. ft. of concrete and costs 30 cents per cubic foot. Cement, 1; sand, 3; costs, 52 cents. This will make 3 cu. ft. of concrete and costs 17 cents per cubic foot. Cement, 1; sand, 5; costs 60 cents. This will make 4½ cu. ft. of concrete and costs 13 cents per cubic foot. Cement, 1; sand, 2; aggregates, 3; costs 60 cents. This will make 3¾ cu. ft. of concrete and costs 16 cents per cubic foot. Cement, 1; sand, 3; aggregates, 9; costs 88 cents. This will make 8¾ cu. ft. of concrete and costs 10 cents per cubic foot. Cement, 1; sand, 5; aggregates, 9; cost, 96 cents. This will make 9¼ cu. ft. of concrete and costs 10 cents per cubic foot.

Some one has figured out that concrete mixed 1, 2, 5 will require 1½ barrels of cement to the cubic yard, and 9-10 barrel if mixed 1, 3, 7½. So for ordinary foundation walls we may safely figure on 1 barrel of cement for each cubic yard of wall. As to the prices obtained for work we have in mind a figure of $1.85 per lineal foot for cellar walls for houses. This, of course, would mean 7 to 8 ft. high, 12 to 18 in. thick, would include everything and require a first-class job, competing with the best work in stone and costing nearly as much where stone is abundant. To these figures we must add the cost of the needed labor of mixing and handling; also that of erecting the forms if this is a considerable item.

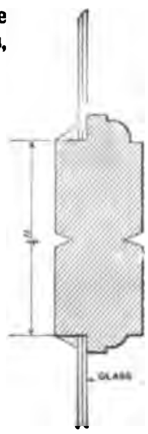
In actual work the following figures hold good for stable floors: One barrel of cement lays 50 to 60 sq. ft. For floors, walks and similar work the surface covered by a barrel of cement depends on the thickness of the work as well as on the proportions used.

Figuring mason's wages at $4 per day, common labor at $2, cement at $2 per barrel, I find that stable floors may be put in for 12 cents per square foot. This includes everything, after the large stones to make the foundations and provide drainage are in place.

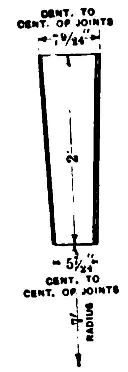
Sidewalks will cost about the same figure for material and labor, perhaps a little more, as there are more forms to build. For the sidewalks 1 barrel of cement will make from 30 to 60 sq. ft. Mixing the bottom course 1:1:6 and the top course 3:5, you may get 50 sq. ft. of 4-in. walk or 30 ft. of 6-in. from a barrel. For the labor



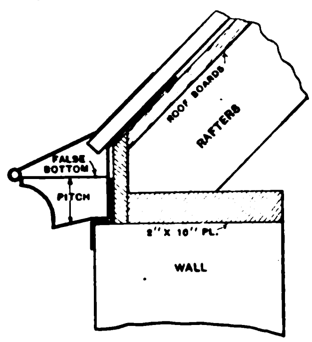
Attic and Roof Plans.—Scale, 1-16 In. to the Foot.



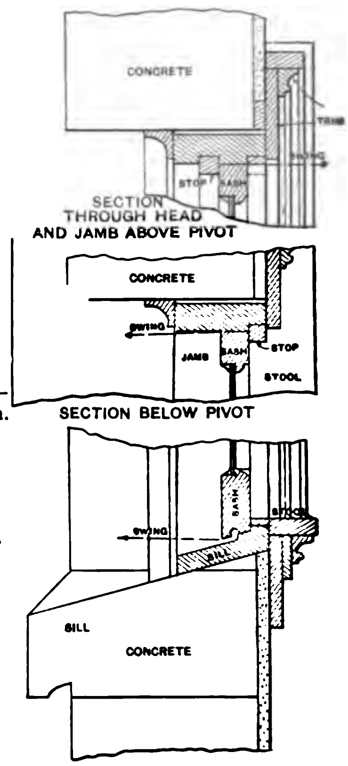
Section of Muntin. —Scale, 3 In. to the Foot.



Arch Stone.—Scale, ½ In. to the Foot.



Detail of Gutter.—Scale, 1 In. to the Foot.



Details of Main Floor Window Frames.—Scale, 1 In. to the Foot.

Miscellaneous Constructive Details of Concrete Block Church, at Central City, Ky.

you may figure at $1.20 to $1.80 per square foot per man per day, depending, of course, on the thickness of the walk and the other conditions to be met.

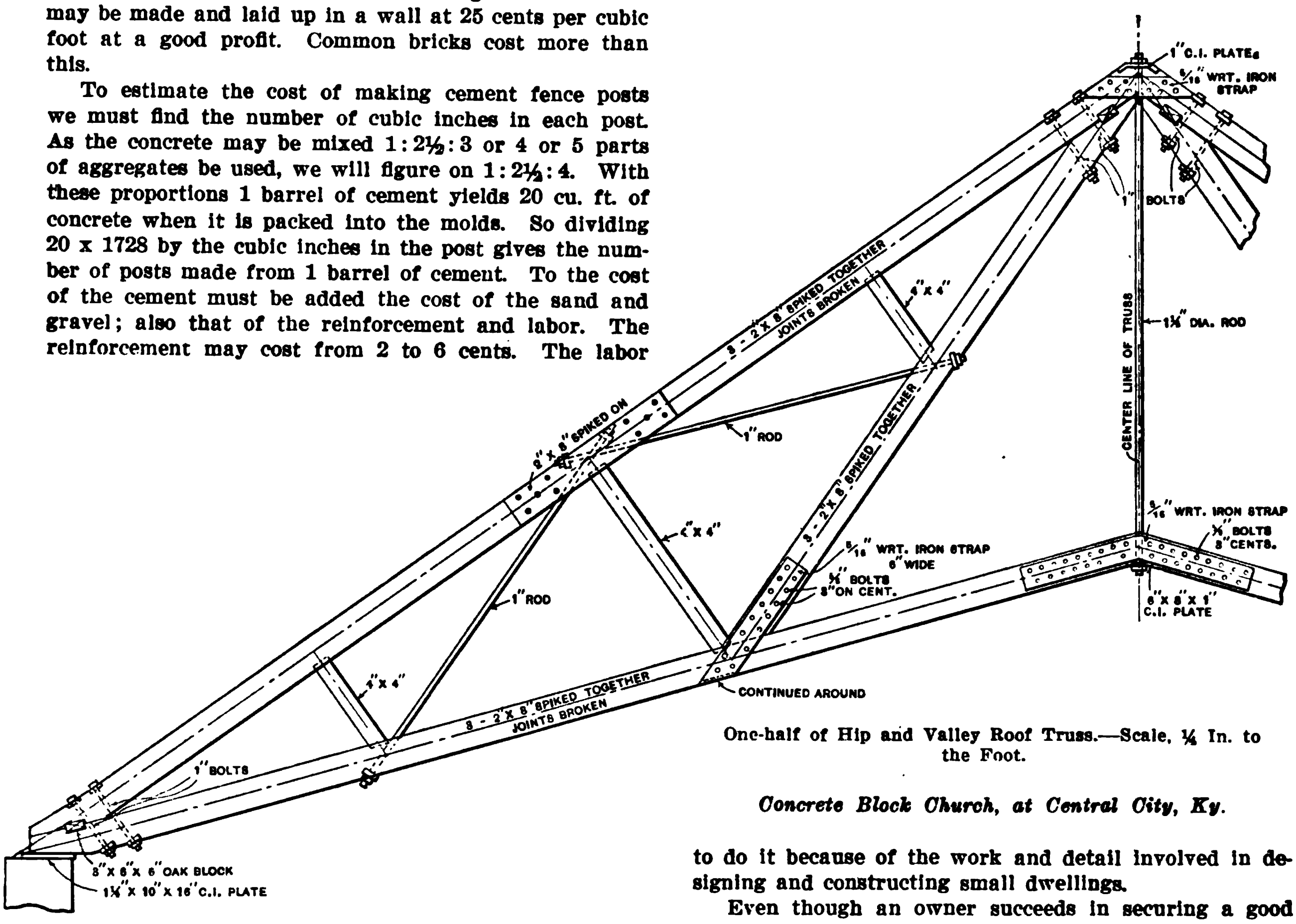
The cost of concrete blocks may be figured out as follows: With a 1 to 4 mixture you will get nearly 15 cu. ft. of concrete from a barrel of cement. This material costs $2.25, making 15 cents per cubic foot for the concrete.

Blocks having an air space of one-third of their volume will cost 10 cents per cubic foot. Those having an air space one-half their volume will cost 7½ cents per cubic foot.

A block 8 x 8 x 16 contains a little more or less than 1-3 cu. ft., according to the size of the air space. So figure 5 cents for the material. The labor cost will depend on the man and the machine, but should be about two-thirds that of the material. We figure that blocks may be made and laid up in a wall at 25 cents per cubic foot at a good profit. Common bricks cost more than this.

To estimate the cost of making cement fence posts we must find the number of cubic inches in each post. As the concrete may be mixed 1:2½:3 or 4 or 5 parts of aggregates be used, we will figure on 1:2½:4. With these proportions 1 barrel of cement yields 20 cu. ft. of concrete when it is packed into the molds. So dividing 20 x 1728 by the cubic inches in the post gives the number of posts made from 1 barrel of cement. To the cost of the cement must be added the cost of the sand and gravel; also that of the reinforcement and labor. The reinforcement may cost from 2 to 6 cents. The labor will be about 5 cents for each post. The molds will be still another item to be figured on.

The total cost of the posts vary from 16 cents for one 5 x 3 at the large end, to 28 cents for one 6 in. square at the bottom and half the size at the top.



One-half of Hip and Valley Roof Truss.—Scale, ¼ In. to the Foot.

Concrete Block Church, at Central City, Ky.

Difficulties of Home Building.

The property owner who undertakes to build a small home in the outskirts of the city costing less than $10,000 is meeting with difficulties these days, for the whole country seems to conspire against him. A few years ago nothing was thought of building a house of this description, for it was a simple matter. Formerly a prospective builder went to the architect, a man with whom he was generally acquainted, and told him what he wanted. The architect was really glad to see him and accepted the commission, argues a writer in the *Economist*, the fee being not probably in excess of 5 per cent.; in many instances it was much lower than that. At the same time the architect was busy; he had more buildings on the boards than he felt he could give sufficient attention to. Yet the small house was designed under the direct supervision of the architect, the work estimated by a number of responsible contractors, some of whom were acquainted with the owner and all knew the architect personally. There was competition, and the work was let to the lowest bidder, and, as a rule, was carried out to the satisfaction of the architect and owner. The result was a dwelling with which the owner had something to do, and naturally the architect had given it some individuality. Further than this he got it at the lowest market price.

Everything is changed now. An owner with anywhere from $3000 to $10,000 in the bank must apologize for taking such a small job to the architect. As an architect expresses it, whenever he is called upon to plan houses of this character he always makes a charge of 10 per cent., with a view to discouraging the prospective client and thus compelling him to go to some other architect. A great many men who have not designed any houses worth speaking of assume this attitude at the present time, and in all probability they were led to do it because of the work and detail involved in designing and constructing small dwellings.

Even though an owner succeeds in securing a good architect the hardest part is still to come. He must obtain estimates from the various local contractors, who are not infrequently banded together for the purpose of maintaining high prices. As far as the city contractor taking the work is concerned it can be said that it is decidedly to his disadvantage to do so, for there is always the uncertain item of cartage to be considered, then there are costly waits for material, labor troubles and numerous delays, all of which make suburban building a hazardous undertaking for the contractor used to city ways.

There appears to be no way out of the difficulty for the prospective home builder. In fact, the building of domiciles is rapidly becoming a business of itself, and as a result those who are in search of dwellings to purchase are compelled to buy from a man or corporation making a specialty of this class of construction.

IN the report of the New Jersey State Tenement House Commission, submitted to the Governor the first of the year, it is shown that the commission approved plans for and supervised the construction of 1333 tenement houses, costing $12.023.000. The cost of the tenements erected in 1906 was $10.832,000, and in 1905 the cost was $6,309,000. The total number of plans filed during the three years was 2610; the total number of plans approved 2266, and the total number of tenements erected 3308, the total cost being $29,164,000.

The Tower of the Metropolitan Life Insurance Company's Building.

(*With Supplement Plate.*)

One of the most interesting sights just at present for the architect and builder visiting the Borough of Manhattan, New York, is undoubtedly the 700-ft. tower now rapidly nearing completion on the Madison avenue and Twenty-fourth street corner of the Metropolitan Life Insurance Company's building. It is interesting not only from an industrial point of view, but because it is the tallest building in the country, overtopping the recently completed Singer Building, the next highest, by more than 80 ft. The great hight of the Metropolitan tower is due to the fact that as it was nearing completion the drawings were changed so as to increase the hight from 658 to 700 ft. above the sidewalk level. From the cellar floor the hight is 715 ft., and from the foundations 726 ft. The hight of the clock face above the sidewalk is 346 ft., and the floor of the lookout at the forty-sixth story is 603 ft. As now completed, the tower contains 53 stories above the sidewalk and two stories below. The increased hight was decided upon by Architects Le Brun & Sons, in order to improve the appearance of the building, a good many feet being required at that hight from the ground to make a slight change in the appearance from the sidewalk. The additional feet serve to give the tower a more symmetrical and pleasing effect when viewed in its entirety.

In the forty-sixth story of the new tower about 600 ft. above the pavement are to be placed four of the largest and costliest bells in the world. The largest bell toned to B flat will be 70 in. at the mouth and weigh 7000 lb.; the second in E flat will weigh 3000 lb.; the third in F natural will weigh 2000 lb., and the fourth in G will weigh 1500 lb. They are to be mounted on pedestals between the marble pillars outside the forty-sixth story. The bells will play every 15 min. and strike each hour.

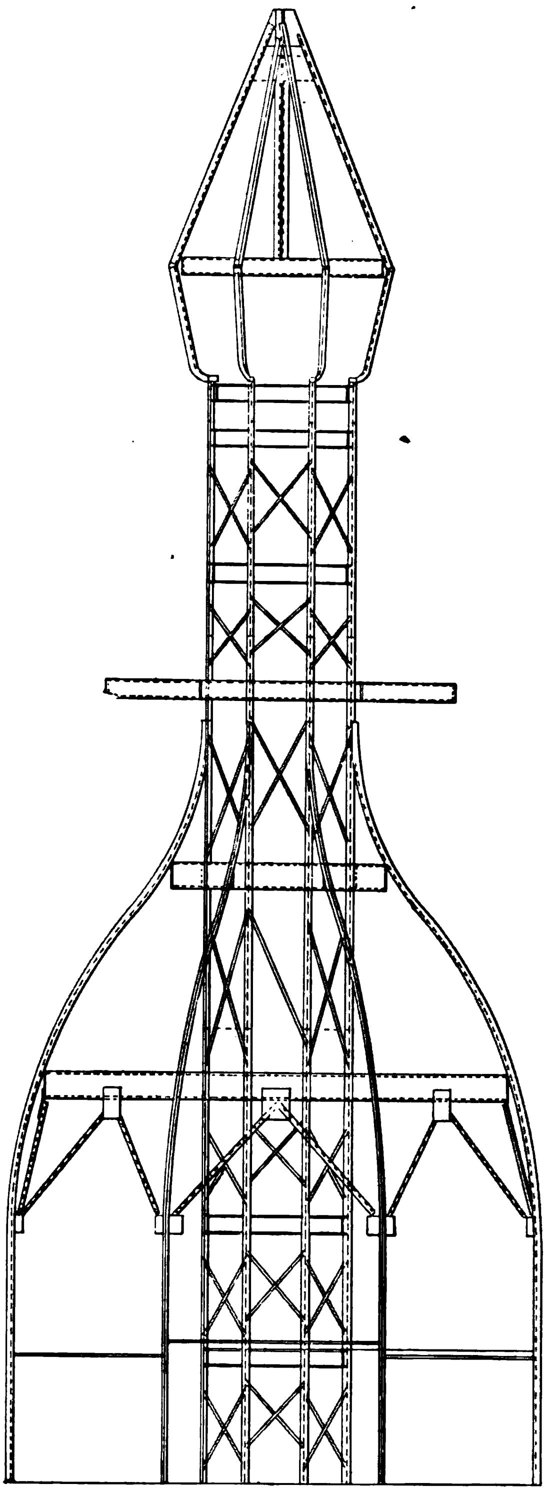
An idea of the appearance of the building with the tower almost inclosed to its top in masonry may be gained from the half-tone supplemental plate which accompanies this issue of the paper. The artist selected a most excellent viewpoint, and the detail is brought out with great distinctness. A suggestion of the iron framework toward the extreme top on the north or twenty-fourth street side is indicated in the diagram presented herewith.

One of the chief features of the tower will be a huge clock with a face on each side of the tower 324 ft. above the sidewalk. The face of the clock will be two stories high, 25 ft. 6 in. in diameter on the dial. It will have figures 4 ft. and hands 12 ft. long. Two stories above the clock will be a line of projecting balconies, and above this a series of Ionic loggias showing five arched openings on each face of the tower. The hight of these loggias will be 50 ft.

One of the points which it was necessary to very carefully consider was the wind pressure, and while engineers usually regard a pressure of 30 lb. to the square inch ample for towering skyscrapers conditions surrounding this particular tower are unusual. It is situated on the corner and facing Madison square, with no other neighboring building to break the force of the wind, so that in a sense it is isolated and must be self-sustaining. When the engineers, Purdy & Henderson, started on their calculations the allowance for wind pressure was increased from 30 to 60 lb. for the square inch, this allowing for a much higher wind than has yet been known in New York City or vicinity.

The gross weight of the Metropolitan tower is given as 37,333 tons, and required more than 8000 tons of steel in its construction. The lower pillars are remarkable for their weight and dimension. The corner columns are 38 in. square, and weigh a trifle over 1 ton for every square foot. The interior columns are 2 ft. square, with an average span of 22 ft. There are 20 pillars or columns on each floor as far up as the nineteenth story above, where they are somewhat lighter. The steel work of the frame was covered with a coat of anticorrosive paint, then with waterproof paint, and then with a casing of cement extending 2 in. beyond the extreme limit of the structure.

The construction of the floors of the tower differs somewhat from that in the average skyscraper, in that where the latter are terra cotta blocks held together with cement, in the Metropolitan Life Building the 12-in. floor



Iron Framework at Top of Tower.

The Tower of the Metropolitan Life Insurance Company's Building.

beams are arranged 4 ft. apart, and joined by concrete arches laid on wire gauze.

The foundations of the tower were carried to a depth of 42 ft. below the level of the sidewalk to bed rock. The steel skeleton frame is filled out with ornamental brick and marble to match the main building, and the tower is lighted by three groups of triple windows on each of three sides with heavy molded and deeply recessed jambs. The pure early Italian Renaissance style of the main structure is preserved in the design of the tower, which in many respects resembles the famous Italian Campanile.

The lantern which caps the tower is 50 ft. high and will be copper gilded. It will contain an arc light of great power, which will be used to designate the time after nightfall. It is proposed to do this by giving one red flash for the quarter, two for the half and three for the third quarter. A white flash will indicate the hour.

The highest point for observation in the tower will be a window over the lookout, 660 ft. above the sidewalk, while the highest lookout in the tower of the Singer Building is 589 ft. above Broadway. The highest office floor in the Metropolitan tower will be 637 ft. above the sidewalk.

THE ART OF WOOD PATTERN MAKING.—VIII.

BY L. H. HAND.

IT is necessary on many patterns to make the follow board first. and using this as a "form" build up the pattern piece by piece over it. This is especially true in all curved open work forms, such as curved side arms and legs of settees, basket racks for passenger coaches, mangers for horse stalls, &c. This is necessary both for the convenience of the molder and the patternmaker. In follow board, which in any case is a good plan to adopt. After the main or heavier parts are in position the smaller ones can usually be secured by making snug glue joints, cutting small gains, &c., as may suggest itself to the mechanic as the work progresses.

It is hardly necessary to illustrate any special casting of this kind, as many forms will readily suggest themselves to the reader which would be delicate to make and handle without a form over which to build them, and also many things that would be almost impossible to dig out of the sand unless a perfect parting was made with

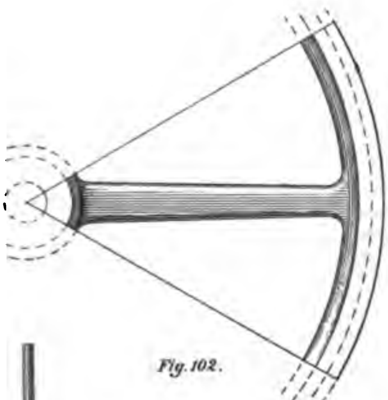


Fig. 102.

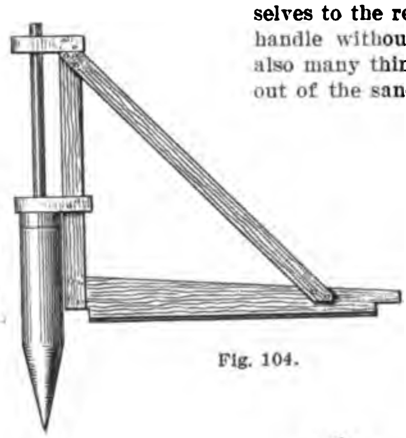


Fig. 104.

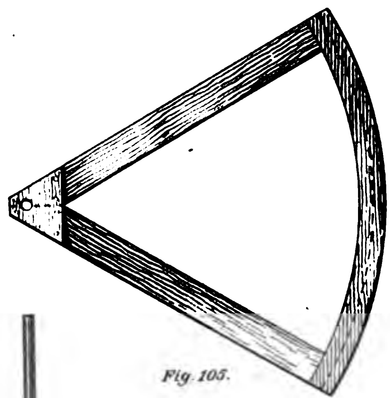


Fig. 105.

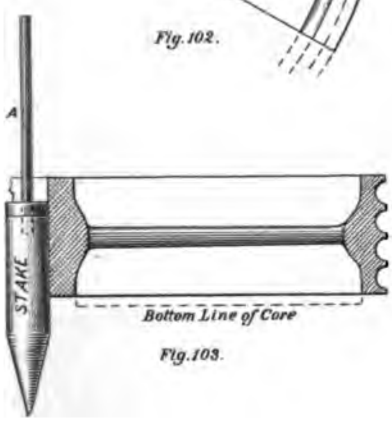


Fig. 103.

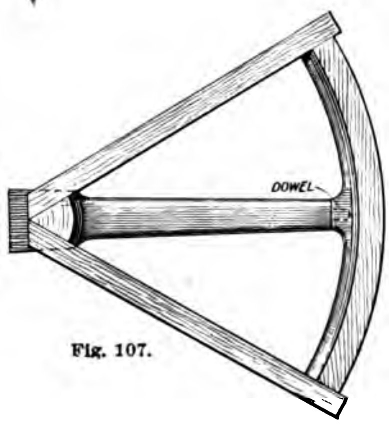


Fig. 107.

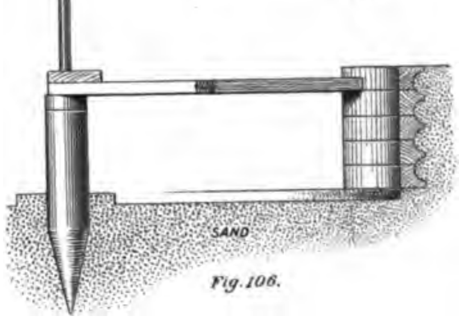


Fig. 106.

Figs. 102 and 103.—Top and Sectional Views of One-sixth of Large Sheave Pulley.

Figs. 104 and 107.—Sweep and Core Box for Sectional Core.

Figs. 105 and 106.—Top View of Pattern and Sectional View of It in the Sand.

The Art of Wood Pattern Making.—VIII.

work of this kind the follow board is made exactly the form of the required parting in the sand. It is then carefully finished and rubbed down with linseed oil to prevent the wood of the pattern from being glued fast to it at joints, &c. In case, however, the curve is only one way, a thin paper can be laid on the follow board, which will, of course, become glued to the wood pattern; but when finished and all is dry the glued paper can be removed with scrapers, &c.

Many patterns are of so delicate and intricate design that it would be almost impossible to build them in any other manner, as they would be shaken to pieces in handling while being constructed; but with a follow board or form over which to build the different designs of the pattern are easily made. It is customary to get out the heavier portions or supporting parts of the pattern and fit them exactly to the proper position and fasten with small brads, allowing the heads to project slightly so that they may be readily drawn out when the glue is dry. If the design is very intricate it may be necessary to make an actual drawing of the parts on the the follow board. Castings of this nature are not numerous about heavy machinery plants or locomotive works, but are more so in connection with architectural iron works, stove foundries, &c.

Passing from this phase of the work, we will now take up a problem which might arise in any heavy machinery repair shop, and for the purpose of illustration we will suppose the patternmaker is called upon to produce a sheave pulley 8 ft. in diameter and carrying four cables. It would be the same if it were an immense gear wheel. It is simply taken as an illustration of the manner in which a difficult place may be bridged over when only a single casting is wanted. The cost of making such a pattern is no inconsiderable sum, and to produce the desired casting with a minimum of expense is what we desire to do. In order to accomplish this, the first step is to secure the co-operation of a competent molder; without this one would be like Adam in the Garden of Eden before the advent of Eve. We next produce a full sized working drawing of one-sixth of the desired wheel, shown in part in Figs. 102 and 103. It is hardly necessary to say that this drawing must be minutely correct, as the six parts working together must just fill the allotted space or there will be trouble. Now turn up the center pin, as shown in the sectional view, and put a neat iron band around the top. Bore in the center of this pin for the iron standard, say a ¾-in. gas pipe.

Now make a sweep as shown in Fig. 104, which is simply a ⅞-in. plank cut to the required shape on the edge and beveled on both sides at the work edge, hung and braced so that in swinging around the stake it will have a tendency to pack the sand as the desired shape is swept out. Next get out a section of the rim grooved on the outside, as shown in the sectional view, Fig. 103. It will not be necessary to finish the inside of this piece, owing to the fact that the outside is all that is used. Frame two arms into this sectional pattern, as shown in Fig. 105, taking care that they are so located in the section that when the ends rest on the pin the arms will be perfectly level, thus insuring the run of the wheel to be at right angles to the center of the spoke, as shown in Fig. 106.

Build a core box, the outside of which is made by getting out a section representing the inside of the rim, as in Fig. 103, and the apex representing a section of the hub, adding enough to equal the depth of core print by the sweep. Through this hub make a mortise for the spoke and in the rim bore a dowel pin hole for holding the spoke in position at that place. Make a pattern for the spoke with a dowel pin in the end, square and slightly tapered where it goes through the hub. An idea of what I mean will be gained from an inspection of Fig. 107. Make a half core box of the size of the pin and long enough to reach the top of the wheel.

In order to make a casting from this pattern drive the stake down into the floor of the foundry, taking care that the center rod stands plumb. Put on the sweep, Fig. 104, and sweep out the floor to the required form for receiving the cores. Remove the sweep and put on the sectional pattern, Fig. 105, banking the sand firmly against the outside. Move the pattern around and bank the sand against it until a complete circular pit is made grooved for the outside of the run. Now remove the rod and the pattern can be slipped back out of the grooves and taken off. Pull the stake and put in the hub core at the center. Place the six cores in their proper positions as shown in Fig. 108. Plain slab cores can be laid around over the run to insure a good cast. Nothing is necessary for these except that they fit the sand and at the joints.

Among the advantages of this method of cast is that it obviates making cores for the grooves in the run, and has been selected as an illustration on that account. In case it were a gear wheel it would be necessary to lift the sectional pattern out of the sand each time it was moved.

Many years ago my brother was working in the sheet metal department of a stove foundry in one of the cities of Indiana, and as he was something of a genius in his line he was asked by one of the molders to make a pattern for some kind of an ornamental door block or weight to prop open the door. In the course of conversation regarding various designs he mentioned that his children had at home a large toy frog made of plaster of Paris, but that as it was of peculiar shape and not intended for casting it might be impossible to get it out of the sand, but he considered the experiment well worth trying, as a casting from it would probably answer the purpose. The frog was therefore brought down to the foundry and a casting made from it which proved to be so attractive that something like 100 door weights were cast from it. In Fig. 109 is shown the manner in which the molder contrived to get it out of the sand without coring. This was accomplished by making a parting in the sand as shown, the pattern being withdrawn by rocking it out of the sand on a pivot from the front foot. However, if such a pattern were sent out from a shop I am certain it would be pronounced impractical and thrown back on the patternmaker's hands.

Sweeps of various forms are very useful and should be thoroughly understood by the patternmaker, as they frequently save much valuable time and material. A sweep is a board cut out of any desired shape and passed over the sand, sweeping the surface to the form of the edge of the board. It may be used entirely alone or it may be used in connection with patterns, core boxes, &c, as, for instance, the core for a locomotive chime whistle, which is cast with three separate compartments, as shown in cross section in Fig. 110. This would appear to be a difficult core box to make, but in reality is not.

To construct such a core box it is only necessary to make a plain half core box, Fig. 111, which may be staved up or carved out of the solid wood, according to the size required. Across the ends of the box lay out the plumb line *a b*, and at an angle of 30 degrees from this line lay out the grooves on the inside face for the partitions. These are cut out only to the inside of the core box and are to hold the partitions in place. The slots for the partitions are then made and the partitions fitted to slide into the grooves, one reaching just to the inside of the box and the other to the round metal center through the core. The shorter one acts only as a filler for the partition slot. Now make a little sweep, C, Fig. 111, which for work of this size might be ⅝ in. thick. Shape the edge so it will fit over the outside of the box and when moved along will sweep out half of the round metal center and half of one partition. What is being illustrated is a core which from its peculiar formation, must be made right and left, from the fact that the ends of the finished core are not alike. If they were, it would be unnecessary to reverse the box.

In molding this core the molder would place both slides in position and ram up the half core. Then taking the sweep he would carefully sweep away the sand from the top of the box until the half round groove for the metal center and the half thickness partition were perfectly formed. The partition slide would then be drawn out and the core removed. Exchanging places with the partition slides, the process would be repeated, reversing the sweep, also thus making a right and left half core in the same core box.

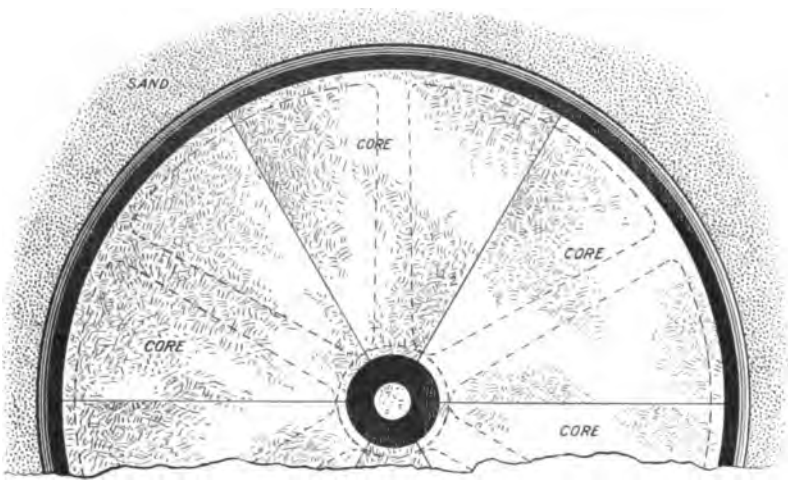


Fig. 108.—Plan of Mold with Cores in Position.

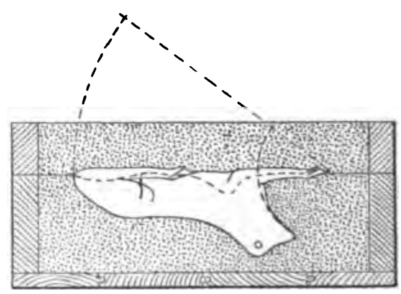


Fig. 109.—Drawing an Apparently Impossible Pattern.

The Art of Wood Pattern Making.—VIII.

Going back now to the bushing for a locomotive cylinder illustrated in the June issue of *Carpentry and Building*, where we attempted to show some wasteful methods of construction in pattern making. we will now demonstrate the value of a thorough knowledge of sweeps and sweep work. The next engine to be repaired was of the same pattern, and required the same treatment as the one for which the pattern was made, only that for some cause now forgotten the bushing required to be 1⅛ in. thick instead of ¾ in. This was taken to a different patternmaker, who was instructed to turn down the core prints of the pattern and fill the core box to the required measurements. Any of the readers of *Carpentry and Building* who have followed the description of this particular pattern will readily see that even remodeling this core box was quite a task.

The young patternmaker, who was not much more than a boy, turned down the core prints of the pattern, then battoned some 1-in. plank together of the size of a longitudinal section through the required core, to the ends of which he secured two half circular boards of the proper diameter. He then dressed up a little scrap about ⅞ x 2 for a sweep. The entire time occupied in making this skeleton box was possibly an hour, but I rather think

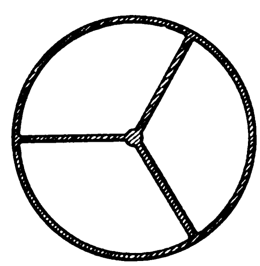


Fig. 110.—Cross Section Through Locomotive Whistle.

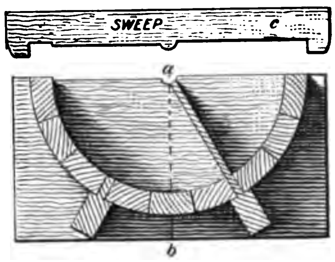


Fig. 111.—Sectional View of Core Box for Whistle.

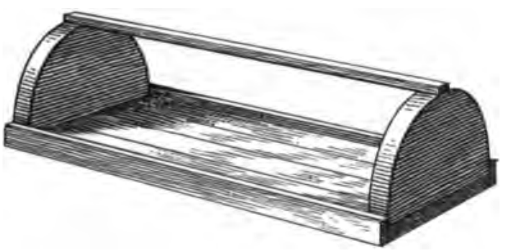


Fig. 112.—Perspective of Plain Skeleton Core Box.

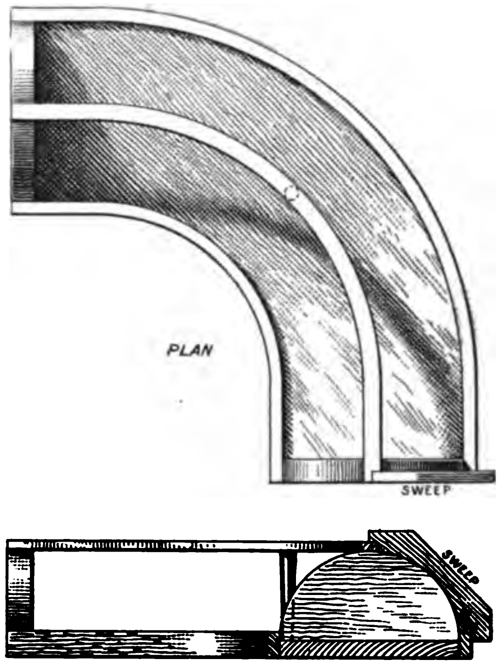


Fig. 113.—Plan and Elevation of Box for Curved Core.

The Art of Wood Pattern Making.—VIII.

half of that time was nearer the truth. The desired casting came back to the shop in due time as perfect in every detail as from the one made of half a cord of $60 lumber. This skeleton box will be readily understood from an examination of Fig. 112.

The process of making a core in this box is very simple. The sand is packed as nearly the shape as possible in the box and struck or swept off until the core is perfectly finished.

In like manner a core for a large elbow or curved pipe of any shape may be swept up, making the bottom of the box of the form of a section through the core at the parting and a guide strip at the top conforming to the shape of the center of the core, which strip must be supported upon tapered pins fitted loosely into the bottom and the ends secured by dowel pins into the ends of the skeleton box. The sweep is arranged to slide along the guide strips and is cut to the radius desired, as shown in Fig. 113. This core is made in much the same way as that previously described, only that the sweep works along the sides of the core instead of over the ends. When the core is swept up the top guide is lifted off and the holes made by the supporting pins are filled with sand.

Extra large, straight cores, with different diameters at places or with grooves running around them, may be made with a sweep hung to swing back and forth over the ends of the skeleton box similar to the skeleton box shown in the June issue of *Carpentry and Building* in connection with the pump cylinder, where the author substituted a turned roller and got "turned down" himself. Frankly and honestly, he would like to know why that box was condemned. It is possible to sweep up almost any circular form, and I have been told that a locomotive cylinder has been swept up with the valve seats, &c., all in proper position, "but right here I get off."

Extending the Teaching of Manual Training.

The campaign being waged by the National Society for the Promotion of Industrial Education is rapidly bringing the questions of industrial education to the fore. The Board of Education in New York City has recently decided to establish vocational schools for girls and boys from 14 to 16 years of age, and also to extend the teaching of manual training in the seventh and eighth grades to many more schools than at present. This action was taken at the suggestion of a committee that has been studying the subject of industrial education as part of the public school system. The committee consists of Frederic R. Coudert, chairman; John Greene, L. Katzenberg, Cornelius J. Sullivan, Hugo Kanzlar and Samuel Donnelly, who, in addition to being a member of the Board of Education, is secretary of the General Arbitration Board of the New York Building Trades, and on the Board of Managers of the National Society for the Promotion of Industrial Education.

The vocational school for boys will be opened in the autumn at Allen and Hester streets, in the crowded lower East Side of the city. The instruction will include woodworking, metal working and mechanical drawing, and several hours a day will be devoted to scholastic subjects related to industrial topics.

As an aid to any Board of Education wishing to establish elementary industrial schools, the National Society for the Promotion of Industrial Education has formed a Committee of Ten, under the chairmanship of Dr. Henry S. Pritchett, president of the Carnegie Foundation for the Advancement of Teaching. This committee will lay out plans for the development of these schools in connection with any public school system, indicate the subjects to be pursued and methods of articulating them with the chief industries of the town. It is not the intention to have these schools take the place of trade schools, but rather to lay a foundation that will enable a girl or boy to greatly shorten the apprenticeship period which cannot begin until the age of 16.

Carpentry and Building

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(Entered at the New York Post-Office as Second-Class Mail Matter.)

SEPTEMBER, 1908.

End of New York's Oldest Skyscraper.

After an elapse of a trifle more than 20 years the first steel frame "skyscraper" erected in the city of New York is about to be razed in order to make room for a modern 38-story office building, which will rank second to the Singer Building among the standing downtown structures. It was on the 17th of April, 1888, that the plans for the present nine-story Tower Building, now but a mere pigmy among its neighbors on lower Manhattan, were filed by Architect Bradford L. Gilbert. At that time there was nothing in the Building Code covering a structure of this kind, and the officials of the Bureau of Buildings were much perplexed as to just what disposition to make of the matter. It was the first building in which the weight of the walls and floors was transmitted through girders and columns to the footings, and the idea of using a steel frame came from the problem of constructing on a 21-ft. lot what was then regarded as a high building and yet secure the greatest possible floor space. The result was that the architect finally devised a building with seven stories of steel framework, with upright columns supporting rolled beam girders. The latter carried the weight of the floors and of the walls, which, in fact, were 1-ft. thick panels. The stories above the seventh were of masonry. In order to decide what should be done with Mr. Gilbert's plans they were referred to an Examining Board which had been created to pass upon such matters as were not covered by the Code. Here the controversy was continued, some members having a strong preference for solid masonry, coupled with a prejudice against iron work in general, while others were in favor of permitting a trial of this peculiar combination of iron and brick work. The result was that the Tower Building was erected, and for a time was one of the points of curious interest for builders visiting the city from far and near. With the destruction of the building will pass one of the country's famous structures, for it is not too much to say that upon the plans first worked out for it New York and many other large American cities have been developed. It is also significant of the rapid growth of New York City that the Tower Building has been erected only 20 years.

The New Skyscraper.

Upon the site of the Tower Building, at 50 Broadway, with some adjoining space, will rise the new 38-story skyscraper. It will have a frontage on Broadway of 81.9 ft. and extending through to New street, on which it will abut 80.2 ft. It will be of brick and terra cotta, and will cost, according to the estimate of Architect W. C. Hazlett, in the neighborhood of $3,475,000. It will be thoroughly modern in all its equipment and conveniences, have 13 passenger elevators and one for freight, and will be as fire resisting as it is possible to make an office building at the present day.

Publicity as a Business Stimulant.

Officially the workmen in the building and some of the other trades are receiving the same rate of wages as a year ago, but unofficially this is only partially true. Many laborers and artisans are actually working for a lower wage than a year ago. The reduction in wages has been brought about in more than one way. Practically every working man is turning out more work per day than a year ago. Many are putting more hours to the day and others are actually accepting cuts in wages, going on the belief that half a loaf is better than none at all. With the wage question itself this article does not concern itself. The fact, however, that lower wages are being accepted very naturally brings up the question as to whether building activity would not be stimulated if these reductions were made known to the people at large. Much building is held up because those contemplating it are waiting for liquidation in all lines. The price of materials has fallen, and if it were generally known that wages are lower, that more work is being turned out per day and that building construction is 15 to 20 per cent. cheaper than two years ago, it might stimulate considerable business. Manufacturers of brick wish the announcement scattered broadcast that their prices are lower than in years previous, and the same is true of cement manufacturers and those of other materials. They have the idea, and rightfully so, that this information coming to the knowledge of people who contemplate building would probably aid in the resumption of business and enable them to move their stocks. Would it not be advisable if labor in the building trades would seek a little of the same publicity in this direction?

Model Apartment Houses on the Co-operative Plan.

More or less attention has recently been given to the question of co-operative apartment houses, the idea apparently being to reduce as much as possible to a minimum the annoyances and inconveniences often resulting from the ordinary method of renting apartments in which to live. The scheme has been put into practical operation in several instances in the Borough of Manhattan, and the plan is now to be carried out in Brooklyn, where a company has recently been organized and incorporated under the laws of the State of New York to erect a number of high class four-story semifireproof apartment houses, planned and designed especially to meet the requirements of refined persons of moderate means. Features now found only in high priced apartments are to be installed and the details of the scheme have been carefully worked out by experienced men. The buildings, while economically planned and arranged, are to be artistic and of ornamental and attractive design. The fronts will be constructed of face brick, polished granite, carved limestone and molded terra cotta. All will be of similar type, but will be different from the ordinary flats and apartment houses erected by speculative builders. The main entrances will be through large Doric porticos, with colored polished granite columns and jambs, the entrance doors being of plate glass and ornate iron grills. The vestibules, entrance and staircase halls are to be wide and lined with paneled polished marble wainscotings. They will have ornamental white tile floors throughout, with colored borders. The stairs will be marble, with wrought iron railings. The apartments will consist of five, six and seven rooms and arranged with every desirable modern labor and space saving improvement. The open courts will insure light to the inside rooms, being of extra large size and equal, it is stated, in area to those of the latest Manhattan apartment houses. All rooms and halls will open directly to the outer air, and all the apartments will be so planned as to have no dark corners, to have perfect cross ventilation and arranged to insure the maximum of privacy. It is stated that in selecting tenants for these buildings the company will give preference to its stockholders, who may be desirous of renting apartments, thus resulting practically in co-operative ownership, which will remove the burden of rent paying from those in the company who rent apartments in the buildings. The plans have all been prepared by Architect R. Thomas Short, who some time ago was awarded the first prize for model dwellings in New York in a competition in which many architects took part.

Annual Outing of the Cleveland Builders' Exchange.

The members of the Builders' Exchange of Cleveland, Ohio, participated in an unusually enjoyable summer outing at Burlington Bay, Ont., during the week beginning July 13. The party, to the number of 180, consisting of members of the Exchange and their families, left Cleveland on the "City of Buffalo" on the evening of Monday of the week named, and arrived at Buffalo, N. Y., on Tuesday morning, where city cars were taken for the Lehigh Valley Railway Station, a special vestibule train conveying the party to Burlington Bay. The route taken was by way of the Suspension Bridge and Niagara Falls, affording a very pleasant morning ride through the garden section of Canada. The train reached Burlington Bay at 11.45 o'clock, in time for luncheon at the Hotel Brant, where headquarters were established for the stay. This hotel is pleasantly located, near a broad, sandy beach, and is easily accessible from Hamilton and Toronto. In the afternoon the time was devoted to a base ball game between teams organized on the trip, and to other athletic sports, while the evening was enlivened by a social party and dancing. Good music was furnished by a quartette of singers, comprising Messrs. Krauss and Dresser, and the Misses McCue and McMillan.

On Wednesday morning the builders visited Hamilton, where they were received by the Mayor and other city officials, and were shown many courtesies, including a visit to Dundern Park, where refreshments were served. In the afternoon a special programme of athletic events was conducted on the recreation grounds near the hotel, prizes being awarded to the winners in these contests.

On Thursday many of the members visited Toronto, going and returning by boat. The party left Burlington Bay on Friday at 10 o'clock, arriving at Niagara Falls in time for luncheon at the Imperial Hotel, and spending the afternoon in sight seeing. At 8.15 o'clock, the party left Buffalo on the City of Erie, arriving home Saturday morning.

The weather throughout the journey was very pleasant, with the exception of Friday, when rain was encountered at Niagara Falls. Before separating the party adopted a resolution expressing thanks to Chairman Klumph and Messrs. Slatmyer, Fay, Chopp and Aylard of the entertainment committee for their efforts in making the outing so successful and altogether delightful an affair.

IT is interesting to state that the plans recently filed by Architects D. H. Burnham & Co., Chicago, for a 62-story office building, to occupy the present site of the Equitable Life Assurance Society in lower Broadway, Borough of Manhattan, New York, have been approved by the Bureau of Buildings.

Some Details of the Proposed Equitable Building.

Some idea of the magnitude of the proposed 62-story structure which the Equitable Life Assurance Society is to erect upon the present site of the old structure at Broadway, Nassau, Pine and Cedar streets, Borough of Manhattan, N. Y., at a cost of approximately $10,000,000, may be gathered from the statement that the building will contain all told 40 acres of floor space, 5,200 windows, 4,800 radiators, 25,000 electric lights, 38 electric elevators, about 3,600 offices accommodating between 20,000 and 21,000 people, two acres of eight-inch thick granite, and 1,750,000,000 brick, making 4,375,000 tons, or 8,750,000,000 pounds of brick.

The two 22-story terminal buildings of the Hudson and Manhattan Railroad, in Church street (taken together), the largest office building in the world, occupy 70,000 square feet of ground. The cubic area is 14,500,000 feet above ground and 3,650,000 cubic feet below ground, comprising a total of 18,150,000 cubic feet. There are 5200 doors, 5000 windows, 120,000 square feet of glass and 39 elevators in the two buildings.

The City Investing Building, 33 stories high and immediately adjoining the Singer Building, contains 12 acres of rentable space, 11,060,000 cubic feet, 500,000 square feet of floor space, 21 elevators, 2260 radiators, represents an outlay of $10,000,000, and accommodates 10,000 tenants.

Argument for Plaster Houses.

It is generally admitted by property owners and promoters of near-by subdivisions that the moment has arrived when something different from the ordinary dwelling house must be erected in order to meet the changing ideas of the buying public. That the familiar type of frame structure which for years has proven a ready seller is no longer the alluring medium through which the sale of lots and plots can be effected is evidenced by the large number of unsold frame houses within 20 miles of the City Hall, says a writer in a recent issue of the *Record and Guide*. Various reasons have been advanced for this stagnant condition, such as an over-supply, hard times and a stringent money market, but it is now fast becoming recognized that something more vital in its effect is blocking the sale of so many domiciles. One prominent property owner suggests that this condition may be attributed to the architecture, and another previously successful promoter says that he is convinced that it is due to the popular idea that frame houses are now poorly constructed and are therefore unfit to occupy during the extremes in weather.

However this may be, might it not be a good move on the part of the vacant land owner or the subdivision promoter to experiment in building plaster houses? The plaster house has many distinctive features, which may account for its surprising increase in popularity during the last few years. Dwellings of this material are almost indestructible when properly built and are warmer in winter and cooler in summer than wood.

From the standpoint of cost it can be said that the plaster house is not at a disadvantage, for the excessive cost of mill work no longer makes the frame house cheaper. Besides, plaster lends itself to more artistic treatment than wood, which is an important consideration when building for the market.

AN important addition is about to be made to the Hotel Astor by which it is expected the capacity of the present hostelry will be practically doubled. The extension will occupy a space of 200 by 150 ft. in area, running through from Forty-fourth to Forty-fifth streets. The improvements when completed will give a hotel with more than 1000 bedrooms, 700 of which will have baths connected with them. On the ground floor of the extension will be the largest hall in the city, which can be used for banquets or concerts. One of the notable features of the enlarged hotel will be the roof garden, which will make possible a promenade more than 1000 ft. in length.

CORRESPONDENCE.

Method of Raising Plank Frame Barns.

From John L. Shawver, Bellefontain, Ohio.—In reply to the inquiry of "Hee H. See," Sacramento, Cal., permit me to say that we have used many different methods of raising barns, but in the case of the barn at the Michigan Agricultural College, and illustrated on the first page of the July issue of *Carpentry and Building*, we used a small jack which a boy could carry, together with one set of block and tackle, with which two men raised the various bents with ease, our lifting pulleys being placed at the top of the purlin posts of the bent previously raised. We have used derricks, gin poles, shear poles, pike poles and hoisting jacks, but unless the barn is too high or very heavy we can make the best time with pike poles. In this manner we raised a barn near Cleveland 40 x 80 ft. in plan in 2½ hours; we raised one near Detroit 36 x 164 ft. in plan with 15 bents in 3 hours.

Now as to the temporary ladders about which the correspondent speaks, I would state that they are made in a few minutes. As soon as the bent is up and the plates are on some one must go up to remove the lifting pulley on the preceding bent and take it to the last bent, remove the guy rope and place the lifting pulley in its new position. On the barn illustrated it was a climb of 17 ft., almost perpendicular, and the steps made of the cross pieces save time and energy. Personally I prefer using hanger pieces and nailing them on the edge of the post instead of the side, but in the case under discussion I had 20 men to manage—all entire strangers to me—and as we framed the barn in three days I could not attend to all the little details.

The arrangement at the left of the picture directly over the buggy, as mentioned by the correspondent, is a combined view of the three "struts" of the end bent of the main barn. There are three more in the east end of the main barn and three in the south end of the wing, but at the time the photograph was taken these had not been placed in position, though they were made and ready to be placed. The frame, as it is shown in the picture, is the work of 20 men in 8 hours' raising.

One of our greatest cares as we go from place to place to take charge of a set of new men entirely unknown to us and unfamiliar with our system of framing, is to take every possible precaution against accident. It is gratifying to state that in many years' experience we have had but two men injured, and that was in connection with the raising of a barn 50 x 104 ft. in plan near Toledo, where, on a very windy day, against my protest, an attempt to "raise" was made without any guy ropes, and just as the second bent was up the derrick broke and both bents fell. I was on top of one and one of the men was just below me. He was unfortunate in having two ribs broken and several cuts, while another man below was injured. I escaped with a few light bruises, and at once ordered guy ropes to be secured and we then proceeded with the work.

We prefer four 1-in. guy ropes, each long enough to provide good anchorage. The first set remains on the first bent raised till the bents are all up, so that no matter what may happen in the raising of succeeding bents or how strong the wind may blow, this bent and all bound to it are safe. The second set of ropes is changed from bent to bent as the raising progresses.

Before commencing operations I tell the men good naturedly that the raising of a large barn is dangerous work; that an accident is nearly always the result of carelessness on the part of some one, and that it is my desire that each man shall attend strictly to his duties, keep his eyes open and his mouth shut until the structure is raised and the danger period past.

Design for Church Roof of 45-Ft. Span.

From J. G., Wellington, New Zealand.—Will you please give through the correspondence columns of the paper a design for a church roof of 45 ft. span, the roof to be of iron and sarked. It is also to be coved and without pillars. The principals are to be of Oregon lumber and spaced 10 ft. apart.

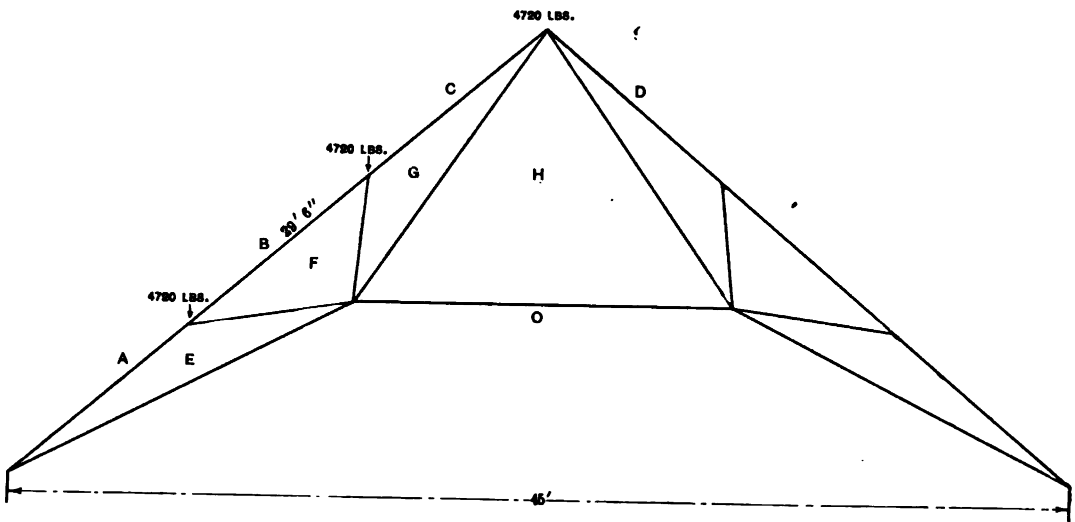


Fig. 1.—Type of Roof Truss Suggested.

Design for Church Roof of 45-Ft. Span.

Answer.—From the data furnished by the correspondent above, the roof load may be estimated at 48 lb. per square foot of roof surface, this load including the weight of the truss as well as the snow and live and dead loads. The trusses are spaced 10 ft. on centers, and the pitch of a roof suitable to meet the requirements of the span stated would be 10 to 12. The type of truss we have chosen and which is shown in Fig. 1 is an all steel construction that does not require unusual skill in its erection.

The two intermediate struts shown in the design are for the purpose of supporting the purlins without producing an undue transverse stress in the top chord. Under an unequal wind strain tending to produce distortion, it might happen that these struts or one of them at least would be subject to a tensile stress, but the member is capable of withstanding a counter tensile stress of equal amount. The upper chord is, of course, continuous, but in figuring the compressive strength it is regarded as having two intermediate supports so that for purposes of calculation its greatest unsupported length is the distance between the apices of the loads, or 9 ft. 10 in. long, being considered square ended posts.

The lowest member of the upper chord has a stress, according to the stress diagram, Fig. 2, of 44,840 lb.

Then $\frac{l}{r} = \frac{9.83}{1.09} = 9$, corresponding to an ultimate strength of 37,760 lb. per square inch, or a safe load of 9440 lb. per square inch. Try two 3½ x 2½ x ¼ in. angles, their least radius of gyration being 1.09. Now $\frac{44,840}{9440} = 4.75$ sq. in., which is the minimum area that can be used. The two angles assumed above have a total area of 2.88 sq. in., so that it is conclusive a heavier pair of angles must be chosen. It is desirable to use an angle with as low a radius of gyration as possible, as such a course secures an economical section. It is found by inspection that a pair of 3½ x 2½ x ½ in. angles spaced ⅜ in. apart also have for their least radius of gyration 1.09, and their united area is 4.86 sq. in. From this result it will be seen that while they fulfill the area requirement, it is found in practice that an angle with a 2½ in. leg does not have as much bearing for purlins as those with longer legs, and the latter are sometimes the most economical. If a set of angles 5 x 3 x 5-16 in. be chosen, the pair would have a least radius of gyration equal to 1.09, and the area would be equal to 4.8 sq. in. and we should recommend this combination.

In order that the single angle shall have the same strength as the combination, the angles should be rigidly connected every 4 ft. by rivets. For stiffness no compression member should have a dimension less than one-fiftieth of its length. Thus $\frac{9 \text{ ft. } 10 \text{ in.} \times 12}{50} = 2.36$ in.; this result shows that a 3 in. leg will fulfill the requirement and a little more, but not by too great a margin. The sectional dimensions of the top chord will be uniform throughout, as the differences in the stresses are not great enough to warrant a reduction in the section.

The strut *e f* stress is 7080 lb. in compression. Its unsupported length is 7 ft. The least radius of gyration of two 2½ x 2 x 3-16 in. angles placed back to back is 0.79. Now $\frac{7}{.79} = 8.8$, which corresponds to an ultimate load of 38,180 lb., or a safe stress of 9545 lb. per square inch. The stress in the member is 7080 lb. Now $\frac{7080}{9545} = .74$ sq. in. The area of the two angles is 1.62 sq. in., which, of course, is more than sufficient, but we would recommend their use because they are the smallest regular angles obtainable.

The first tension member required is *o e*, with a stress of 38,350 lb. The net area required is $\frac{38,350}{16,000} = 2.396$ sq. in. The two angles employed for tension members must have an area over and above the calculated area and equal to the net area required, which includes the area cut out or injured by the rivet holes. The diameter of the rivet holes is increased by ⅛ in., in calculating the area of the fibers destroyed by punching the holes. For a ¾ in. rivet the diameter is taken at ⅞ in., and we will assume all rivets to be ¾ in. As shown by the arrangement, but one rivet hole in each angle need be deducted in getting the net area, one rivet hole reduces the area of two angles equal to two (⅞ x 5-16), equal to 0.547 sq. in. nearly.

If we add the 0.547 to 2.396 = 2.943 sq. in., and look for the corresponding angles, we find them to be two 3½ x 3 x 5-16 in. angles. The gross area of the two angles 3.86, deduct the 0.547 sq. in., makes the net area equal to 3.313 sq. in.

The next tension member is *h g;* the stress is 25,762 lb. The area required is $\frac{25,762}{16,000} = 1.61$ sq. in., to which add two (⅞ x ¼) = 0.44 sq. in., thus 1.61 + 0.44 = 2.05 sq. in. Use two 3 x 2½ x ¼ in. angles, their gross area is 2.62 sq. in. less 0.44 sq. in. = 2.28, which is slightly in excess of the absolute net area required, and will be recommended. Theoretically lighter angles could be used, but they would have to be of special make and not obtainable without delay.

For the next tension member *e h* we have a stress of 12,980 lb., and the next area required is $\frac{12,980}{16,000} = 0.811$ sq. in., then two (⅞ x 3-16) = 1.139 sq. in. Use two 2 x 2 x 3-16 in. angles, with an area of 1.44 sq. in., which will be ample.

For the lower joint in member *e a* the rivets required are in double shear, a ¾-in. rivet will safely carry 8840 lb., hence $\frac{44.840}{8840} =$ five rivets required. The smallest bearing against the rivets is the three-eighth gusset plate. The safe bearing value in a ⅜-in. plate for a ¾-in. rivet is 5630 lb., hence $\frac{44.840}{5630} =$ eight rivets, which is the least number that may be employed. Joint for *o e* lower part will require seven rivets; joint at either end of E F will require two rivets, at either end of F G two rivets; upper end of E O requires seven rivets; either end of G H five rivets and either end of O H two rivets.

A plate not less than ½ in. thick is riveted under the bottom chord at the end supports to act as a bearing plate or sometimes a full riveted knee or chair with end

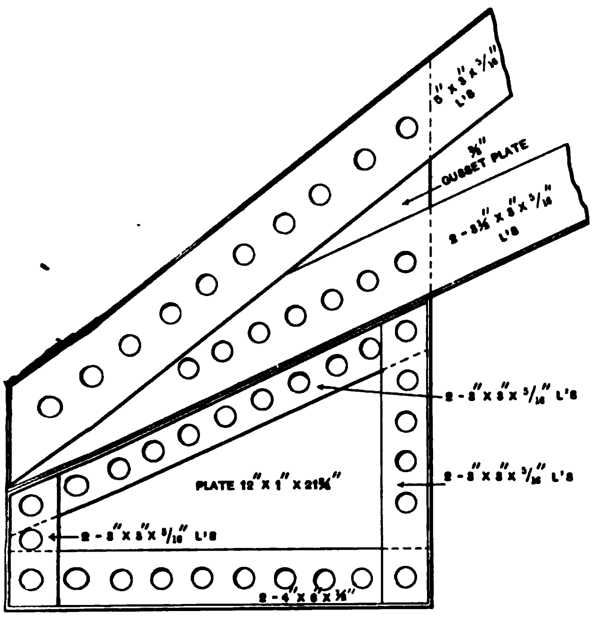


Fig. 3.—Detail of Shoe at Foot of Truss.

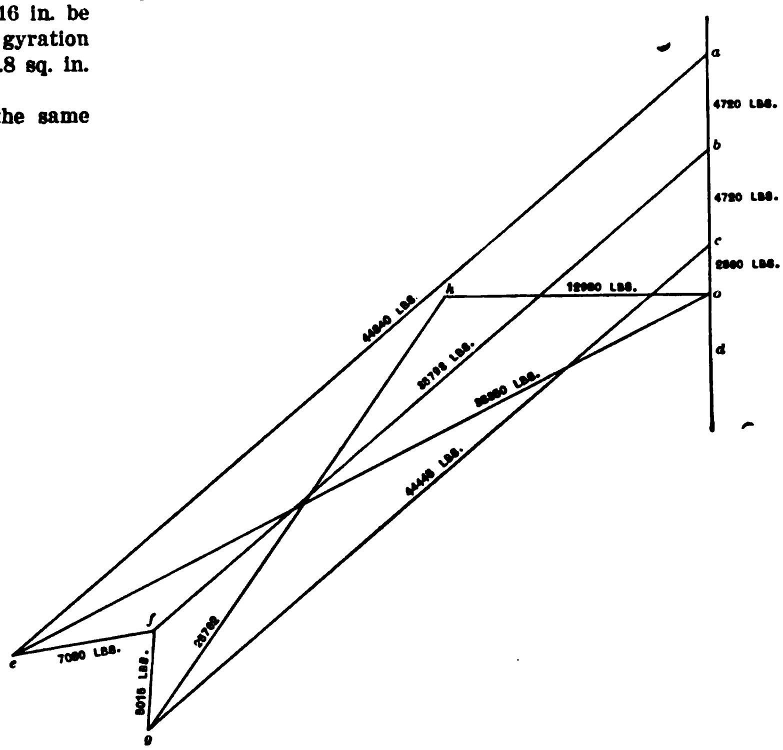


Fig. 2.—The Stress Diagram.

Design for Church Roof of 45-Ft. Span.

stiffeners is constructed so as to transmit the load on the truss to the supports without producing a transverse stress on the members at the foot of the truss. The entire reaction must pass through this plate or shoe. This reaction amounts to 14,160 lb., or $\frac{14,160}{5630}$ = say three rivets, which, added to those already found, brings the requirement up to, say, 10 rivets. The bearing plate or shoe may slide upon a wall plate anchored to the supporting wall, the anchor bolts extending through the upper plates in slotted holes. The rivets should not be spaced closer together than 2¼ in. on centers on the same straight line, nor exceed 16 times the thickness of the thinnest gusset plate.

A detail of the shoe at lower end of truss is shown in Fig. 3, and is self-explanatory. C. P. K.

A Problem in Roof Framing.

From W. J. B., Ottawa, Canada.—In the April issue of *Carpentry and Building* I noticed the inquiry of "J. E. D.," Milton, Iowa, asking for a method of framing an addition to his residence, particularly the roof. I inclose sketches of roof made with a pencil and a 3-ft. rule while I was reading the paper. I think the plans indicate quite clearly my method of performing the work, and as they speak for themselves little comment would seem to be necessary. It will be seen that in Fig. 1 the solution of the problem provides for a deck between the ridge of the main building and that of the addition, while Fig. 2 shows an alternative solution.

From Newman Pynn, St. Johns, Newfoundland.—In reply to the inquiry of "J. E. D.," Iowa, I would state that if such a problem in roof framing in connection with an extension as he describes should ever confront me, I think I would be able to solve it in accordance with the inclosed sketches. Fig. 3 represents the plan of the roof with the hips, valleys and ridges indicated, while Figs. 4 and 5 represent end and side elevations. The drawings so clearly indicate the solution of the problem that detailed comment would appear unnecessary, as all the practical readers will readily understand my method.

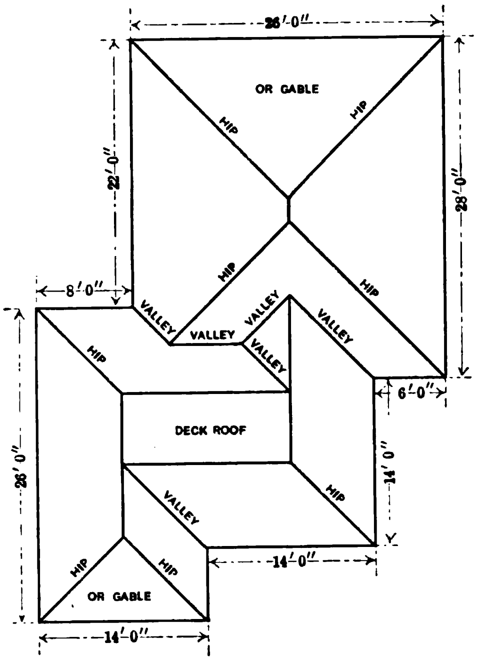


Fig. 1.—Solution Suggested by "W. J. B."

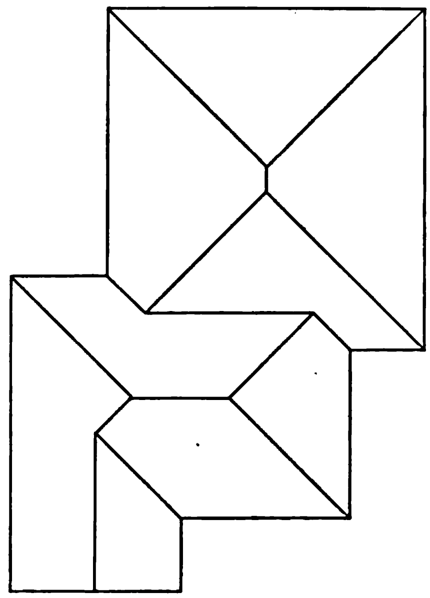


Fig. 2.—Alternative Solution.

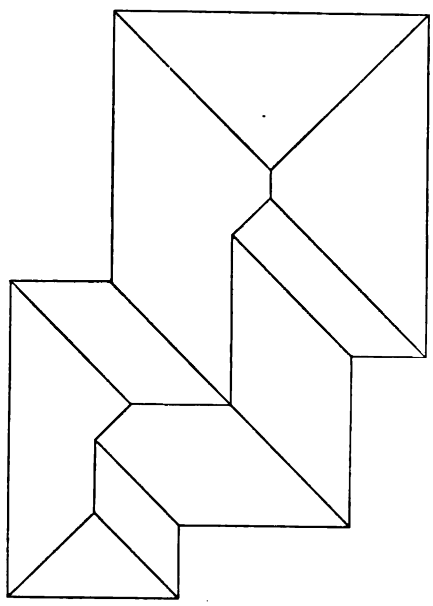


Fig. 3.—Outline of Roof Plan Furnished by Mr. Pynn.

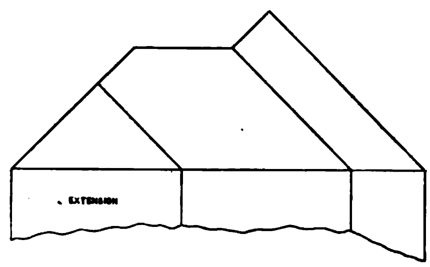


Fig. 4.—End Elevation.

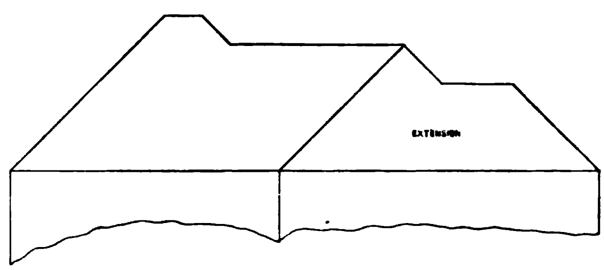


Fig. 5.—Side Elevation.

A Problem in Roof Framing.—Contributed by Newman Pynn.

I have been a reader of *Carpentry and Building* for about 10 years, and hope to continue for many more. I would not be without it for any money; it is a pure manual of self-help.

Design Wanted for a Sheep Barn.

From J. E. S., Bennington, Vt.—Will some one who has had experience in this line kindly furnish for publication a good plan for a sheep barn having a capacity for housing about 100 sheep.

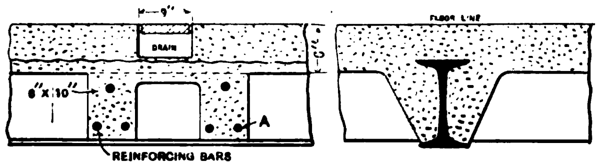
A Question in Concrete Floor Construction.

From C. H. E., Marshalltown, Iowa.—I have been a reader of *Carpentry and Building* for several years, and I wonder if you could give me some information relative to a certain job of concrete work which I will describe. I have been getting out some plans for an addition to a pork packing house, the addition being 18 ft. wide and about 50 ft. long. I put in the second floor of reinforced concrete, carrying the floor with 12 in. I-beams spaced about 7 ft. on centers, and reinforcing the concrete with No. 10 gauge expanded metal, which is strong enough. Running through the center, however, the long way of the building is a floor drain to carry away all of the waste, and water is always running. The way I made the drain is indicated in the accompanying sketches.

A small reinforced girder, as shown at A, is placed each side of the gutter or drain to hold the end of the slot. These girders are only 7 ft. long, extending from beam to beam. This floor, and especially the drain, will be covered with dirty, filthy water. I would like to inquire if there would be any danger that the strength of the concrete would be destroyed or impaired under these conditions. Under ordinary conditions the floor would do the work very easily, but under the conditions above stated I am very doubtful. I would use plenty of cement on top, and also Medusa waterproofing.

Answer.—The questions raised by our correspondent above were submitted to Sanford E. Thompson, the well-known consulting engineer and authority on concrete work, who furnishes the following in reply:

I understand from the sketches of the correspondent that his building is 18 ft. wide by 50 ft. long, that 12-in.



A Question in Concrete Floor Construction.

I-beams spaced 7 ft. apart and 18 ft. in length run across the building from wall to wall, and that the concrete is 6 in. thick reinforced with No. 10 gauge expanded metal.

With the expanded metal bent up over the supports and the concrete carried down to the lower flanges of the I-beam, as shown, the reinforced concrete slab is capable of sustaining a safe working load of 125 lb. per square foot in addition to the weight of the slab itself. This assumes the concrete to be carefully laid with a wet mixture in proportions about 1 part cement to 2 parts sand to 4 parts clean, broken stone or gravel.

But the principal questions which the correspondent asks are in connection with a drain 9 in. wide, and, I should judge from his sketch, about 5 in. deep, which must run lengthwise of the building—that is, across the slabs and over the I-beams. The slab is supported by the I-beams, and therefore the stress in them is at right angles to the I-beams. Consequently, even if the slab is cut clear through in a line at right angles to the I-beams, its strength will not be greatly affected.

To illustrate: Suppose we have a slab 7-ft. span and 18 ft. wide on the one hand, and two slabs, placed side by side, of the same span, but each 9 ft. wide; the two slabs would sustain substantially the same load as the one slab, which is the width of the sum of the other two. In the same way, placing a drain in the center of this floor which directly cuts the slab in two as far as the strength is concerned, does not appreciably reduce its strength. If the drain ran in the other direction—that is, parallel to the I-beams—the condition would be entirely changed and extra beams would need to be supplied under it to support each edge of the drain.

I will say, then, that for strength the beams which are shown by your correspondent under each edge of the drain are unnecessary. In order to give a greater thickness of concrete to prevent leakage from the drain, however, it may be advisable to thicken the concrete slightly just below the drain. The expanded metal can then be dropped, say, 1 in., directly under the drain so as to better protect the metal from moisture.

There will be a slight tendency for the concrete to crack in the bottom of the drain, due to the contraction of the floor surface on each side of it, but the expanded metal should be sufficient to protect this. Where the drain runs over the I-beams it will be best to cut the expanded metal, so that it can be properly bent up on each side of it, and the step cut out can be laid in short lengths under the drain and crosswise of it.

The other point—the effect of the filthy water upon the concrete—is a more serious one. Dirt of an ordinary character will have no effect upon the concrete, but animal grease, which I judge from the use of the building as a pork packing house, to be part of the refuse, has sometimes been known to disintegrate concrete.

The writer has known of concrete being entirely disintegrated in a ceiling over a vat in which animal fat was melted, the fumes coming up against the concrete and softening it, so that it had to be removed. On the other hand, the concrete in the parts of the same building against which the fumes did not directly strike was sound.

Cold fat has less effect upon concrete, and if the cement finish to the floor is made as rich as 1 part cement to 1 part good coarse sand, is placed before the concrete of the body of the floor has set, and is thoroughly troweled, it should be dense enough to prevent penetration of any liquid, and therefore the greasy water should have no appreciable effect. The Medusa compound, if used, will also increase the water tightness. The floor ought to be allowed to harden for at least 30 days before permitting any grease upon it. As a further precaution, if the floor load is designed for more than 100 lb. per square foot, the top finish coat of mortar should be in addition to the 6 in. thickness of the floor proper.

It may be said, then, that if no boiling fat or vapor comes in contact with the concrete it will undoubtedly stand better and be more economical than any other type of floor, and if the surface should be slightly affected in the course of years it can be recovered with mortar.

Estimates of Time Required in Framing Wooden Trusses.

From A. W., Omaha, Neb.—I am greatly interested in securing some data as to the time required to construct wooden trusses of various kinds, and I therefore come to the correspondence columns of *Carpentry and Building* with the suggestion that those who have had experience in this line send for publication the time required to frame wooden trusses, such, for example, as those shown in the chapter on the subject in Kidder's Architects' and Builders' Pocket Book. These include among others, king and queen post trusses for different spans; Howe trusses of various kinds; lattice trusses; wooden trusses with raised tie beams, such as scissors trusses of various construction; hammer beam trusses which are peculiar to the Gothic style of architecture; wooden trusses with iron ties, &c. Any information which the practical readers can furnish will, I think, prove interesting to many others besides myself.

Economy of Suburban Building Operations.

From C. F. A., Oakville, Conn.—I should be very glad to see published a series of articles on suburban building operations either on a small or large scale, showing not only plans and elevations of houses but especially the system by which the work can be most profitably carried on, with particular emphasis on labor or expense saving either in buying, handling or erecting the houses.

Note.—Possibly our correspondent will obtain some of the information which he desires from a careful perusal of the illustrated article entitled, A Typical Philadelphia Building Operation, published in the issue for March, 1907. We shall, however, be glad to have those of our readers who have conducted building operations upon a scale sufficient to show the economy of erecting buildings in numbers as compared with a single structure, send us for publication such data as may be available.

Constructing a Dumbwaiter.

From G. L. M., Tacoma, Wash.—For the benefit of "H. H. W." I submit a description of a very satisfactory dumbwaiter I have made, and which is inexpensive, at the same time requiring no apparatus other than can be found at any hardware store. I made my "cage" of $\frac{1}{2}$-in. spruce, although any light tough wood will answer equally as well. It was 16 in. deep, 24 in. wide and high enough for three shelves, including the bottom, the shelves being 12 in., 11 in., and 10 in. respectively. I made the sides to project about 2 in. below the bottom and 5 in. above the top. I dadoed the top, bottom and shelves and mortised a $\frac{7}{8}$ x 2 in. piece for a suspension bar immediately above and close to the top of the cage. A plan and elevation is presented in Fig. 1 of the sketches.

For guides or track I used a 1 x 1 in. strip on one side, and the pocket 4 x 5 in. outside as indicated, on the other. The "cook" of this establishment being left handed, the pocket was placed on the left side to make room for the hand rope, as shown in the sketch; also to save room by eliminating a pocket space on the other side.

For the guides on the cage 1 x 1 in. block, about 6 in. long, were glued and screwed on so as to fit on each side of the track on the top and bottom of the cage. A block at the top and bottom allow the cage to run easily and with less liability of binding than if the guides extended the whole length of the cage.

The cage is hung and balanced by common sash cord weights and pulleys, both the weights hanging in one pocket, as indicated in the plan view. The weights should weigh from 4 to 6 lb. more than the cage. It will require three-sash pulleys to hang the cage, and $\frac{1}{2}$ or $\frac{5}{8}$ in. Manila rope is run from the center of the top of the cage at X of the plan diagonally across the top of the shaft to Y, passing over a pulley at both places; then down the open space in front of the pocket to the bottom of the shaft; thence back to the center of the shaft and up to the center of the cage. This is for a hand rope to pull the cage up and down, and I used for it three extra large sash pulleys—two at the top of the shaft and one at the center of the bottom and one 3-in. awning pulley.

It will be advisable to rig a catch to hold up the cage, and for this purpose I made a spring latch, D, of hardwood to engage the underside of the top guide block and operated by a cord from the bottom of the shaft and by a thumb knob at the top. An idea of the construction of this feature is indicated in Fig. 2 of the sketches.

The door to the shaft is not shown in the sketches, but it should be wide enough to leave the space occupied by the hand rope open so as to give free access to the rope.

Referring again to Fig. 1, it may be stated that A A A are guide blocks, B the track, *b* the hand rope, *e* awning pulley, *d d* sash pulleys, *a a* weight ropes, C suspension bar and D the latch.

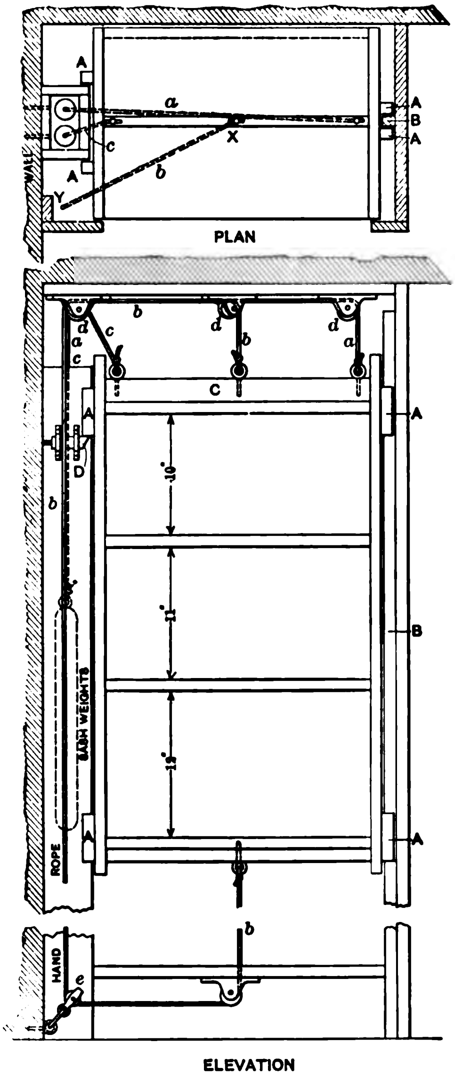


Fig. 1.—Plan and Elevation of Dumb Waiter.

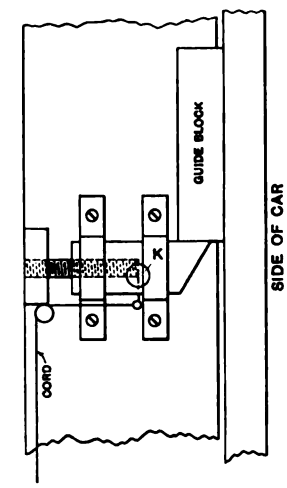


Fig. 2.—Detail of the Latch to Hold the Car.

Constructing a Dumbwaiter.—Sketches Accompanying Letter From "G. L. M."

Hip Rafters on a Building One End of Which Is Out of Square.

From T. J. H., Guthrie, Ky.—I have been a subscriber to your valuable paper, *Carpentry and Building*, for a few years, and I note from time to time that there are a number of questions sent in for debate and for information. I, therefore, send the following problem, which I am unable to solve to my entire satisfaction: My problem is that of finding the hip and jack rafters in the roof of a building of which I enclose a plan, one end being out of square. I have endeavored to solve it by the method explained and illustrated in Figs. 70 and 72, on pages 97 and 99 of *The Builder's Guide*, by I. P. Hicks, edition of 1901. I do not understand why the lines of the hips do not intersect at L of my diagram.

Answer.—The method of obtaining the lengths of the rafters explained in connection with Fig. 70, on page 97, of the work referred to, and employed by our correspondent in his diagram, which we reproduce herewith in Fig. 1, is correct. The diagram, Fig. 72, which we have reproduced in our Fig. 2, is, however, incorrect in drawing and the method explained is erroneous, as we shall show, in consequence of which he has been led to draw his hip lines from B and A to L, instead of to the point L′ of Fig. 1.

The roof surface A B F, of Fig. 1, considered geometrically, is simply a triangular inclined plane, one side, A B, of which, being horizontal, is correctly shown. The length of the side B F (one of the hips) has been correctly obtained, as shown by B F″, while the length of the third side A F is also correctly obtained at A F‴. With the three sides of a triangle given, there is but one method of constructing it, viz.: that of assuming one of its sides as a base, from the opposite ends of which as centers two arcs are drawn whose radii are respectively equal to the lengths of the other two sides, the said arcs being continued till they intersect. Thus, from point B of the side A B an arc whose radius is equal to B F″, the length of the longer hip, is drawn and continued to intersect another arc drawn from point A as center, with a radius equal to A F‴, the length of the shorter hip. Lines drawn from B and A to the L′, the point of intersection, will give the true shape and angles of this roof surface.

Observation will show that an arc whose center is K and whose radius is equal to the true length of the common rafter, shown by K F′, will also pass through the point L′. Of course, if the length of the common rafter were set off on the center line or line of the ridge, it would reach to the point L, as shown by extending the arc F′ L′ to cut the ridge line F G, and our correspondent is, beyond doubt, led to the conclusion that the hip lines should intersect at this point, because the author of the diagram shown in Fig. 2 has erroneously stated that the common and jack rafters should be drawn perpendicular, meaning, presumably, perpendicular to the line C A of Fig. 2, which represents a suppositional square front to the building, for he has in fact so drawn them.

The error of drawing them thus will be made plain if we suppose the inclined triangle of roof surface shown in the plan by A F B, of Fig. 1, to be hinged upon its horizontal edge A B and then lowered into a horizontal position; that is, into the plane of view. In such an operation it must be plain to any one that the point F as well as all other points of the roof must, as the surface revolves, move upon lines at right angles to A B. In proof of this, if the reader will draw a line from L′, of Fig. 1, through the point F and continue it to meet A B, such line will be at right angles to the line A B. With L′ established as the vertex of this portion of the roof, the hip lines must be drawn from that point to A and B and a line drawn from L′ to K will represent the common rafter, after which the jack rafters will be drawn parallel to the common rafter, when their intersection with the hip lines B L′ and A L′ will give the correct top bevels, while the side bevel will be that shown at F′.

While there may be reasons for running the rafters parallel in plan to the sides of the building, we believe it to be the common practice to run them at right angles to the plate. This would avoid any backing or beveling of the top of the rafter, which becomes necessary when running them as in Fig. 1, and would also, most likely, have avoided the error which has caused our correspondent's trouble.

We wish to call our readers' attention to the fact that this portion of the roof, having been laid out in accordance with directions given in connection with Fig. 70, viz.: that of making the distance A H equal to F H, thus becomes of a different pitch than that on the other portions of the building. This and the more important error previously discussed could have been avoided if the methods of descriptive geometry had been employed in obtaining the desired lengths and bevels.

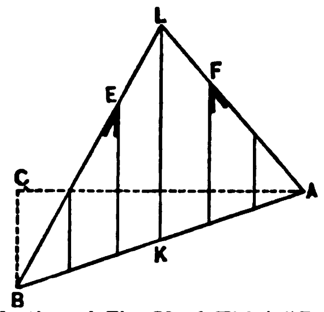


Fig. 2.—Reproduction of Fig. 72 of Hicks' "Builders' Guide."

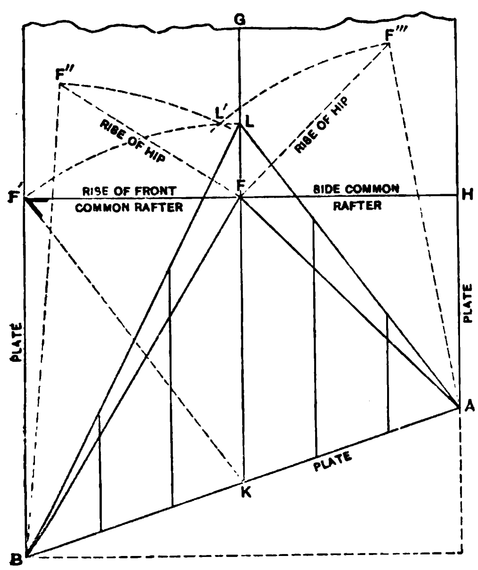


Fig. 1.—Reproduction of Correspondent's Diagram.

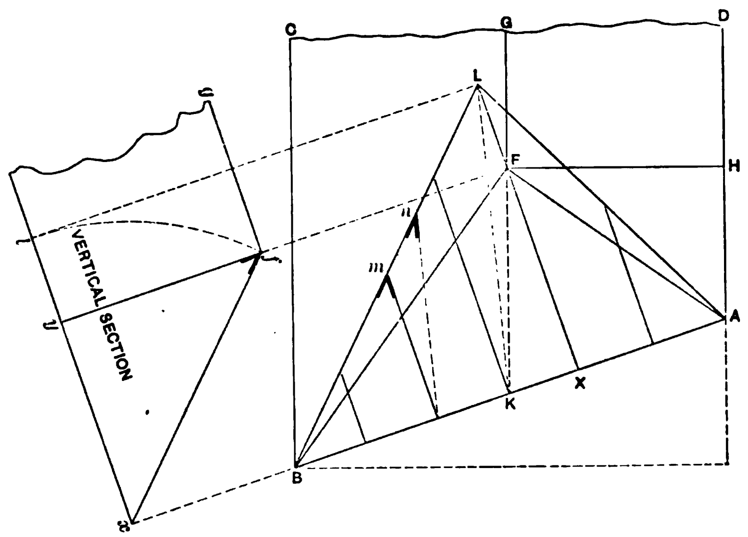


Fig. 3.—Solution of the Problem by the Methods of Descriptive Geometry.

Hip Rafters on a Building, One End of which is Out of Square.

To illustrate the availibility of those methods, we have introduced Fig. 3, which shows the plan of a portion of a building having an oblique front placed at the same angle as that shown in Fig. 1. The first thing necessary is to construct a section of the roof on a vertical plane at right angles to A B. To do this, first extend A B in either direction most convenient and at right angles to it draw *x y*, representing a horizontal line. From *x* set off on *x y* half the width of the building, as F H; that is, the run of a common rafter in the main roof, as shown at *y*, and at *y* erect a perpendicular line *y f*, equal to *x y*; that is, equal to F F″ or F F‴, of Fig. 1, and draw *f x*, which gives the length of the common rafter and makes the pitch of the roof the same on the front as on the sides. Now project the point *f* into the ridge line of the plan; that is, extend *y f* to cut the ridge line G F at F and draw F A and F B, then will A F B be the correct plan of the roof. Now from F draw F X at right angles to A B, which will be the plan or run of the common rafter.

The operation of revolving this roof into a horizontal plane as previously described, in connection with Fig. 1, can be accomplished in the sectional view by describing an arc from x as center with $x\ f$, the length of the common rafter, as radius, to cut the horizontal line $x\ y$ extended, as shown by the arc $f\ l$. The point l just obtained may now be projected into the plan to cut the line X F extended, as shown at L, and L A and L B drawn. This operation shows again that the point L cannot fall upon the line of the ridge F G. The jacks can now be spaced off on A B and drawn parallel to X L till they cut the hip lines L A and L B, when the top bevel will be that shown at *m* and the side bevel that shown at *f*. If it is desired to have the rafters run parallel to the sides B C and A D of the building, the common rafter can be drawn from L to K and the jacks drawn parallel thereto, as shown dotted. The top bevel of the jack would then be that shown at *n*, and the side cut would be obtained as shown, Fig. 1.

By the operations shown in Fig. 3 it is made plain that the true pitch of the roof is in the direction of the line F X and not in that of F K. In other words a marble released at F would roll toward X and not toward K.

G. W. KITTREDGE.

CONCRETE ARCHITECTURE.

AMONG the reports submitted at the recent Chicago convention of the American Institute of Architects was that of the Committee on Applied Arts and Sciences, by Irving K. Pond. This report dealt largely with the architectural aspects of concrete construction and is of such general interest that we present the following extracts:

Although the exact relationship existing between concrete and steel reinforcement under a given condition is yet to be accurately determined, and the structural use of reinforced concrete is yet to be reduced to an exact science, and although the manipulation of concrete and its application to structural uses has not as yet become an art, yet the fact that in its use and treatment there are immense scientific and aesthetic possibilities brings the subject of reinforced concrete well within the field of study of this committee, especially at this time when the general topics of steel structure and concrete reinforcement are before the Institute for discussion. It is essential throughout such discussion to keep clearly in mind the true and abiding status of architecture and the architect.

The Architect's Ideal.

The architect is not a mechanical fabricator of mathematical diagrams. His highest concern is with the ideal, and his first sketch should present an idea—an idea which is conceived in beauty. The past has demonstrated that architecture as the expression of the ideal can materialize in but one or the other of two great manners; that of the articulated structure, unit added to unit, and that of the plastic mass. The most noble development in the first manner is in the architecture of masonry (brick or stone), and this development has reached its logical limit; in no way, except, may be, in mere size, its least noble attribute, is it to be excelled. Under the vital art of this first manner lay an intuitive science; under the too transient beauty of the work of the second great manner lay nothing of science at all, and so this architecture has well nigh vanished except as some adherence to the principles of the first manner has interposed to save. And now comes the ghost of what might have been and calls for an incarnation, feeling (if a ghost can feel) that in reinforced concrete science is preparing a body which can be vivified with the spirit of art. If this feeling is substantiated, to the architect is opened up a new range of possibilities. The architect becomes in a sense a sculptor, a molder of monumental mass; not the fantastic figure who, at first, with sharply insistent blows and then with infinite persuasive tappings, releases the form imprisoned in the block, but a creative constructor who builds up his ideal and shapes it by the irresistible though tender molding of mass and form. In this the architect assumes no new function, but develops that feeling which by nature and of necessity inheres in the architectural mind. The architect as well as the sculptor revels in this feeling of mass taking form under his skillful manipulation; and the feeling for plasticity and for mass in flux is potent in the true architect even though he be designing in that most refractory medium, a masonry clad steel skeleton.

In most of his work the architect has to content himself with an intellectual substitute for real feeling, and his conscious delight is rather intellecutal than emotional, as the idea takes form in the sketch and in preliminary plan and elevation. His fingers may itch, they do itch, to feel the flow of the mass, but the feeling remains abstract and intellectual. Therefore, certain architects, if not indeed the architectural body general, are viewing with keen interest, when not actively aiding, the development of the possibilities of this fairly new and altogether plastic medium, reinforced concrete; a medium which really does flow and is molded, and through which the form appears in gracefully unfolding stages till the final mass stands revealed, a veritable unit. One cannot in thought connect with this materialization the shock of unloading beams, the rattling musketry of riveting, the petty and fussy application of fireproofing and surface coating. In fancy as almost in thought the architect sees the flowing mass take form under his own hands.

The masonary clad steel structure of to-day is an architectural anomoly, representing as it does rather a branch of engineering than of architecture; and it is doubtful if any treatment of the incrusting material, be it brick, stone or terra cotta, can make the structure architecturally interesting as compared, for instance, with the interest which attaches to a well designed brick cottage, or stable even. The steel structure, however, will continue to occupy its own domain. But the call of concrete is heard inviting architecture to occupy an as yet undeveloped territory.

Plastic Architecture.

Though the use of concrete goes back into antiquity, plastic architecture would seem to be in the veriest infancy, and would seem to be asking the genius of this age to give it perfect expression and make it worthy to stand with the architecture of the past and the yet to come. Though the past be examined for precedent little will be found. Rome used concrete in bulk, but undeniable evidence of a scientific use of the material is wanting. Rome employed masonry in bulk, but again evidence of a scientific use is wanting. Rome applied superficially the arts of other times and countries, but of itself left to posterity only monuments expressive of a highly temperamental force, breathing little or nothing of spirituality. Persia covered with stucco or veneered with beautiful tiles her masses of crude masonry. The Arabians and the Moors expressed their emotionalism in a plastic architecture decorated with a skim coat of ornamental plaster or an incrustation of tile, intricate in pattern and beautiful in color. The concrete of the mass was but mud, and the science of building was unknown. In such material beautiful day dreams were realized only to crumble when the spell was past. The Spanish missions were built with rare feeling for mass and light and shade, but feeling swayed and science did not guide. With the science of to-day to guide and the art experience of the past to illuminate, into what logical, noble and beautiful forms should not concrete shape itself, to the end of an enduring, spiritualized architecture.

In this study your committee has taken no cognizance of the concrete block as a structural possibility, believing that such blocks, as well as terra cotta used in the same manner, are mere imitations of stone, and when used after the manner of stone are impossible in the architecture of sentiment, and, like all imitations of one material in another, are inimical to art.

The possibilities, even the æsthetic possibilities, within the range of reinforced concrete construction, can hardly be overestimated. Little beyond the introductory chapter has been written in the history of reinforced concrete, and every advance in the science of its manufacture and use will signal an advance along the line of artistic application.

Except in well defined types, designed to serve certain well defined uses, it is impracticable so to carry masonry construction beyond and behind the façade as to result in a homogeneous structure—wanting which architecture becomes but a hollow sound. The architecture of a reinforced plastic material may and logically will express itself throughout the entire structure to the remotest core. The unity, the truth, the harmony of the whole may in every part be manifested. Therefore, again, the possibilities inherent in concrete present themselves alluringly to the architect to whom the art means as much as does the science of building.

The architectural brain is not so congested by the weight of pregnant thought that at a blow a Minerva shall issue forth full-fledged and full-armed. That is not the history of the evolution of an architectural style. It will take time, and struggle, and developed artistic perceptions in this, as in former cases, to reveal the possibilities of beautiful and of monumental design.

Molded Architecture.

It may well be conceived that a molded architecture, so to speak, an architecture of flowing and harmoniously interrelated masses, may not appeal immediately to the architect who has been taught that his art consists in naively piling up child's building blocks on a large scale. Whatever may be urged against the deadly dulling practice of following the line of least resistance in architecture, certain it is that a material in which it is easier, as well as more logical, to fashion new and appropriate forms than to follow cut and dried conventions, cannot be regarded as other than a vivifying factor in possible architectural development, and its advent hailed with delight. When architects relieve themselves of the notion that monumental architecture, for example, consists solely in a row of classical columns superimposed upon a basement pedestaled, it will be a wholesome day for the art they profess to practice. Probably ignorance, inability and self-distrust in the architectural ranks will remove to some more or less remote future the development of a monumental architecture expressing itself in new forms fashioned in new materials. Yet it is possible that, in this, as in other ages, commercialism, itself so devoid of aesthetic tendencies, will pave the way to the realization of an aesthetic ideal. A material which holds in itself the qualifications for commercial use will in that very use reveal its aesthetic possibilities. No material which puts into the hand of the architect power to produce permanent mass and form and add the enrichment of light and shade, color and texture, will long be ignored. when science has made its use commercially possible. It would then, seemingly, remain only for science to demonstrate the practical value of reinforced concrete, in respect to its physical properties, and art must unfold whatever it holds of beauty.

The steel skeleton developed from commercial necessity, and to clothe and protect that skeleton, the architect, naturally, used whatever means lay at his command; stone, brick, terra cotta and metal were called into requisition. To clothe the skeleton in one or another or all of these materials became a fixed habit with the architect. So that when concrete came into use, not only was it ignored as a possible clothing for steel, but when the skeleton of reinforced concrete was set up it was itself clothed after the existing fashion for steel. Such is the fatal force of habit! Granting to concrete the qualities ascribed to it, that it is fireproof, that it may be rendered moisture proof, that once in place it is not affected by atmospheric and climatic conditions, that it can be permanently colored, can be molded and chiseled, that it can be formed in place and need not be applied piecemeal—what better material could be sought for clothing the steel skeleton—and why the need of any cloak at all to such material when it has been treated with any manner of decency or respect by the designer? So aesthetically there would seem to be unlimited possibilities in reinforced concrete.

The pre-eminence of concrete for all manner of commercial work has not been established and may never be. The installation of reinforced concrete must proceed under favoring conditions of workmanship, moisture and temperature, and besides there must enter into the process an element of leisure which is now incompatible with the requirements of certain forms of commercial work. The erection of the steel skeleton, clothed after the established manner, can proceed independent of external conditions, and operations may begin, advance and terminate almost independently of the seasons, which thus will not seriously interfere with the uniform and rapid progress of a work of great magnitude. It is construction in wood, as well as certain classes of steel structures and of masonry building, that concrete seems destined entirely to supersede. But wherever conditions dictate the use of structural concrete, the æsthetic treatment of the material becomes incumbent on the architect.

Although it has not been its purpose to study that especial phase, it seems to your committee that the æsthetic possibilities inherent in terra cotta and faience as covering materials for the steel skeleton have not as yet been in the highest degree realizer, while, as stated before, concrete as a possible covering has been ignored. Simultaneously with their development in the field already assigned to them, it is not inconceivable that ornamental terra cotta, and tile, beautiful in color and texture, and also sculptured stone, will be called upon to embellish and distinguish, though not in any manner to clothe or conceal, the concrete structure. The pressure of these materials may be needed as a saving grace in these early days of design in concrete, to save designers from too brutal conception of the forms they deem the material must necessarily take. There is an unfortunate though marked tendency now in what should be a refined and restrained domestic architecture to shape concrete, and its lath and plaster imitations, into the crude though characteristic forms of the old mission work. It is needless to say that these forms have no meaning outside of their original environment and would not have existed there but for the exigencies of the case—the crude nature of the materials procurable and the absence of all skilled labor.

An Unusual Building Alteration.

An alteration of a private stable into an addition to an adjoining three-story residence has just been undertaken in East Fortieth street, Borough of Manhattan, N. Y., the job involving some rather interesting features. The plans filed for the improvement call for the enlargement of the dwelling by making the private stable adjoining into an ornamental addition connected with the residence at the first and third stories. A basement story is to be built under the present ground floor of the stable and finished with an ornamental area, while the side wall will be rebuilt with bays overlooking the yard of the dwelling and fitted with decorative windows having small lattice panes.

The first floor of the stable will be refitted as a study and music room in connection with the drawing room of the present dwelling. The top floor will be made into a studio and picture gallery connected with each other and lighted by new skylights, one of which will serve as a mansard for the stable, which as reconstructed is to harmonize with the design of the present dwelling. The remaining portion of the remodeled stable will be fitted as additional living and sleeping rooms. The plans for the improvements were drawn by Architect George B. de Gersdorff.

AN APARTMENT HOUSE of ornamental brick and stone and to cost $175,000 is now in process of erection at the corner of Audubon avenue and 170th street, Borough of Manhattan, N. Y. It will be six stories in hight, have a frontage of 100 ft. and a depth of 90 ft., and will contain 46 suites of rooms.

Corrugated Iron Roofing on Steel Construction

BY OLIVER TWIST.

To put on corrugated iron roofing of No. 20 gauge or heavier upon a steel frame structure is not one of the easiest of jobs, especially if one has had no previous experience. One method of doing such work when no sheathing is used and the iron has to be laid directly on the purlins is shown in the accompanying sketch, Fig. 1, of a section of such a roof, in which the purlins, which are of channel iron, are placed as shown and parallel to the side walls. This roof has a span of about 43 ft., more or less, and we used for the first row along the eaves, sheets 33 in. wide and 8 ft. long, and above that three 6-ft. sheets the same width, the purlin being spaced about 5 ft. 4 in. on centers, so that the top end of sheet should reach to the top edge of purlin, as in Fig. 1, and allow the next sheet above to overlap about 6 in. Although this is all the bearing they have, two men can stand close together in the center of supports without much deflection of the sheets.

To secure the sheets to purlin we use a roofing bolt, like Fig. 2, passing through the ridge of corrugations and hooking under the steel as shown, using first a lead washer close to the galvanized iron sheet, fitting the bolt tight, and then a galvanized iron washer and nut. These were put in every fourth corrugation and screwed down tight, taking care to have the bolt tight up against the top of the purlin. You will notice particularly that the bolt passes through the top sheet only, which allows for expansion and contraction of each sheet without tearing holes larger, and at the same time securing each sheet just as effectually as though it passed through both. The side seams are lapped two full corrugations.

The only piece of wood in the whole construction was a 2 x 10 in. piece along the eave, as shown in Fig. 1, which was used to spike an ogee eave trough to, and which could be dispensed with by fastening hangers to end of galvanized sheets.

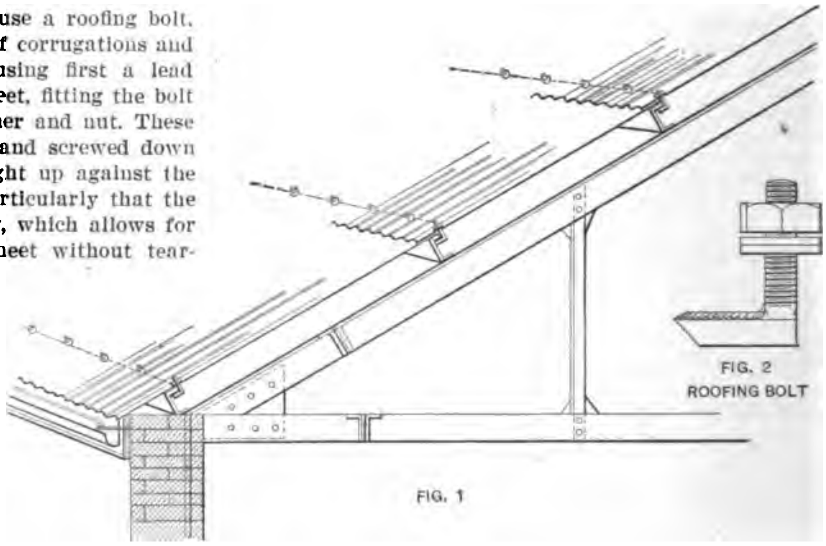


FIG. 2
ROOFING BOLT
FIG. 1

Placing Corrugated Iron Roofing on Steel Construction.

Lumber Production of the Lake States.

One of the greatest forest regions that ever contributed to the lumber activities of any country is comprised in what are known as the Lake States, and according to a preliminary statement just issued by the Bureau of the Census, they are rapidly falling behind in timber production. Statistics concerning the annual output of forest products collected by this Bureau in co-operation with the United States Forest Service from more than 2100 sawmill operators in Michigan, Wisconsin and Minnesota—the big three—have shown that the cut last year was only 5,500 000,000 ft. of lumber, which was 12 per cent. less than the cut of the preceding year.

The heavy inroads made in the exploitation of the timber resources of the large lumber States on the Great Lakes have been too much for the great forests, and the amount available for cutting is getting lower each year. The decadence of the lumbering industry in this region is forcefully illustrated in the drop in the white pine cut during the past ten years. Michigan's forests of this valuable tree were the richest in the world and were often said to be inexhaustible. The folly of such a statement is shown by the report that the cut of white pine in Michigan last year was only one-fourth of what it was in 1899, only eight years before.

In lumbering the forests no thought was given anything but immediate money returns, and consequently the countless fires running over the land, after the timber was stripped, have killed young growth over wide areas and greatly impoverished the soil. Now, 6,000,000 acres, or nearly one-sixth of the State of Michigan, known as the "pine barrens," have been thrown on the delinquent tax list and are a burden to the people. Under proper forest management this land would have been producing timber to-day. Between 1899 and last year the white pine production fell off nearly as much in Wisconsin as in Michigan. In Minnesota, the State which now contains the largest amount of virgin white pine, the decrease in the same period was nearly one-third.

Taking the three States together, pine constituted nearly 46 per cent. of the total lumber production in 1907, hemlock a little more than 27 per cent. and maple 10 per cent., the balance being made up mostly of basswood, birch, tamarack, elm, beech, oak, spruce, ash, and cedar in the order given. The pine is mostly white and Norway, which are grouped together under the general trade term of "northern pines." Pine made up over nine-tenths of the lumber produced in Minnesota, one-third of that produced in Wisconsin, and less than two-fifths of the total cut of Michigan.

Along with this great decrease in pine there have been relatively as heavy decreases in the most valuable of the hardwoods—oak, elm and ash. Little more than one-fifth as much oak was cut in the Lake States last year, for instance, as in 1899, while the cut of elm and ash was but half of that of eight years earlier. As is always the case, the decreasing supplies of the more valuable woods have caused those once considered of little or no value to be drawn upon heavily. This has been particularly true with hemlock, so that now more hemlock than pine lumber is manufactured in Wisconsin, and twice as much hemlock as pine is cut in Michigan. There have been heavy increases in the use of maple, birch and beech within the past few years, but the maximum cut of these species is probably near at hand; and taking all of the hardwoods together, there has been a slight falling off since 1899.

Treatment of Floors with Linseed Oil.

An inquiry as to how floors are treated with linseed oil in order to secure a good job is thus answered by the *Painters' Magazine* in one of its recent issues. Oiling floors is apt to darken the wood, and when a floor is oiled repeatedly it is apt to retain much dirt and dust. Floors that are much in use should not be oiled for this reason: A linseed floor oil or rubbing oil is best made from 8 parts by measure of raw linseed oil, 1 part turpentine and 1 part orange shellac varnish. The oil in the container must be shaken frequently during use, and it should be rubbed in thoroughly with a floor brush. Never use dark boiled linseed oil for a floor, and if you do not care to use shellac varnish with oil, then mix 1 pint of good oil drier with 9 parts of raw oil. Do not forget, however, that plenty of elbow grease is necessary for oiling a floor in workmanlike manner.

WHAT BUILDERS ARE DOING.

OWING to the filing of permits for several important office structures in the Borough of Manhattan, N. Y., the record of building operations for the month of July, covering the leading cities of the country, closely approximates that for the corresponding month a year ago. It is a noticeable fact that the heavy percentage increases which are shown are in the smaller cities, covering a widely scattered territory, but the amounts of capital involved are comparatively small. Important percentage decreases are found in connection with such leading cities as Philadelphia, San Francisco, Brooklyn, Cleveland, Minneapolis, St. Paul, and Buffalo, many of these representing localities in which building operations have heretofore been very active. The feeling seems to be quite general that if the situation develops nothing disturbing politically or financially during the remainder of the year the coming spring will witness a resumption of operations upon a scale which will compare most favorably with those existing two years ago.

Cleveland, Ohio.

The building outlook for the balance of the year in this city is somewhat more favorable than a month ago. Considerable new work was started during the latter part of July and early in August, and architects and builders are figuring on other work that was held up earlier in the season.

During July the city building inspector's office issued 622 building permits, amounting to $859,524, as compared with 758 issued during the corresponding month a year ago, amounting to $1,365,513. This is a satisfactory increase over June, when 543 permits were issued, aggregating $692,562.

Denver, Colo.

The city continues to make steady progress in the way of building improvements, and each month shows a volume of operations in excess of the corresponding period of last year when operations were upon no mean scale. During the month of July of the current year there were 276 permits issued from the office of Building Inspector Robert Willison calling for an outlay of $698,025. These figures compare with 223 permits for improvements, costing $524,850, in July last year. Of the total for last month permits were taken out for 153 brick residences, costing $372,400; for 3 apartment houses, costing $58,000; for 20 terraces, costing $68,000, and 16 business buildings, involving an outlay of $45,400.

Since the first of the year 1857 permits have been issued, calling for an outlay of $5,892,385, as compared with 1565 permits, involving an estimated outlay of $4,116,160, for the first seven months of last year.

Detroit, Mich.

The building situation in Detroit is, of course, no different than that of other cities this year. It is practically an acknowledged fact that building conditions are not as good anywhere as they were last year, and for the first four months of 1908 operations in Detroit were practically *nil*. Despite the falling off in the volume of building as compared to last year, there seems to be at present a noticeable improvement in building activities. This improvement will undoubtedly continue and greatly reduce the difference in favor of the year 1907 before the present year's operations are over.

Building permits issued during July, 1908, showed a falling off as compared with the same month in 1907, when they were nearly twice those of July this year. According to the records in the fire marshal's office, there were 218 permits taken out in July, 1908, for new buildings, at a total cost of $649,500, and for 56 additions, to cost $200,450, making the total $849,950. In July, 1907, there were 435 permits for new buildings, valued at $1,227,800, and 65 permits for additions, valued at $348,900, making a total of $1,576,700.

The total figures for the year to August 1 are $5,417,350. The total for the first seven months in 1907 was $8,889,800, making a difference of $3,472,450 in favor of 1907.

Building permits issued during the first week in August, 1908, show a good degree of activity in the various building lines, and denote that the "build now" movement is having a good effect. The largest building operation commenced the first week in August in this section is a new factory for the Ford Motor Company, costing several hundred thousand dollars. This, however, will be built just outside the city limits. Otherwise August would show a good gain over the operations as compared with the same period last year.

Los Angeles, Cal.

There has been an improvement in the building situation here, and the outlook is considered somewhat better. A number of fine residences and many frame cottages are under construction or planned as well as some modern business structures. During the month of July the number of building permits issued was 571, with a valuation of $1,352,290, as compared with 626 permits, with a valuation of $757,856 for the month preceding and 655 permits, with a valuation of $1,313,020 for the month of July, 1907. The unusual increase in the valuation showing for the month just ended is due to the permit for the Nelson Story Building, which alone amounted to $600,000.

The figures for the month represent every class of structure; but, as usual, residences greatly predominate. One-story houses to the number of 271 were begun during July, to cost $293,691; 28 one and one-half story houses, represent a total of $59,262, and 36 two-story houses, represent a total of $149,903.

Oakland, Cal.

A summary of the building work in Oakland for the fiscal year ending June 30 shows that there were issued during the year 3768 permits, with an aggregate valuation of $6,456,047, as compared with 5493 permits, with an aggregate valuation of $9,821,331 for the year preceding. Of the total, 2130 permits, with a valuation of $5,654,669, were for new construction, and 1656 permits, with a valuation of $801,377, were for repairs, alterations and additions; as compared with 3404 permits, with a valuation of $8,580,270, for new construction, and 2089 permits, with a valuation of $11,241,061, for the year preceding.

The total for the year ending June 30, 1908, included 20 brick and steel buildings, valued at $779,956; 15 reinforced concrete buildings, valued at $69,250; 21 corrugated iron and frame structures, valued at $54,160, and 2076 frame buildings, valued at $4,741,304. There were 1654 alterations, additions and repairs, valued at $801,377.

The volume of building work in Oakland and its environs is keeping up remarkably well, all things considered. The advent of the Western Pacific Railway is acting as something of a stimulant to the extension of Oakland, and the surrounding towns and new additions are being opened up constantly.

The Great Western Power Company has been granted a permit for the erection of a reinforced concrete switching station for its high tension lines in the eastern part of Oakland, near Trestle Glen, to cost about $40,000. A two-story fireproof structure, to cost upward of $100,000, is soon to replace the Altenheim, which was destroyed by fire a few weeks ago. The building is to be of steel and stone construction, with a wide main hall and two long wings. It will contain more than 100 rooms, and will be furnished with every modern appliance for the health and comfort of its inmates. A frame building of 40 rooms has already been built for temporary purposes.

Henry W. Taylor has made preparations to erect a unique and commodious mansion at a cost of about $100,000 on a very sightly terace in the Claremont District. The building has an extreme length of 290 ft. and a width of 40 ft.

New York City.

The feeling in the building world is that the situation is gradually assuming a more nearly normal condition, and that by the opening of spring, if all goes well politically and financially, confidence will have been restored to such an extent as to enable building operations to be conducted upon the same scale as of yore. This feeling of optimism is gradually being strengthened by the fact that the amount of capital which is being invested in building improvements is now slightly in excess of what it was for the corresponding period last year. The fact that current projects aggregate a greater cost than last year is due largely to the office buildings for which permits have recently been issued. Notable instances are the $10,000,000 permit for the new Equitable Life Assurance Society's Building, the $7,000,000 Municipal Building and Bridge Railroad Terminal, the $3,500,000 Post Office Building and the $3,500,000 skyscraper to replace the Tower Building in lower Broadway.

During July permits were issued by the Bureau of Buildings in the Borough of Manhattan for 52 operations, involving an estimated outlay of $12,281,750, as against 88 permits in July last year for structures calling for an expenditure of $5,887,450. Of the total for last month, $5,400,000 is the estimated cost of six office buildings for which permits were issued, as against three permits for similar structures a year ago, costing $800,000. The total last month was also swelled by the permit for a $2,000,000 hotel. There were 16 permits issued for what is designated as "tenement houses," estimated to cost $2,233,000, as against 29 permits for similar structures in July last year, costing $3,075,000. The estimated cost of alterations for which permits were issued was $1,402,792, which compares with $1,612,125 in the same month of 1907.

In the Borough of the Bronx 181 permits were taken out in July for buildings to cost $1,881,800, while in the same month last year 190 permits were issued, calling for an outlay of $1,902,900.

In the Borough of Brooklyn July shows 506 permits to have been taken out for building improvements, estimated to cost $3,306,405, whereas in July last year 597 permits were taken out for building improvements, estimated to cost $5,332,150. For the first seven months of the year only 2831 permits were issued for building improvements, including alterations, estimated to cost $19,590,935, which figures compare with 6135 permits for improvements, costing $50,-336,765 in the first seven months of last year.

Philadelphia, Pa.

While the volume of business transacted in the local building trades during July did not reach the total for the previous month, nor that for the same month last year, it is encouraging to note that the expenditure for work undertaken compares favorably with that of other normal years. Permits issued by the Bureau of Building Inspection during July numbered 805 for 1298 operations, at an estimated cost of $2,912,480—a decrease of but slightly over $100,000, when compared with July of last year. Of the total expenditure authorized last month, that for two-story dwelling houses aggregated $958,885, a falling off of about $150,000, when compared with the month of June; a gain of about the same amount, however, was to be noted in the amount of work begun in three-story dwellings.

The total expenditure during the month of July, however, has been exceeded but three times during the past 10 years for the same month, those of 1902, 1906, and 1907—in which years the building trades experienced an abnormal amount of business. Taking this into consideration, therefore, as well as the general depressed state of business during the current year, builders are inclined to view the situation more optimistically, and it is now believed that the volume of business which will develop during the last half of the year will show a much more satisfactory total. Confidence appears to have been restored to a considerable extent, and in a number of instances work which has been deferred for some months past has been started. The financial situation continues to improve, and with the reduced cost of building materials, which is evidenced in many directions, the tendency to take up projects which have laid dormant for some time is increasing.

There is considerable activity to be noted in suburban building, both in dwellings of the small and medium size, as well as those of a more elaborate nature, for which latter class quite a few plans have recently been posted.

A large delegation of the Members of the Philadelphia Master Builders' Exchange accompanied the Master Builders' Base Ball Team to Baltimore, Md., on July 29, where they were entertained by the Baltimore Builders' Exchange, and later engaged in the annual ball game with the team representing the Baltimore Exchange. After visiting the Baltimore Exchange the visitors were taken to Yokels Park, where a Maryland Crab Lunch was served. The annual ball game followed, and resulted in favor of the Philadelphians, by the score 6 to 3. The local builders speak most highly of the hospitality of the Baltimore builders, and a return game has been arranged, to be played in this city on August 19, when the Baltimore team and delegation will come to Philadelphia as the guests of the local Exchange.

San Francisco, Cal.

Thus far there has been no cessation in building operations, in spite of predictions that things would quiet down during the latter part of the year. If two-thirds of the buildings now in plan are commenced this fall, there will be employment for a large force of mechanics. The finishing of the buildings now under way is occupying the time of the bulk of the available help now in the city, especially in the line of interior work, plumbing, &c. Several large steel frames are now going up, and a number have been finished within the last month. The building permits issued during the month of July numbered 569, with a total valuation of $3,139,027, as compared with 638 permits, with a valuation of $2,351,211 for the month of June, and $4,752,778 in July last year.

The classification of the July permits is as follows: Class "A," 3 buildings, $720,000; Class "B," 2 buildings, $131,500; Class "C," 36 buildings, $858,332. Frames, 327 buildings, $1,234,619; alterations, 201 buildings, $194,-576.

Building materials of all kinds are still comparatively low in price, and everything except the supply of money is favorable for a continuance of the erection of business blocks, apartments, &c., until the entire downtown section is rebuilt. Lumber prices have dropped still further, and lumber is now selling on a basis of about $10.50 per thousand, wholesale, for rough merchantable fir. Redwood has dropped proportionately. Common brick are also low in price for this section. The Holland Sandstone Brick Company is offering its sand-lime brick at $12.50 per thousand, delivered on the job. The difficulty of borrowing money for building purposes is still limiting the number of new buildings started, and it is claimed that some of the local savings banks are refusing to accept large deposits, as they hesitate at the risks of reloaning the money at present.

Out of $450,000 of the surplus left over from the relief fund contributed to the sufferers in the San Francisco disaster of April, 1908, the city authorities of San Francisco have just built a Relief Home for the Aged and Infirm, which will afford accommodations for a total of 566 persons. It consists of a main group of nine buildings—the administration building, four buildings for women and four for men, besides two additional buildings for men, two rooms for social purposes, a chapel, a dining room and an annex. Each of the main buildings about the administration building is 165 x 45 ft., contains 27 rooms and will accommodate 54 occupants. The buildings for women are on the right, and those for men on the left of the administration building.

Spokane, Wash.

The number of permits issued during the month of July was 182, calling for an estimated expenditure of $433,560, while in July last year 157 permits were issued for building improvements, calling for an outlay of $478,303. From this it will be seen that while the number of operations increased, the amount of capital involved showed a loss of 9 per cent. The improvements were made up, for the most part, of dwelling and minor business structures. The feeling is that there will be a reasonable volume of operations during the remainder of the year, but no records are likely to be broken.

The Roofing Slate Trade.

The following is taken from a report of the United States Geological Survey by A. T. Coons:

The greater part of the slate quarried in the United States is made into roofing slates. Produced almost entirely in the northeastern part of the country, these slates are shipped all over the United States, and are also exported to a small extent. A few years ago, during the strikes in the famous Welsh quarries, they were shipped in large quantities to England and English colonies. The great durability of slate as a roofing material overcomes to a large extent the disadvantages of the weight of the roof and of the cost of slate as compared with cheaper and lighter materials, and also unfavorable labor conditions. The scarcity and high price of shingles also have served to keep slate in favor both for local use and for shipment.

Size of Roofing Slate.

Roofing slate as put on the market is sold by squares, a square meaning a sufficient number of pieces of slate of any size to cover 100 sq. ft. of surface on a floor, allowing a 3-in. lap. The approximate weight of roofing slate of ordinary thickness is 650 lb. per square, and the slate is generally shipped in carload lots of from 50 to 100 squares per carload, according to the size of the pieces. The sizes of slate in a square vary from 24 x 16 in. to 9 x 7 in., and the number of pieces necessary for a square varies from 85 to 686, according to the size of the pieces. The thickness of ordinary slate is 1/8 to 3-16 in., slates less than 1/8 being sold at a discount, as they are more liable to breakage, while those over 3-16 command higher prices.

The price per square depends on the size of the pieces, the quality of the slate, and the uniformity of the pieces as to thickness, smoothness and straightness. The color of the slates, which varies considerably, also affects the price. Among the distinguishing colors are the black, dark gray, green and red of Arkansas slates, the very dark gray of California and Maine slates, and of the Maryland-Pennsylvania Peachbottom slates, the black of New Jersey, the red and green of New York, the bluish black, dark gray, and dark green of Pennsylvania, and the dark grays, green, purple and bluish black of Vermont slates. Some of these slates fade somewhat on exposure to the sun, and are therefore not considered entirely satisfactory by some, though their other roofing properties remain unimpaired. On the other hand, these fading slates are often preferred as giving a softer tone and assisting in producing a roof of more beauty than the brighter slates. Roofing slates of cheaper quality are also made of mottled and ribboned slate, it being possible to conceal these deficiencies of color and appearance under the lap of the slate.

Prices of Slates.

The prices per square of slate of good quality and of ordinary thickness range from $3.75 to $10, free on board at quarries, the highest prices being for New York red slate. Slate of an inferior quality or color is quoted as low as $2.75 per square, while squares of selected pieces over 3-16 in. thick are quoted at much higher prices. The prices per square vary from month to month, and the freight rates, changing according to point of shipment, range from $1 to $1.75 per square to places west of Pittsburgh and east of the Mississippi to nearly $8 per square to San Francisco and along the Pacific coast, the only local source of supply for the West being in Eldorado County, Cal.

Among the uses of slate other than for roofing are for blackboards, school slates, flooring, sinks, laundry tubs, grave vaults, sanitary ware, electrical switchboards, billiard and laboratory table tops, mantels, hearths and caps. Slate used for these purposes is known as mill stock and is sold either by the quarreymen to milling companies or is milled by the quarry operators who have their own mills. It is generally sold in the form of slabs from 1 to 3 in. thick, the price varying according to the thickness and to the work done on the slab. Maine, Pennsylvania and Vermont produce nearly all the mill slate, and Pennsylvania reported the only slate that was used in 1907 for blackboards and school slates.

The Slate Trade During Late Years.

During the years since and including 1903 the slate trade has been more or less adversely affected by the financial condition of the country or by labor troubles in the building trades and strikes in slate quarries, by the use of tiles, concrete, shingles and of patent roofing processes and cheaper grades of material for roofing, by the high price and scarcity of labor, and by a decrease in the export trade. In 1907 there were nine States producing a commercial output of slate in the United States. These States were Pennsylvania, Vermont, Maine, Virginia, Maryland, New York, California, Arkansas and New Jersey, named in order of value of output. In 1906 Georgia reported an output and New Jersey had no production in that year.

Slate valued at $6,019,220 was quarried and sold in the United States in 1907. This is an increase of $350,874 over the value reported for 1906, which was $5,668,346. The production in 1907 represents the largest output since 1903, when it was $6,256,885, the largest production of slate in the history of the United States. In 1907 the production of roofing slate was reported as 1,277,554 squares, valued at $4,817,769; in 1906 the figures reported were 1,214,742 squares, valued at $4,448,786, an increase in 1907 of 62,812 squares in quantity and of $368,983 in value. The increase in average value per square from $3.66 in 1906 to $3.77 in 1907 was 11 cents. Producers generally reported an advance in price per square on account of increased cost of supplies and from scarcity and increased cost of labor.

The Building Situation in San Francisco.

Architects who are engaged on plans for numerous business buildings and apartment houses say that there is enough work in sight to keep up a good average record for the remainder of this year. There are several apartment buildings under consideration. They range from four to six stories and vary largely in dimensions. Like most of the commercial buildings now under consideration, they are of class C or class B type. For the present it seems the larger steel frame construction which marked building activities in the past two years is temporarily checked. Owners are beginning to evince a more general inclination to lay foundations for tall buildings, and to construct but two or three stories for the present, making the walls and columns strong enough to carry as many as five more stories, which they intend to add in the future, when conditions are more conducive to heavy investments. In the outer districts flats and homes are springing up with the same rapidity as has characterized this class of work since the fire.

The comparative prices of building materials in San Francisco in April, 1907, and in July, 1908, are as follows:

	April, '07.	July, '08
Lumber, per M	$32.00	$14.00
Common brick, per M	12.50	9.00
Crushed stone, per cubic yard	2.25	1.65
Gravel, per cubic yard	2.25	1.65
Lime, per barrel	1.90	1.20
California cement, per barrel	2.05	2.15
Imported cement, per barrel	3.10	2.85
Three-in. terra cotta partition tile, each	.07½	.06
Hardwall plaster, per ton	14.00	11.00
Face brick, per M	45.00	42.50
Steel erected, per ton	80.00	72.00

The decline in building materials is not without its effect in stimulating new operations.

New Publications.

House Painting, Glazing, Paper Hanging and Whitewashing.—By A. H. Sabin. Size 5 x 7½ in.; 121 pages. Bound in board covers. Published by John Wiley & Sons. Price $1.00, postpaid.

This is referred to by the author as a book for the householder, the statement being made that "for every man, woman and child in the country more than a gallon of paint is used every year, and the relative amount is increasing." Paint is a necessity as well as an economy, for it is a means of sanitation, and it tends to keep us warm in winter and dry in summer; it brings light into dark corners and beautifies the home. The author states that it is not his purpose to enter largely into the theory of paint manufacture, nor to describe the thousand and one purposes for which special paints and varnishes are made, but to tell simply and plainly the use of preservative coatings of one sort and another for the protection and ornament of our houses.

The work is divided into sections rather than chapters, these dealing with materials, pigments, care of paint, brushes, exterior and interior painting, varnishing, floor finishing, painting structural metal, glazing, papering, whitewashing, kalsomining, and, finally, cold-water paints. The author states that an experience of many years in the manufacture and use of paints and varnishes is the foundation of the knowledge set forth.

The Building Mechanics' Ready Reference.—Cement Workers' and Plasterers' Edition. By H. G. Richey. Size 4½ x 7 in.; 458 pages. Numerous illustrations. Bound in leather. Gilt edges. Published by John Wiley & Sons. Price $1.50, postpaid.

The extent to which cement and concrete is at present being used in connection with various forms of building construction, renders both timely and instructive this cement workers' and plasterers' edition. In preparing it the author had in mind the fact that there is very little literature available for the use of the ordinary mechanic or worker in cement and concrete, for while there are a number of works devoted to the subject, they are, for the most part, written from the engineers' standpoint, and largely for the use of engineers. A large amount of the information contained in the book has been presented in the form of tables so that the mechanic can at a glance find what he wishes to know and which will expedite his work.

The book is comprised in eight parts, or chapters, the first dealing altogether with cements, the second with concrete, including aggregates, mixing, strength, composition and specifications. The third deals with mortar and materials for making reinforced concrete, forms and centering, short cuts, &c. Part 4 takes up sidewalk construction, curbs, coping, &c., and tells the effect of various actions on concrete, giving tables for estimating cement work and also for excavation work. Part 5 is devoted to cement blocks, including tests, specifications, building regulations for the use of blocks, materials and manufacture of cement blocks, &c. As there is a very large number of mechanics who are engaged in both cement work and plastering, the author has introduced a chapter devoted to plasters and plastering. The last chapter in the volume is given up to rules for superintending concrete construction, tables of strength, weight, &c., mensuration and miscellaneous tables, wage tables, various receipts, hints, &c., together with a few "odds and ends for the noon hour." Owing to the rapid advancement of cement and concrete work, the author has introduced a chapter on laying out work, this being especially intended for the mechanic, who is often called upon to work from drawings, and it is therefore essential that he should have a full knowledge of how to lay out any part of the work upon which he may be engaged.

Competitive Designs for Cement Houses at Moderate Cost. 52 pages, each 15 x 19 in. in size. Portfolio form. Published by the Association of American Portland Cement Manufacturers. Price, $1, postpaid.

The prize plans for concrete houses which were designed and submitted during the recent competition conducted by the Association of American Portland Cement Manufacturers have been published in book form, the matter being arranged so as to be most convenient for reference. The designs are 24 in number, and embrace plans, elevations, &c. In the make up of the matter the right-hand page is given up to half-tone engraving of the front elevation accompanied by comments of the Examining Committee and a description of the design, while on each left-hand page is shown the floor plans, together with side and rear elevations. The work is issued in portfolio form for the sake of greater convenience and beauty. The extent to which concrete houses are at present being erected makes this portfolio of designs of unusual interest and value to the building fraternity.

Building Activity at Gary, Ind.

In the category of growing towns it is doubtful if any of them can show a better building record for the year beginning July 1, 1907, and ending July 1, 1908, than Gary, Ind. During that period, in which Gary has advanced from a town of only a few hundred population to one of 10,000, 469 permits for business and dwelling houses have been issued from the building department of the city in charge of Building Commissioner William H. Kliver. Of the 469 houses that were erected in that time, the 500 houses erected by the Gary Land Company in the First Subdivision are not included, says the Gary *Tribune*. These houses were under construction and many of them were practically completed when the building department of the city was established with Mr. Kliver at its head. However, if one were to add the 500 houses of the Gary Land Company in the First Subdivision together, with probably 200 other houses scattered about the town, the grand total would be in the neighborhood of 1200 business and dwelling houses in Gary at the present time.

In the light of the rapid advancement of Gary in comparison with other towns this is to be considered no mean figure. In older, more settled communities it is doubtful if the number of houses of every description erected in one year would exceed 100 to 150. The most promising feature of the report of the building department of Gary is the fact that the number of buildings shows no sign of a decrease. Negotiations are already under way for a large number of homes and business dwellings, and if the plans of the contractors are carried out Gary will witness within the next two or three years the greatest building boom that any town in the United States has ever experienced.

A rough estimate of the number of houses, business and dwelling, now in course of erection in Gary would be about 100. The majority of the business buildings at present under construction are on Broadway, north of the Wabash Railroad, and on Fifth avenue. On both the east and west sides of the First Subdivision houses are being erected by private parties. On the south side of town building is at present very active, the number of dwellings being in excess of the business houses.

Building Commissioner Kliver reports that the trouble which he found so prevalent some time ago with the contractors of this city in regard to starting the construction of building without applying for building permits has stopped almost entirely. The builders in Gary are now beginning to realize, according to Mr. Kliver, that it is necessary for them to be on good terms with the building department and comply with the provisions of the building ordinance.

The Portland School of Trades.

At the last meeting of the National Society for the Promotion of Industrial Education, State committees were formed for carrying on the work. The Board of Education in Portland, Ore., now makes the announcement that at the beginning of the school year in September there will be established under the direction of the board, the Portland School of Trades, the object of which will be to furnish the boys of the city instruction in some trade in order that they may be better fitted for their life work. Opportunity will be given for instruction in carpentry, cabinet making, pattern making, architectural and mechanical drawing, plumbing, electrical construction, &c. Such academic branches as English, mathematics, applied physics and electricity, as well as industrial chemistry, will be included in the course. Special attention will be given to these subjects as they relate to or have a bearing on the trade work. The course will be three years.

In constructing the Hudson Terminal Buildings occupying the area bounded by Church and Greenwich streets on the east and west and extending from Fulton to Cortlandt streets, Borough of Manhattan, New York, 170,000 cu. yd. of material were excavated for the substructure which forms the station proper, while 60,000 cu. yd. of concrete reinforced with 1000 tons of twisted steel bars were used in the construction of the foundation walls, column footings and floors.

CONTENTS.

TOWER OF METROPOLITAN LIFE INSURANCE COMPANY'S BUILDING
FACING MADISON SQUARE, NEW YORK CITY.

LE BRUN & SONS, ARCHITECTS

Carpentry and Building

New York, October, 1908.

A Shingled House at Riverhead, Long Island, N. Y.

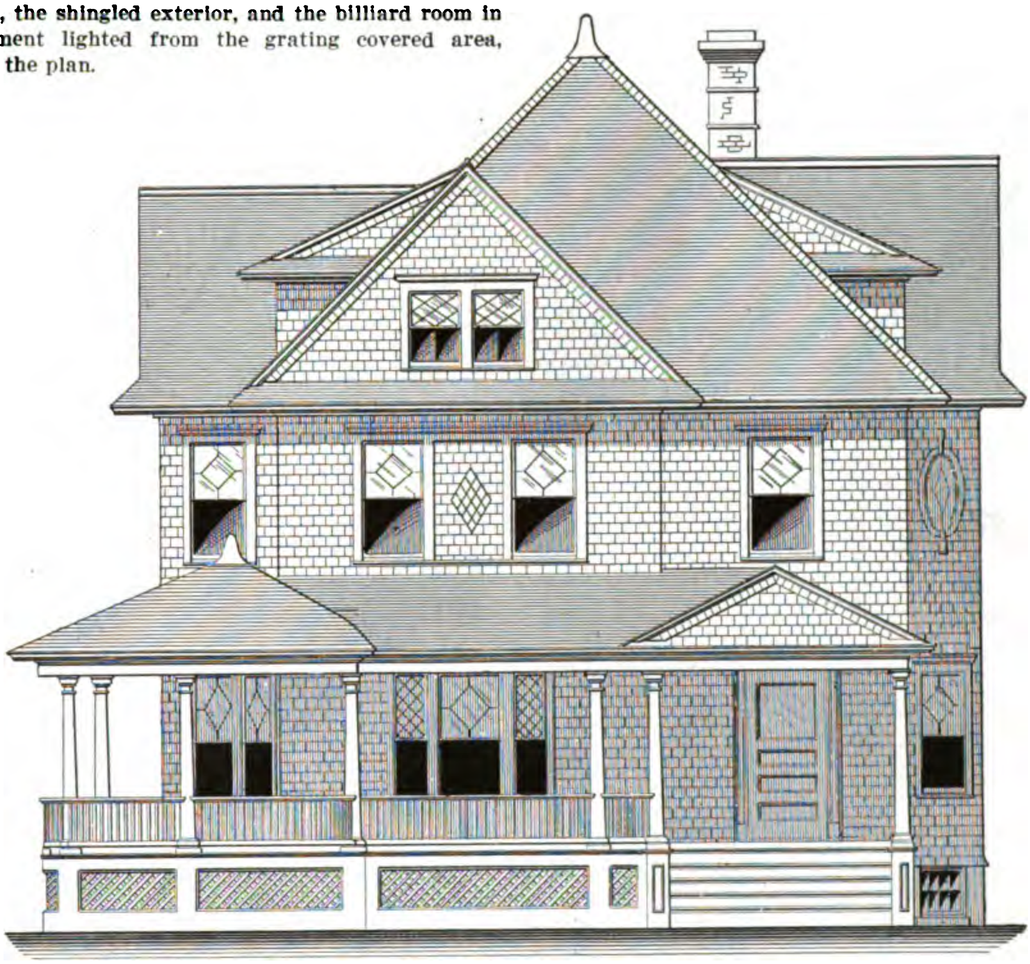
We have taken for the subject of our half-tone supplemental plate this month a two-story and attic frame dwelling, recently erected at Riverhead, Long Island, and embodying architectural points likely to prove of interest to many of our readers, especially those contemplating the erection of a house of their own or for a possible client. Noticeable features are the broad veranda extending entirely across the front and partially around one side of the dwelling, the gable and dormer treatment, the shingled exterior, and the billiard room in the basement lighted from the grating covered area, shown on the plan.

are laid 6 x 18 in. cypress shingles, exposed 5 in. to the weather.

The veranda floor is 1⅛ in. cypress, laid in white lead joints, and the columns are of the interlocking type, 8 in. in diameter, made by the American Column Company, Battle Creek, Mich.

The balcony floor is of Meurer's "Old Method" tin, with a slat floor over it.

In the billiard room in the basement is a wooden



Front Elevation.—Scale, ⅛ In. to the Foot.

A Shingled House at Riverhead, Long Island, N. Y.—Architect, Edwin H. Blume.

According to the specifications of the architect, the foundation walls are of hard burnt brick laid in Portland cement mortar, with struck joints. The house is mortise frame, with sills and girders 6 x 8 in.; first floor and attic beams, 2 x 8 in., and second floor beams, 2 x 10 in., placed 16 in. on centers. The corner posts, ties and bearing partition caps are 4 x 6 in.; window studs, 3 x 4 in.; door studs, 4 x 4 in., and intermediate studding, 2 x 4 in., all spaced 16 in. on centers. The rafters are 2 x 6 in., spaced 20 in. on centers. All framing timber is spruce. The entire building is sheathed diagonally on the outside with ⅞ x 8 in. tongued and grooved North Carolina pine, over which is placed red, rosin sized sheathing paper, well lapped, this in turn being covered with 18 in. random width Washington cedar shingles, laid 5½ in. to the weather. The rafters are covered with 1 x 2 in. shingle lath, on which

floor, while the balance of the area has a floor of Rosendale cement concrete base, finished with ½ in. of Portland cement.

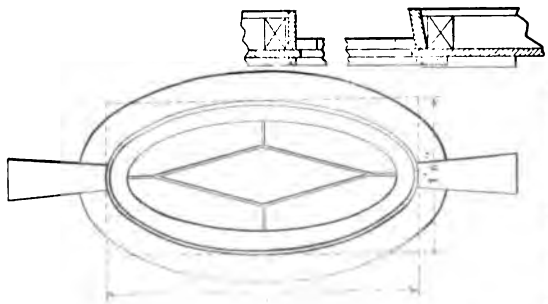
The walls and ceilings of the first and second stories, except the bathroom and the kitchen, are plastered with King's Windsor cement hard finish. The bathroom is finished 4 ft. high with Keene's, and blocked off in 3 x 5 in. rectangles. The kitchen is ceiled with ⅝ x 2½ in. tongued and grooved V-joint North Carolina pine.

The billiard room, as well as the approach to it and the stairways leading to the basement, have a rough sand finish. The living room and hall are finished with a neat plaster cornice.

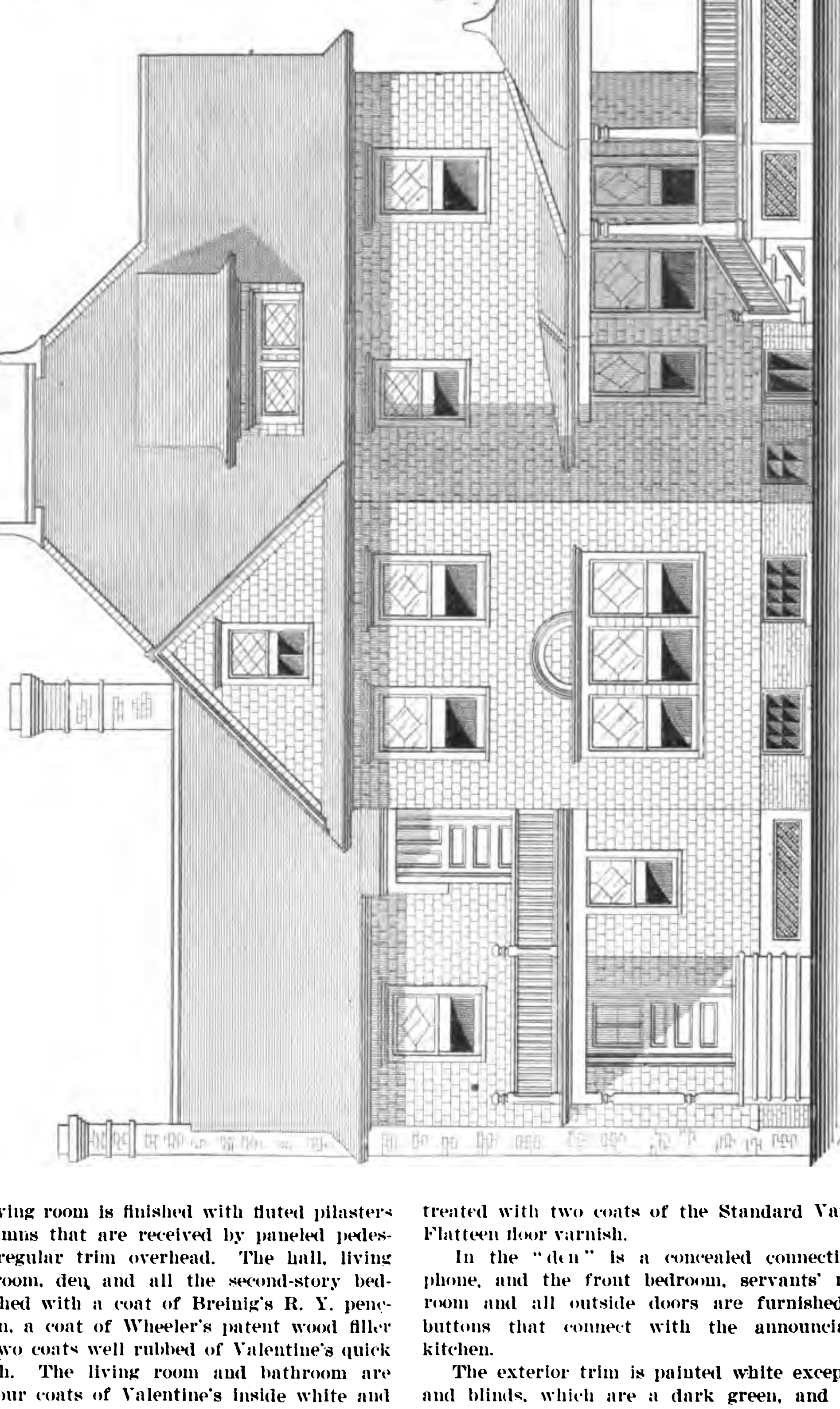
The floor beams in the first and second stories, with the exception of the bathroom, are covered with ⅞-in. North Carolina pine, over which is a layer of paper and then a finish floor of ⅞ x 2¼ in. North Carolina pine comb grain flooring. The finish floor in the bathroom is ¾ x 2¼ in. maple, while the attic floor is ⅞ x 8 in. North Carolina pine. All trim throughout is cypress.

The dining room is finished 4 ft. high with a panel wainscoting having a molded cap on top. The billiard room has a beamed ceiling. The cased opening between two coats of enamel. The kitchen is finished with a coat of wood filler and two coats of the above mentioned varnish flowed on. The billiard room is finished in a similar manner.

The first-story floors except the kitchen are waxed, while the floors of the kitchen and second story



Details of Ornamental Window in Bedroom Over Den.—Scale, 1½ In. to the Foot.



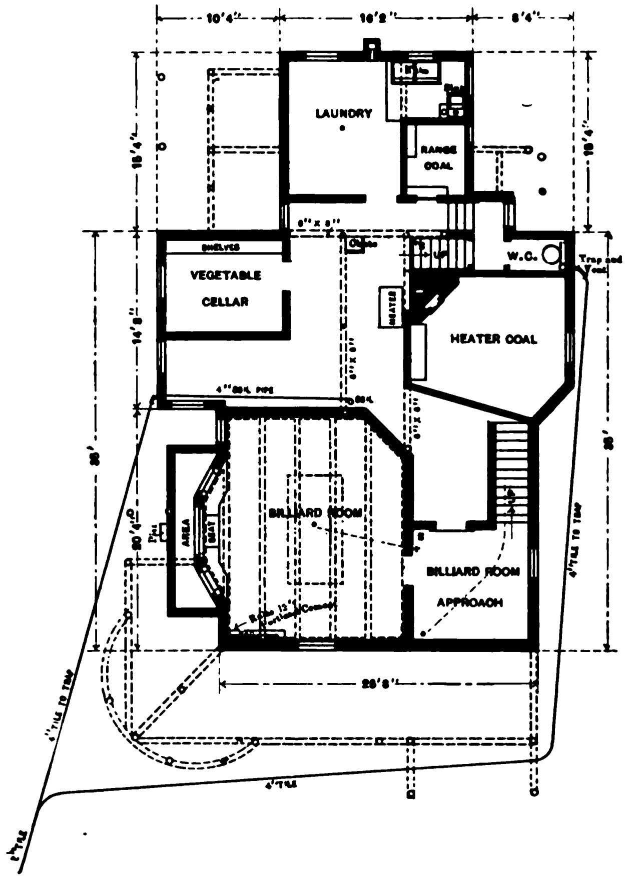
A Shingled House at Riverhead, Long Island, N. Y.—Side (Left) Elevation.—Scale, ⅛ In. to the Foot.

the hall and living room is finished with fluted pilasters and fluted columns that are received by paneled pedestals, and the regular trim overhead. The hall, living room, dining room, den, and all the second-story bedrooms are finished with a coat of Breinig's R. Y. penetrating oil stain, a coat of Wheeler's patent wood filler to match and two coats well rubbed of Valentine's quick rubbing varnish. The living room and bathroom are finished with four coats of Valentine's inside white and treated with two coats of the Standard Varnish Works Flatteen floor varnish.

In the "den" is a concealed connection for telephone, and the front bedroom, servants' room, dining room and all outside doors are furnished with push buttons that connect with the announciator in the kitchen.

The exterior trim is painted white except the lattice and blinds, which are a dark green, and the veranda floors are painted a drab. The shingles are left to weather out.

The plumbing in the bathroom consists of a 5-ft. Occident tub, an Ophir lavatory and a Delecto closet, all



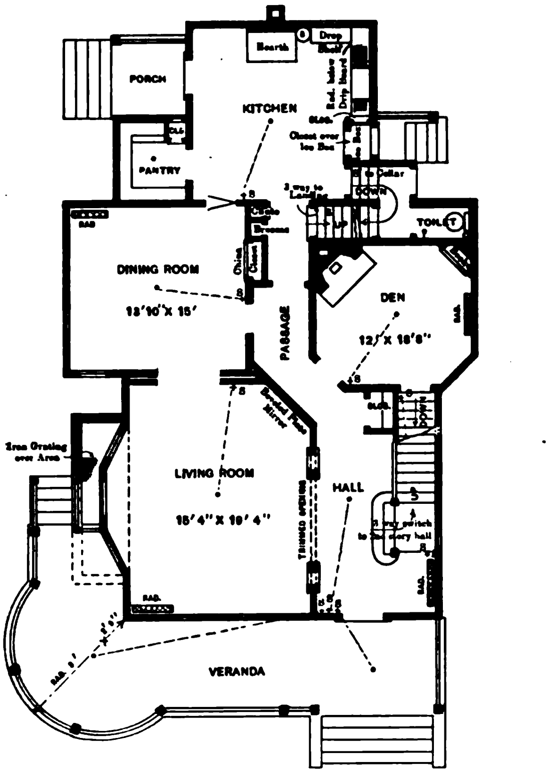
Foundation.

dry set and a No. 3 brass cylinder Douglas pump, supplied with a 30-in. brass point and tin lined galvanized iron pipe. The house is wired and generously supplied with switches for electric lighting, as indicated on the floor plans.

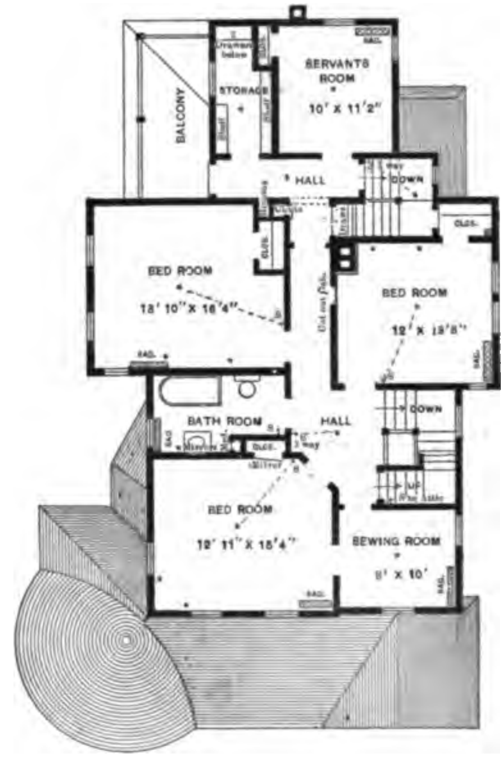
The building is heated with an American Radiator Company's Ideal sectional boiler, which supplies the radiators marked on the plans. All piping showing in the billiard room and the approach thereto are neatly bronzed, while the balance of the piping in the basement is wrapped with H. W. Johns sectional covering. The boiler is plastered with 1 in. of plastic asbestos cement.

The dwelling here shown was erected for H. H. Williamson, editor of the Riverhead *News*, in accordance with plans prepared, and the work of construction supervised by Edwin H. Blume, architect, Riverhead, N. Y. The contractor for the building was D. Stanley Corwin, Greenport, L. I., N. Y., and the heating and plumbing

View in Dining Room, Showing Finish.



First Floor.



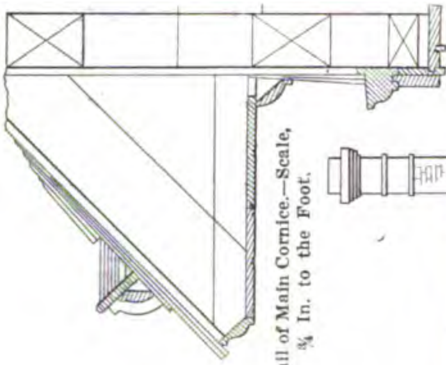
Second Floor.

A Shingled House at Riverhead, Long Island, N. Y.—Floor Plans.—Scale, 1-16 In. to the Foot.

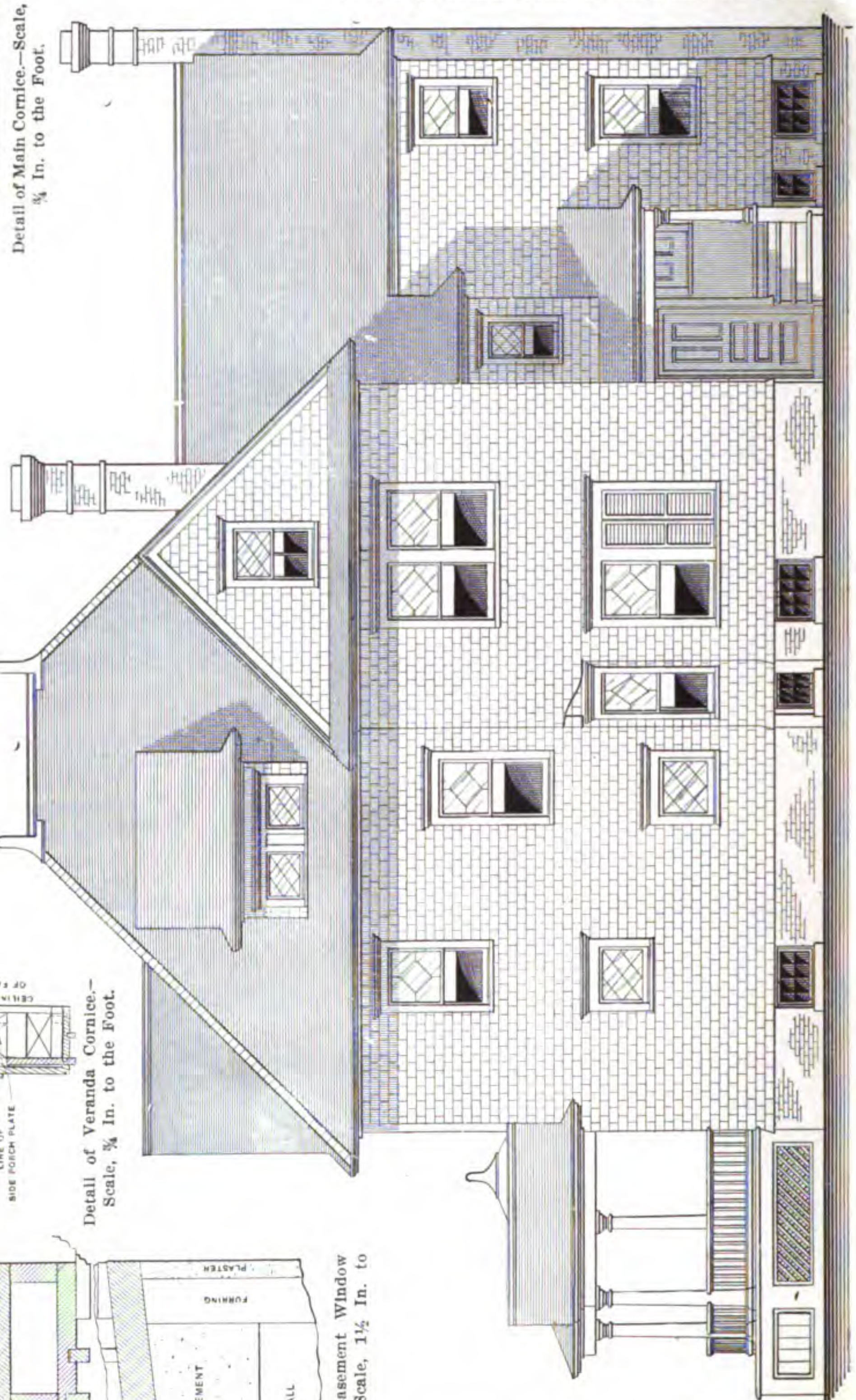
made by the Standard Mfg. Company. In the toilet room is a Kolo water closet, made by Fred Adee Company, New York City. The kitchen is supplied with one of the Standard Mfg. Company's enameled iron sinks, a 40-gal. copper boiler and a No. 290 Thatcher range of the portable type. In the laundry is a two-part Alberene laun-

contracts were executed by J. Irving Edwards, also of Riverhead, N. Y.

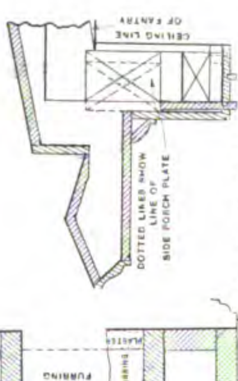
All sorts of excuses are offered for doing jobs in an unworkmanlike manner, but they are not always accepted as satisfactory. In a recent case where freezing weather was pleaded for doing work on some houses in Iowa in a way it should not have been executed, the Supreme Court of that State has ruled that "if it were to be con-



Detail of Main Cornice.—Scale, ¾ In. to the Foot.



A Shingled House at Riverhead, Long Island, N. Y.—Side (Right) Elevation.—Scale, ⅛ In. to the Foot.



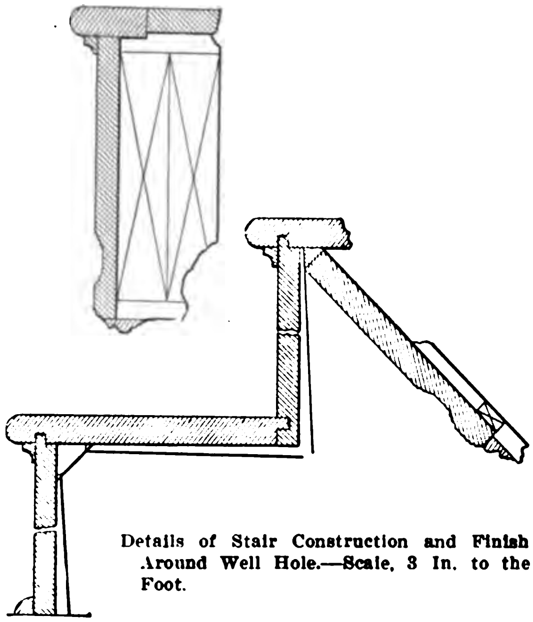
Detail of Veranda Cornice.—Scale, ¾ In. to the Foot.

Details of Basement Window Frames.—Scale, 1½ In. to the Foot.

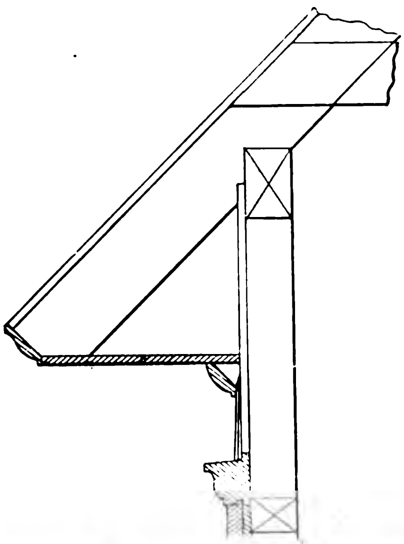
ceded that the season had something to do with the faulty foundation, the plaintiff undertook to erect the buildings at that particular season and do a first-class job. There was no provision in the contract whereby he was relieved from protecting his work or materials from the effects of freezing weather, and he cannot now claim that he should be released from liability because thereof. The evidence conclusively shows that buildings may be safely erected at any season of the year, if proper steps are taken to protect the material and construction work, and that such is the case is a matter of almost common knowledge." This decision shows the importance of making a distinct provision regarding operations during the winter in contracts where the work is likely to be affected by very cold weather.

The new home for the Union Dime Savings Institution will occupy a site at the northwest corner of Sixth avenue and Fortieth street, Borough of Manhattan, New York, and will cost about $225,000. It will be two stories in hight, and will be constructed of granite and limestone in the Italian style of architecture.

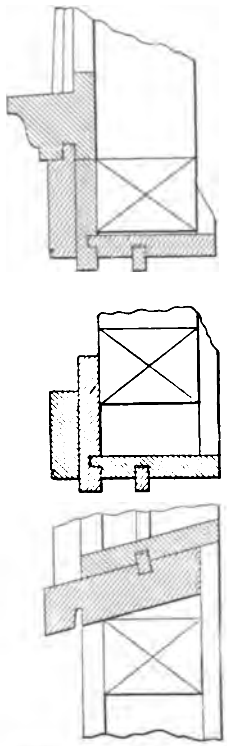
Stair Hall as Viewed from the Living Room.



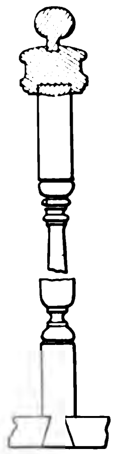
Details of Stair Construction and Finish Around Well Hole.—Scale, 3 In. to the Foot.



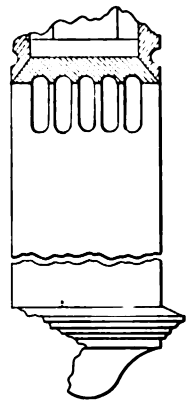
Detail of Kitchen Cornice.—Scale, ¾ In. to the Foot.



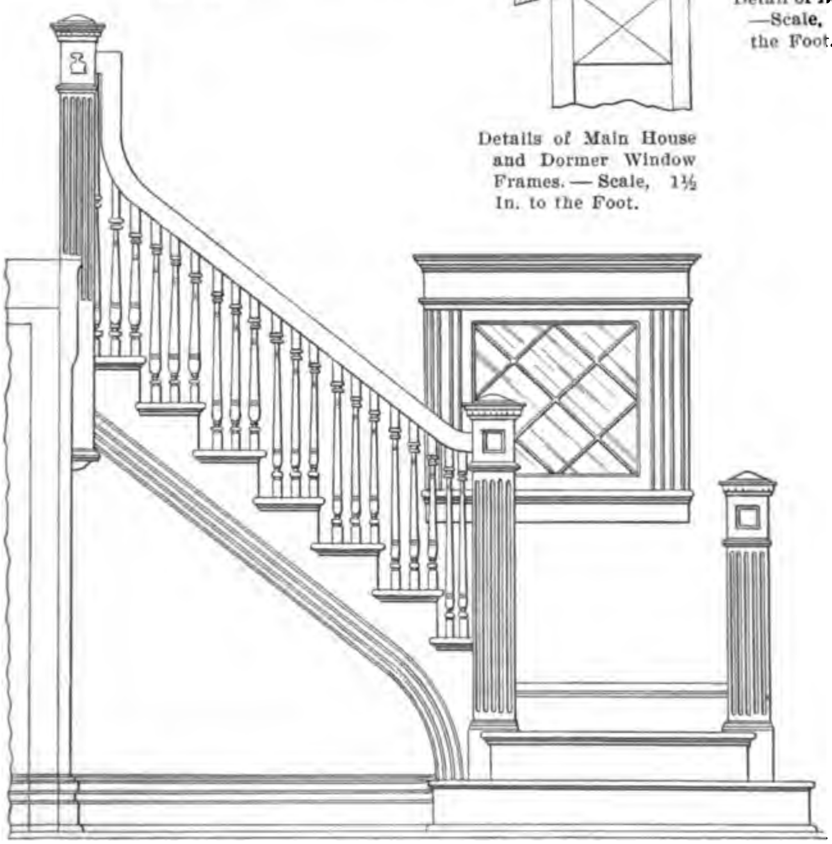
Details of Main House and Dormer Window Frames. — Scale, 1½ In. to the Foot.



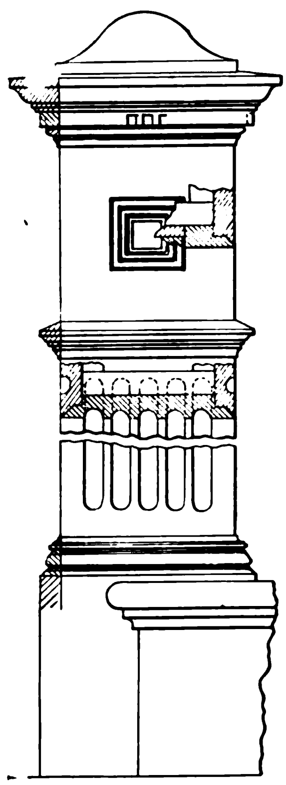
Detail of **Baluster.—** —Scale, **1½ In.** to the Foot.



Detail of Hanging Newel.—Scale, 1½ In. to the Foot.



Elevation of Main Stairs.—Scale, ⅝ In. to the Foot.



Details of Main Newel.—Scale, 1½ In. to the Foot.

Miscellaneous Constructive Details of Shingled House at Riverhead, Long Island, N. Y.

in., and dividing 104 by 8, the correct number of risers required will be found and to those having confidence in their arithmetical qualification, the last method is probably the one most commendable, as it saves a deal of time and guarantees an exactitude of measurement impossible by the first method.

In Fig. 2, which represents the elevation of the stairs shown in the plan, Fig. 1, it is seen that for a flight having 13 risers, the number of treads required will be 12; that is one less than the number of risers, this being due as indicated in the elevation to the landing on the second story being counted as one tread. The flight as shown starts with a riser and ends with a riser, thus calling for one more riser than tread—an item that should be always considered in laying out every kind of stairs.

To lay out the treads for the space of 8 ft. allotted for the total run the same method may be used as was described for laying out the risers. The total run being 8 ft., with 12 treads required, we divide the 8 ft. into 12 equal divisions, either with the compasses or by the arithmetical rule of simple division, as follows: 8 ft. reduced to inches gives 96 in., and 96 divided by 12 equals 8 in., which is the width of the tread

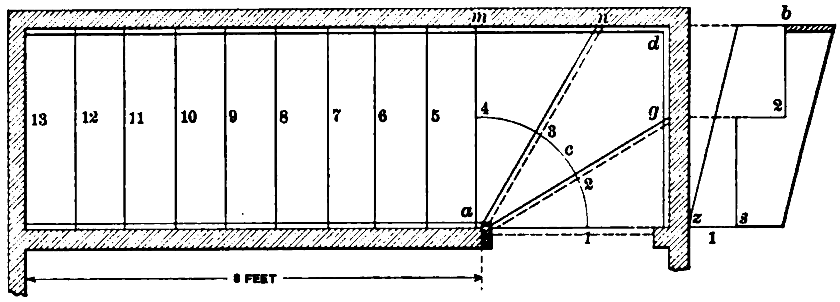


Fig. 7.—Flight of Stairs with Winders at the Bottom.

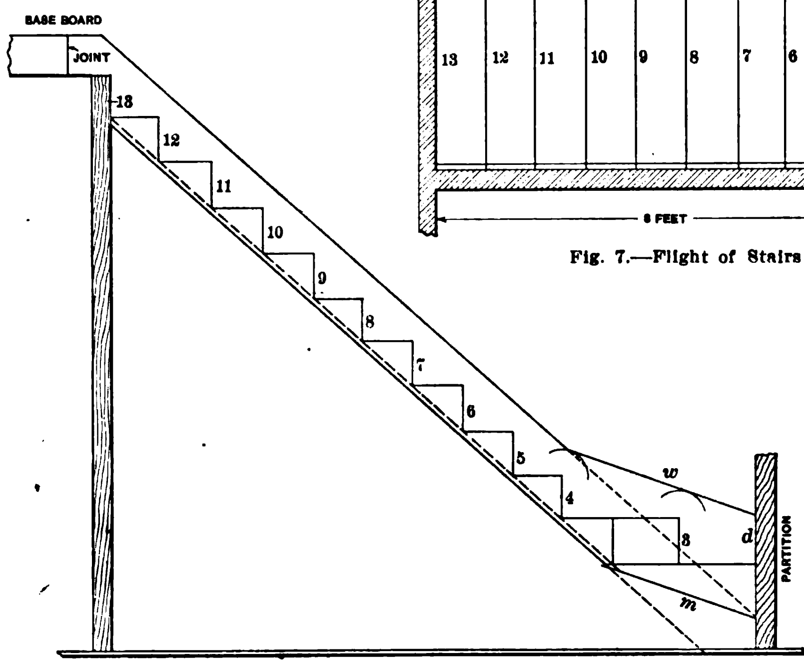


Fig. 8.—Elevation of Flight of Stairs Shown in Previous Figure.

Some Problems in Stair Building.—I.

required. In this example it will be noticed that the treads and risers happen to be the same—that is, 8 in.

"Will this relative proportional dimension of treads and risers guarantee a safe, comfortable stepping?" is the next consideration.

One rule to ascertain this is to divide the width of the riser into the number 66, as follows:

$66 \div 8 = 8\frac{1}{4}$, which should be the exact width of a tread for a riser 8 in. deep. It will be observed that the tread in the example under consideration is only 8 in., and therefore ¼ in. narrower than the required width for an exact proportional dimension to guarantee comfort and safety in stepping.

Another rule is to make twice the depth of the riser and once the width of the tread combine to equal 24 in. For example, assuming the riser, as in Figs. 1 and 2, to be 8 in., we have twice 8, equals 16, and 16 subtracted from 24 leaves 8, which will be the exact proportional dimension of the tread for an 8-in. riser, according to this standard rule of solution.

Still another rule is illustrated in Fig. 3 of the diagrams. Here the base of the triangle, *a b c*, is made equal to 24 in., and the altitude *b c* to equal 11 in. From *b* on the base line measure 8 in. to *d* to indicate the width of the tread; at *d* erect the line *d h*, cutting the long edge of the triangle in *h*. Then the line *d h* will be the exact relative dimensional riser for a tread 8 in. wide.

Again, measure from *b* on the base line 12 in. to *s*. At *s* erect the line *s z*, as shown, and the line *s z* will indicate the relative proportional depth of a riser for a tread 12 in. wide, &c.

Either of these three rules is considered safe to follow in finding at least an approximate workable relative dimension of treads and risers that guarantee safety and comfort in stepping.

Having in the above manner ascertained that the step is satisfactory, the next process is to get out a template, known as a "pitch board," for laying out the form of the steps on the stringers. The template is shown in Fig. 4 in the form of a right angle triangle, the base representing the width of the tread, 8 in., and the altitude the depth of riser, 8 in.

In Fig. 2 it is shown how the pitch board is applied to the stringer. The line *c c* in the illustration is gauged at a distance of 1¼ in. from the bottom edge, and the pitch board is applied to this line as shown by the shaded steps, *w*, *w*, the long edge being placed against the line and the pitch board moved along the stringer as many times as there are steps required.

In Fig. 5 is illustrated a very common method of laying out the steps on a stringer with the steel square. Take 8 in. on the blade and 8 in. on the tongue, as shown; apply to the line *c c* of Fig. 2, and, as before, move it along the stringer as many times as required to complete the number of steps contained in the flight. This method is usually employed for rough hemlock stringers and steep steps to save time.

Referring now to Fig. 6, it will readily be seen how the stringer is cut at its top end to fit the floor and connect with the baseboard on the landing. In Fig. 2 is shown at *a* how the stringer is cut at the bottom end to fit the floor and connect with the baseboard.

Figs. 7 and 8 represent the plan and elevation of a closed or boxed flight of stairs, with three winders at the bottom. Counting the winders in plan, Fig. 7, it will be observed that this flight contains the same number of steps as in the flight shown in plan in Fig. 1. It will be observed also that the winders in Fig. 7 occupy the space alloted to the bottom landing in Fig. 1, and that by manipulating winders a gain equal to the width of the landing is procured in the run of the flight, which is the factor to be obtained in the manipulation of winders.

In order to lay out the winders place one leg of the compasses at the outside end of riser 4, as shown at *a*; extend the other leg 14 in., and describe the curve *c*. Divide this curve into three equal divisions and from the points thus found draw the line of the winders, as shown to the base at *a*. The dotted lines indicate the addition to each winder for the nosing. This process of laying out winders must be made full size on a drawing board or the floor, as the case may be. From the drawing the form and correct size of each winder may be obtained.

It is shown in Fig. 8 how to lay out the stringer for the winders. From riser 4 measure to riser 3 the distance *m n* on the plan of string in Fig. 7, and from 3 measure to *d* the distance shown by *n d*. Now place one leg of the compasses on 4 of the elevation and extend the other leg to touch the upper edge of the stringer. Place one leg of the compasses on 3 and with the same radius describe the arc as shown. Now draw the line *w* to touch the arcs drawn from *a* and 3, and draw the line *m* parallel to the line *w*.

At the right in the plan is shown how the short stringer, to receive the first and part of the second winders, is laid out. Draw riser 1 from *z* to *s*, making *s z* equal to the hight of the first winder. Draw riser 2, and from 2 to *b* measure the distance *g d*, shown in the plan.

Dwellings with Individual Sewage Disposal Plants.

A very interesting experiment is being carried out in a suburb of New York City involving the erection of a number of dwellings equipped with modern sanitary conveniences and provided with individual sewage disposal plants, which do away with the necessity of a regular sewage system. The individual systems are a development of the so-called septic tank, and consist in running the house drain into an underground tank commonly of cast iron where the liquefaction of the sewage is allowed to take place through the aid of the so-called ærobic bacteria, and then of conducting the liquid into a so-called nitrification duct where the liquefied sewage is purified before reaching the earth surrounding this duct.

The trench to accommodate the nitrification duct usually extends along one side of the house and is also continued parallel with the front of it. The duct comprises two lines of tile pipe laid with broken joints and both imbedded in broken stone or similar material, one tile line being 12 in. above the other. The upper one is connected with the outlet from the tank, while the lower one is employed as an air duct and at its discharge end is connected to an air inlet grating in some inconspicuous place in the sidewalk or in the lawn. This is an arrangement for providing an air circulation essential in the second process in the purification of sewage which demands the activity of ærobic bacteria—the class that needs air for existence. On account of the open and porous nature of the broken stone medium between the tiles and that the upper pipe will only have a stream of liquid in its bottom, it is the scheme of this system to allow for a movement of air from, say, the inlet grating through the lower tile pipe.

The tanks as installed in the residences at Haworth, N. J., where the installation is in progress, are built in sections, which fact facilitates installation, and when the job is finally completed nothing is visible, the trench being covered with the lawn and the tank being located only by a manhole cover flush with the ground surface.

The main body of the tank is substantially a large iron pipe built in two parts, one fitting into a flanged recess of the other. The third or top part brings the top of the tank to the ground surface. After the excavation for the tank is made, concrete is spread over the bottom of the excavation and the iron pipe constituting the tank is then lowered in place. Over the concrete bottom and within the tank is added a further supply of concrete in order to insure a watertight bottom.

With the tank comes an inlet and an outlet fitting passing through holes provided in the tank. These two fittings are practically tees and the inlet one is located slightly above the outlet. Both dip below the surface of the liquids in order not to agitate the floating material on the surface, and the upward pointing outlets of the fittings allow for a freedom of the movement of air from the outlet of the tank into the air space of the tank and thence into the inlet fitting and so into the house drain and the vent of the plumbing system. The two fittings lie on opposite sides of a diaphragm or baffle plate. This is to prevent an immediate admixture of the incoming fresh sewage and that partially purified and liquefied.

A characteristic of the biological process of sewage purification is the existence of a floating mat which carries such grease as may have entered with the sewage from the kitchen sink and which also is a provision of nature shutting out the air and thereby giving the anaerobic bacteria the chance to survive over the ærobic. Similarly insoluble matters, such as mineral matter, like sand, which may enter the water supply, fall to the bottom of the tank; but in the average case this is said to amount to very little over a period of years. The provision of the manhole means that access can be had to the tank at any time to remove the mineral matter and sludge collecting in the bottom.

The above covers the main features of what is known as the Ashley system, the originator being Burton J. Ashley, a civil engineer of Chicago, and the work at Haworth is being done under the direction of S. B. Hardy, representative in New York, at 55 Liberty street, of the House Sewage Disposal Company of Chicago, Ill.

Compensation for Injuries of Laborers in the Service of the United States.

The "Act granting to certain employees of the United States the right to receive from it compensation for injuries sustained in the course of their employment," which went into effect on August 1 of the present year, is a measure of great importance in the domain of labor legislation. The new law is much more sweeping than the previous ones, as it applies to persons employed by the Government as artisans or laborers in arsenals, navy yards, fortification construction, river and harbor construction, manufacturing establishments and hazardous employment in the reclamation service; that is, in construction and in control and management of works. According to a rough estimate made by the Department of Commerce and Labor, about 75,000 Government employees come within the provisions of the law. Compensation will be paid under this act only for such injuries to an employee as occur in the course of his employment and cause inability to pursue his employment for more than 15 days. Compensation is not paid if the injury is due to the negligence or misconduct of the employee injured, and the act applies only to injuries received on or after August 1, 1908.

Compensation consists of a continuance during the period of disability, but not over one year of the same pay which the employee was receiving at the time of the injury. If the employee is killed by the accident or dies from the result of the injury received, leaving a widow or children under 16 years of age or dependent parents, the same amount of compensation is paid to these dependent relatives until the completion of the 12 months' period. Applications of dependents for compensation in case of the death of an employee from accidental injury must be made within 90 days after such death.

It is felt that the records of the application of this act will furnish valuable material for statistics of accidents which for this country are quite meager. In order to make the statistics more complete and valuable reports of all accidental injuries to Government employees, regardless of the application of the act, have been requested from all Government establishments and offices. As the number of United States Government employees exceeds 300,000, these statistics will undoubtedly prove of great scientific value and practical use in the future.

Cost of Concrete Flooring.

The cost of concrete flooring is concisely placed as follows by an exchange in answer to a question relating to the basement and first floors of a school house with 4000 ft. of floor. With cement at $2 per barrel and sand gravel at $1.50 per cubic yard, a 4 in. basement floor will cost about 14 cents per square foot. The first floor will require forms and reinforcing, and its thickness will depend on distance between supports. With supports 12 ft. apart, the floor would cost 32 cents per square foot, if 20 feet apart about 50 cents per square foot. These figures are approximate.

THE ART OF WOOD PATTERN MAKING.—IX.

By L. H. Hand.

A VERY interesting process for molding a large gear wheel 30 ft. in diameter has just been related by an old carpenter working for me, and who for some years was employed as flask maker, &c., in a large foundry in the city of Chicago. During this time it was necessary to cast a monster wheel of the dimensions stated. The pattern consisted of the hub, one spoke and a segment of the rim, arranged to lift out of the sand and to swing around a central pin. The sand was first swept off perfectly level and the pin and pattern placed in position and suitably rammed up, as it was banked against the pattern. The pattern was then raised and placed and placed in position for another spoke, and the operation repeated, this being continued until a complete mold was made. Plain slab cores were then placed over the openings, gates put in, and several feet of sand put on to hold the metal in place. The old carpenter informed me that a foreman and a gang of workmen required three days to mold this wheel in the sand. An idea of the wheel may be gained from an inspection of Fig. 114.

To sweep a straight pipe, say 12 in. in diameter and 6 ft. long with a flange on either end, as indicated in Fig. 115, is a less difficult job than to make the pattern and at the same time it requires very little material. Take the flanged end, as in the illustration, because plain pipe would be still more simple to produce. Make a wood pattern of the desired flanges and core prints which part in the center. Into these flanges at one side of the parting cut gains to receive two straight edges, as at A and A of the cross section, Fig. 116. These straight edges should be secured with wood screws to the upper half of the flange pieces, and should be made interchangeable with blocks that just fill the gains.

Now prepare two sweeps which conform exactly on their work edge with the outside diameter of the pipe in Fig. 116, and are so arranged that they will run smoothly and steadily on the straight edges when in use, and have the bevel on the work edge all on one side, so that by reversing they will work clear up to the flange piece, all as indicated in Figs. 117 and 118 of the engravings.

In order to produce a casting from this pattern, first sweep the floor of the foundry level, then bed the flange pieces until the straight edges lay solid the full length. Next carefully heap up and ram the sand between the straight edges until the form is approximately correct, after which sweep off with sweep No. 1, which will give a form of the upper half of the pipe. Remove the straight edges and substitute the filling block, make a parting and ram up the cope. Remove the cope and replace the straight edges; dig out between the straight edges, using sweep No. 2 to shape the concave lower half of the mold or drag.

The skeleton core box already mentioned in a previous issue will answer as a suitable core.

This casting may be swept up in another way, providing the foundry is already equipped with suitable flasks for the work and a shaft and hand wheel. This method is used for sweeping large cylindrical forms, such as pipes, rolls for rolling mills, &c., and will work nicely on any cylinder or cylindrical form having grooves or projections running around it. But when a special flask shaft and wheel would have to be provided for a single casting the method described would be more economical.

In the second method, a sweep corresponding in shape to the outside of the casting and core prints, as shown in the working drawing by a longitudinal section is hung with stout wooden arms, "A," to revolve on an axis located centrally on the parting of the cope and drag.

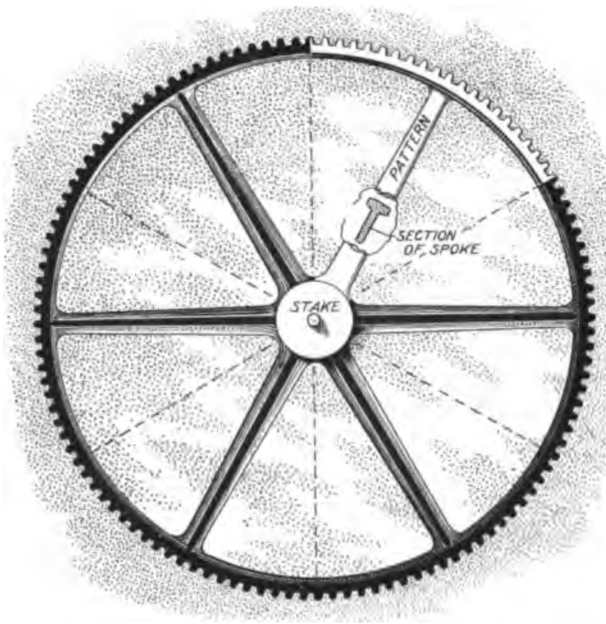


Fig. 114.—Mold for Large Gear Wheel.

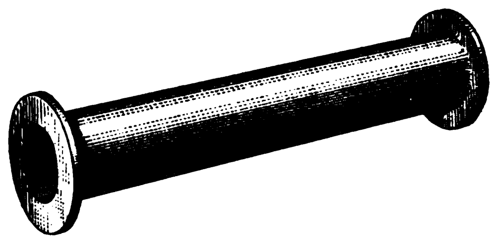


Fig. 115.—Round Pipe with Flange at Either End.

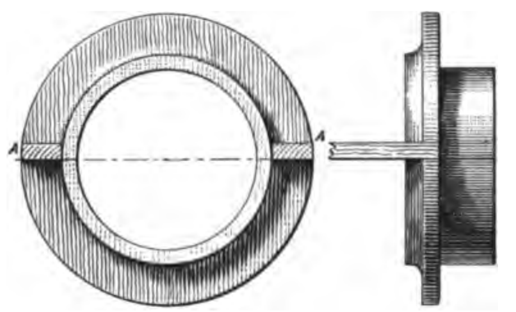


Fig. 116.—Pattern for Flange and Core Prints, with Straight Edges in Position.

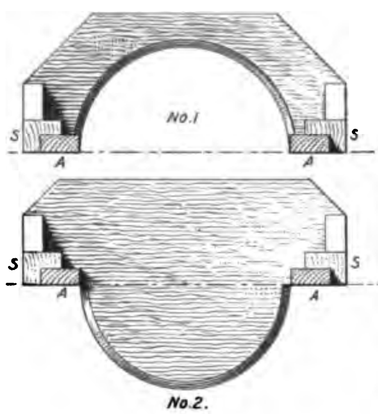


Fig. 117.—Upper and Lower Sweeps.

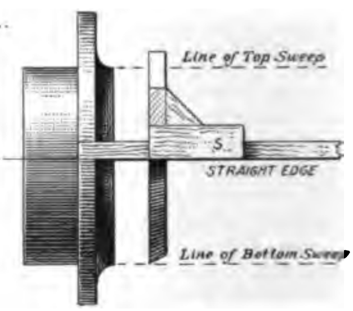


Fig. 118.—Side View of Flange Core Print and Lower Sweep.

The Art of Wood Pattern Making.—IX.

Usually a 1½ in. hole is bored in the parting of the flask at the center of each end. A part of a flask with sweep in position is shown in Fig. 119. The sweep, beveled both ways on the working edge, is secured in position to the 1½ in. iron rod which has a hand wheel, H, for revolving it, and two adjustable collars, C, to prevent any end motion. This rod is laid in the half hole in one of the parts of the flask, and secured in position by an iron clamp and wood screws. The collars are then adjusted to the ends of the box, and the sand put in, after which the mold is rammed up. The sweep revolving around its axis in the center of the flask, will maintain the form of the desired cavity for receiving the molten metal.

It will readily be seen that very complicated cylindrical forms such as rod rolls, &c., may easily be swept by this method. The method for sweeping the pattern is the same in cope and drag.

To sweep a large elbow is a similar job to that just described, for sweeping a straight pipe only instead of straight edges the sweeps are made to swing around a stake driven firmly into the floor of the foundry. It is

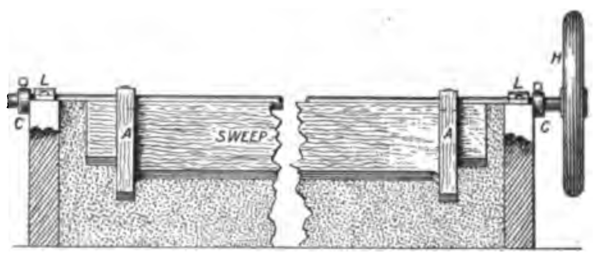


Fig. 119.—Section Through Half of Flask, Showing Sweep in Position.

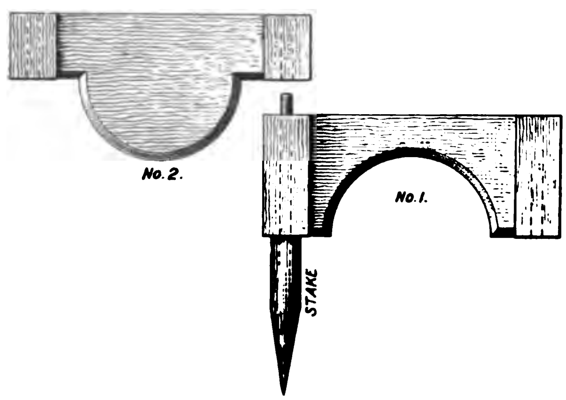


Fig. 120.—A Pair of Reversible Sweeps for a Large Elbow.

The Art of Wood Pattern Making.—IX.

important that this stake stand plumb and be firmly braced in position.

The foundry floor is now swept level by any method most convenient, and using sweep No. 1, as shown in Fig. 120, as a guide, the flanges and core prints of Fig. 116, without any straight edges, are bedded in position. Sand is then heaped and rammed, using sweep No. 1 of Fig. 120 as a guide until the form of the upper half of the desired elbow is produced. A parting is then made and the cope rammed up and removed. The sand is then dug away until the approximate form of the part in the drag is obtained. Sweep No. 2 is then put on and the mold swept out. It may be here remarked in passing that these sweeps must be made reversible so they will work clear up to the wood pattern of the flange and core print. The method of sweeping a core for an elbow has already been described and need not, therefore, be repeated here.

Irregular curved pipes may be swept up by the method described first for sweeping a straight pipe, substituting curved strips for the straight edges, only it must be borne in mind that much more care will be required in handling the sweeps, as it is not so easy to prepare the slides and braces to make the sweeps run steadily and operate smoothly, and unless you are "good people" at the foundry and can get permission to go and sweep the pattern yourself or have an absolutely dependable molder to assist you, you may be "turned down." Not every molder is a mechanic, and many will not undertake anything the least bit out of the every day hum-drum routine of pattern work.

Yesterday I was told by a man who had owned and operated a foundry for several years, that a straight pipe could not be swept by the method I have described, even when he had just seen me sweep a complicated molded veranda rail in comparatively coarse concrete, which is a 10 times more difficult job than to sweep a plain round 12 in. pipe in fine molders' sand. In fact, I have in mind a man in Vincennes, Ind., who will, if provided with the core prints and flanges, as shown in Fig. 116, produce a pretty fair pipe, as described, with nothing but a straight edge and his molder's tools. He would also count it a kind of recreation to mold any of the shapes I have described with well made sweeps.

In making sweeps for circular hollow castings, such as kettles, locomotive domes, &c., it is customary to prepare a full sized working drawing of the desired casting, or what is the same thing, a half drawing from a line drawn perpendicularly through the center. This line is the center of the stake. The outside line of the casting, as

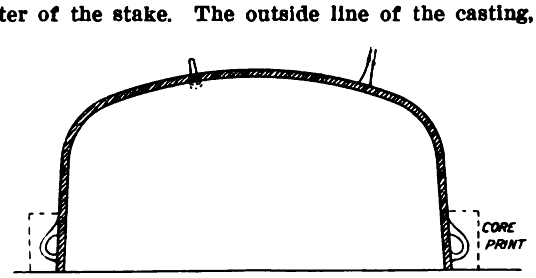


Fig. 121.—Working Drawing of Kettle.

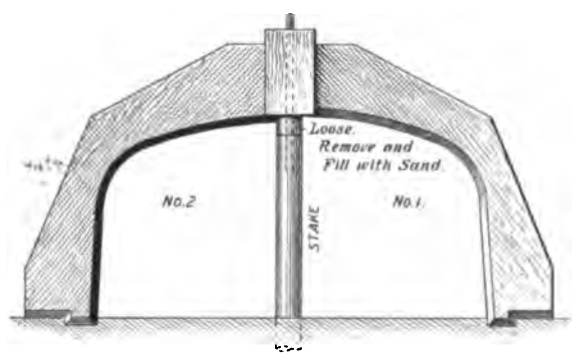


Fig. 122.—Pair of Sweeps for an Iron Kettle.

shown by this drawing, is the form of the work edge of the first sweep. The inside line of the casting is the work edge of the second sweep. On Sweep No. 2 both lines are laid out, and the space between the lines is painted black to represent metal. An ordinary iron kettle with three legs and the ears for holding the bail, is a fair illustration of most of the problems in ordinary work of this class.

We will suppose Fig. 121 to be the working drawing of an iron kettle and Fig. 122 the sweeps. Make three wood patterns of the legs of the kettle and two blocks for the core prints for the ears. Provide a core box for the ears, as has been explained in a previous issue.

Drive the center stake into the floor of the foundry and put on sweep No. 1, as shown in Fig. 122. Ram up and sweep off the sand until a perfect form is produced. Remove the sweep and make a parting. Begin ramming up the cope, and at the desired point place the core prints, which will lift off with the cope; continue ramming up until ready to put in the legs and gates, which will be held in position by the sand in the cope. When finished, lift the cope and put on sweep No. 2, which will sweep off just the thickness of the metal required. Draw the legs and core prints out of the cope and put in the cores for the ears, replace the cope and pour the metal.

Open sand work is work cast without a cope. It is frequently used for plain plates. Most of the forms are swept with straight edges. It does not enter very largely into pattern makers' work, and will be easily understood, if occasion requires, by standing around a few hours in a foundry where work is in progress.

Now a word about pattern wood. As real cork pine is exorbitantly high in price and difficult to obtain, one naturally asks what is a fair substitute. I found no trouble at all in making good patterns from both cypress and basswood. I have experienced no difficulty from warping when the softest straight grained basswood was used. I mean the kind that will split readily with a blow of the hatchet. There is, however, a kind of basswood that should be avoided for anything of much length. Basswood cuts smoother, if possible, across the grain with a keen edged tool than pine and cypress, shrinks less than pine nearly one-half from the perfectly green to the bone dry stage. I never had any trouble with cypress from warping that I can remember in any kind of work. Pattern wood was discussed at length by Professor Golden of Purdue University in a back number of Carpentry and Building, but from my own experience I would place the wood for ordinary pattern work in the following order: Pine, cypress, basswood with mahogany, cherry and maple for fine, showy patterns for brass work.

The pattern markers' art is ancient, honorable and respectable. I have never known a real good pattern-maker who was not held in esteem by both employers and employees of the shop where he worked. I have endeavored to treat the subject logically, consecutively and in a manner to be readily understood. I make no pretensions to being extra smart, but have carefully studied at the school of *Carpentry and Building* since many of its readers were babes in arms. I owe to its pages perhaps the fact that I have never had to work for the lowest wages. I have never to my knowledge but once been the lowest bidder on a contract. I remember very few days that I was able to work that two days' work have not stared me in the face, and I am a sound man bodily, so far as I am aware. If I have contributed a grain of wheat to *Carpentry and Building's* great storehouse of information, I am content. I will gladly answer any inquiries which may assist any of the fraternity regarding the subject here treated through the correspondence columns of *Carpentry and Building*.

(THE END.)

A Swimming Pool on the Third Floor of a Building.

We usually associate the idea of a swimming pool with the ground floor or basement of a building, but in the city of Philadelphia there has recently been constructed a pool in connection with the new building of the Racquet Club and it is located upon the third floor. Here in New York City one has recently been built on the fifth floor of a building. The Racquet Club pool is carried above the central hall of the ground floor, the hall being comprised within 12 vertical supports extending the hight of the building. These structural columns are placed one at each corner of the tank and two midway of each side. The four corner columns are tied together by plate girders 3 ft. deep, and similar girders extend from two intermediate columns on each side to two corresponding columns opposite. Across these girders 15 in. I-beams are laid about 1 ft. 6 in. apart. These constitute the foundation upon which the steel tank was set.

This tank is 35 ft. square inside and has such a capacity that the water is 4½ ft. deep at one end and 8½ ft. at the other, the water being 7½ in. below the floor surrounding the pool.

An interesting problem in connection with this work was the waterproofing of the tank. Upon the steel bottom was laid 3 in. of concrete, this in turn being covered by 1 in. of asphalt mastic and then 3 in. of concrete, upon which a floor of circular tiles ¾ in. in diameter was laid in cement. Upon three walls of the tank, including the shallow end, 1½ in. of asphalt mastic was laid against the steel, then 4 in. of brick laid in the mastic and on the brick 3 x 6 in. tiles were laid in cement. On hte wall at the deep end of the tank the brick was laid 9 in. thick.

The mastic was hot when the bricks were laid and the front of each joint was filled with it, the back being left until a hight of five courses was reached, at which time the hot material was poured in behind and made to thoroughly fill and seal the space.

Five more courses were laid and similarly grouted, then five more and this process was continued until the work was completed. At the top the mastic was turned over the edge of the tank under a marble coping 5½ in. high and continued over the entire area surrounding the pool. A layer of concrete covered with terrazza gave the finished floor and brought it up flush with the coping.

The space between the bottom of the tank and the ceiling of the hall underneath is sufficiently high for a man to readily walk, but the floor of this space is protected by means of a coat of concrete and one of asphalt mastic, while the chamber is ventilated through several openings provided at each side.

The piping is so arranged that the pool may be filled from the city water main, or it can be filled by pumping from an artesian well bored for the express use of the building.

The Clay Working Industries in 1907.

The value of the marketed clay products of the United States in 1907 was $158,942,369, according to Jefferson Middleton, of the United States Geological Survey, who has prepared the following table:

	1906.	1907.
Common brick	$61,300,696	$58,785,461
Vitrified paving brick or block	7,857,768	9,654,282
Front brick	7,895,323	7,329,360
Fancy or ornamental brick	207,119	361,243
Enameled brick	773,104	918,173
Drain tile	6,543,289	6,864,162
Sewer pipe	11,114,967	11,482,845
Architectural terra cotta	5,739,460	6,026,977
Fireproofing and terra cotta lumber	3,652,181	3,162,453
Hollow building tile or blocks	934,357	1,088,165
Tile (not drain)	4,634,898	4,551,881
Stove lining	743,414	627,647
Firebrick	14,206,868	14,946,045
Miscellaneous	3,988,394	3,000,201
Total brick and tile	$129,591,838	$128,798,895
Total pottery	31,440,884	30,143,474
Grand total	$161,032,722	$158,942,369

The only important product showing a large gain was vitrified paving brick, which increased in value $1,796,514, or 22.86 per cent. Firebrick made the next largest gain—$739,177, or 5.20 per cent. Next to common brick this is the clay product of greatest value.

New York's Latest Hotel.

The new 14-story hotel which has been designed by Architects Warren & Wetmore for erection on the block on the west side of Madison avenue from Forty-sixth to Forty-seventh streets, Borough of Manhattan, New York, will have an avenue frontage of 200 ft., a depth of 140 ft., and will cost $2,000,000. It will be constructed of brick, with ornamental stone trimmings elaborately decorated in the modern Renaissance style. The façades will present a series of tall pilasters extending around the building, inclosing the windows above the second story, and Ionic pilasters on similar rows at the top story supporting a cornice with festoon carving and having a balustrade adorned with long rows of pedestals bearing decorative vases.

An important improvement on the lower west side of the Borough of Manhattan, N. Y., consists of three 6-story elevator apartment houses, which will cost in the neighborhood of $245,000. The buildings are being erected at the northeast corner of Eighth avenue and 21st street, replacing a group of ten 2-story and attic dwellings, which occupied the site for more than half a century and were a landmark of old Chelsea Village.

A "DOUBLE" OR "TWIN" HOUSE FOR THE SUBURBS.

A DESIGN well adapted for execution upon a suburban site and treated exteriorly in a way to lend a varied effect is the "twin" or "double house," which we illustrate upon this and the pages immediately following. The brick veneer of the first story is a dark red with joints the same color as the plaster of the second story and gables, which is of a creamish hue. The exterior woodwork is painted a bottle green. A peculiar feature of the interior arrangement is that the dividing or party wall does not extend in a straight line from front to rear of the building, but takes an irregular course so as to permit of a decided variation in the arrangement of the rooms for the two families.

The foundation walls are of concrete composed of 1 part Portland cement, 2 parts clear, sharp sand and 4 parts gravel. The footings for the brick walls, posts, steps, &c., are also of concrete. The partition or dividing wall in the basement is of brick, but is not plastered. The chimneys are of the same kind of brick, except where exposed to view, and there dark red pavers are used. The first story has a 10-in. base course of field stone and veneered with a dark red paving brick up to the belt course, laid with a cream colored mortar joint. The basement floor consists of 2½ in. of concrete with a facing ½ in. thick composed of 1 part Portland cement and 1½ parts sand. The front entrance steps and outside cellar entrance are of concrete. All walls and ceilings of the first and second floors are lathed and plastered ¾ in. thick, two-coat work. The kitchens and bathrooms are finished with Acme cement 4½ ft. high on a hard plaster.

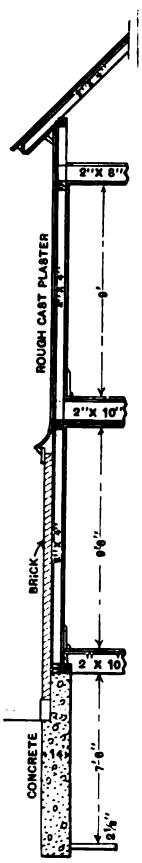
All timber is of No. 1 hemlock, the first and second floor joists being 2 x 10 in., the attic joists 2 x 8 in. and the rafters 2 x 4 in., all spaced 16 in. on centers. Each tier of joists has one row of bridging, all spans over 14 ft. having two rows. The dividing partition is formed of double studding set staggering, while the plates are of two thicknesses spiked together and to the studding. The outside walls are inclosed by 1-in. dressed hemlock boards covered with rawhide sheathing, and then brick veneer for the first story and plaster for the second and gables. All outside mill work is of white pine. The roofing is covered with pine shingles laid 4½ in. to the weather and stained green.

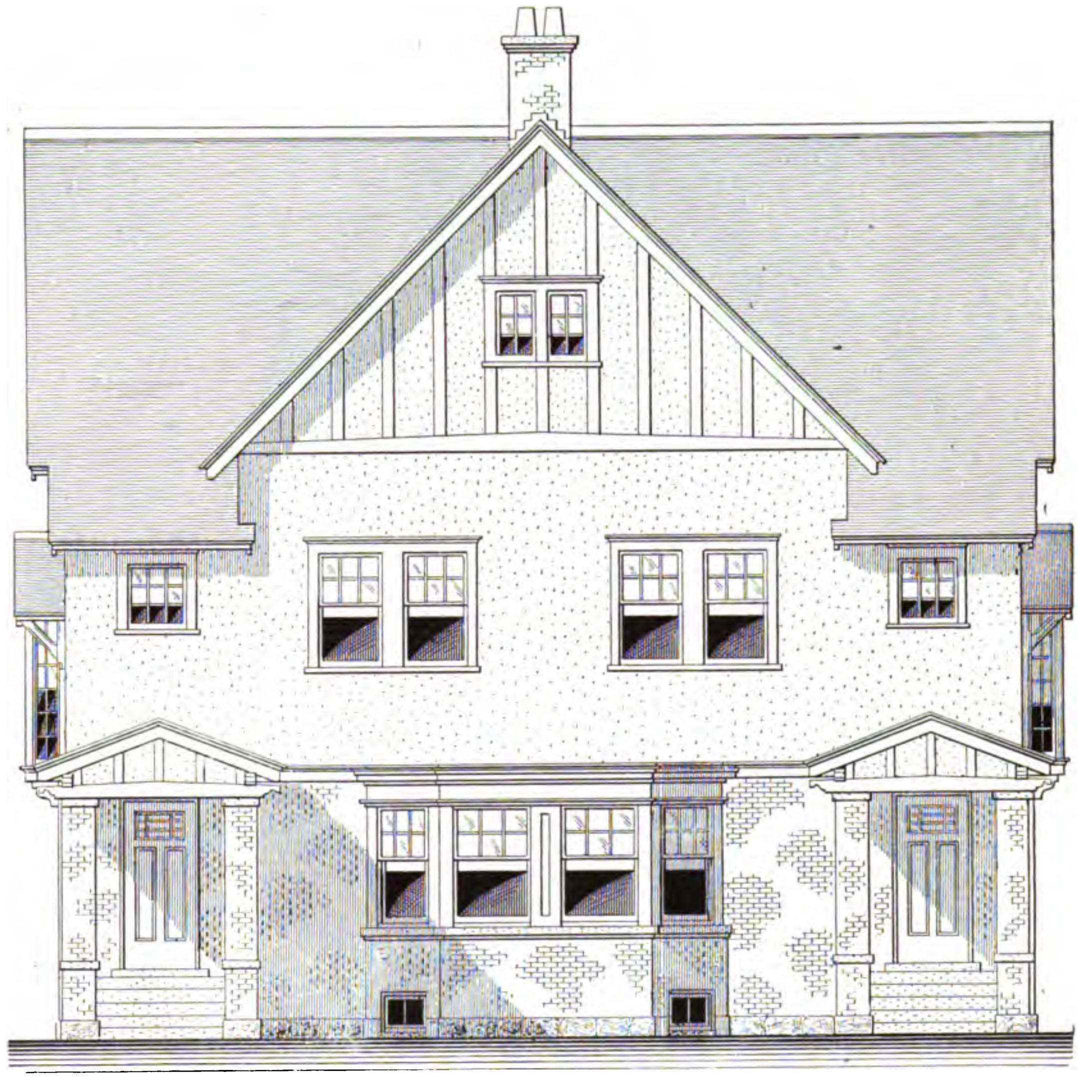
The subfloor in the first and second stories is of 1-in. hemlock boards with a finish floor of yellow pine, except in the halls, living rooms and dining rooms where it is of white oak. The first story, except the kitchens, is finished in black ash lumber. The kitchens and the entire second story are finished in yellow pine.

The black ash finish is filled and varnished and then finished with one coat of Flatilac. The yellow pine is finished with two coats of varnish.

All tin used is N. & G. Taylor's "Old Style." The valleys are lined with 14-in. wide tin. The tin work was painted on the inside with mineral paint, and allowed to dry before laying in place.

Each family has in the basement a laundry, toilet, cold room, separate bins for range and heater coal, and a cast iron furnace having sufficient grate area and heating surface to properly warm the several rooms with an ordinary



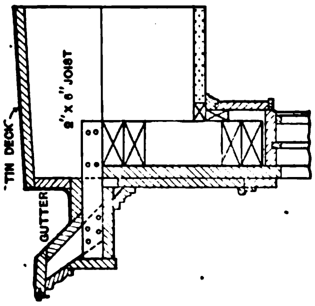


Section and Front Elevation.—Scale, ⅛ In. to the Foot.

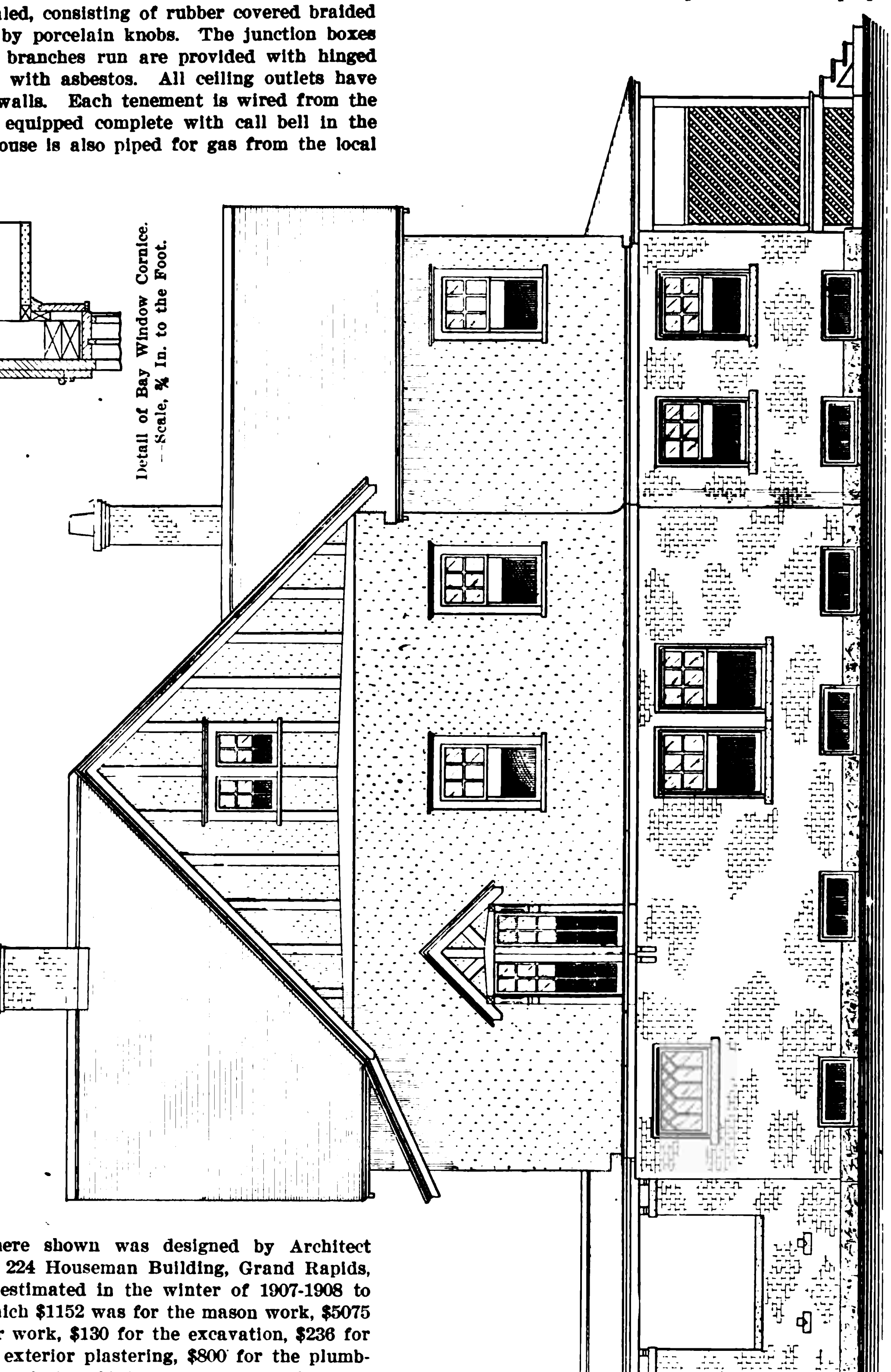
A "Double" or "Twin" House for the Suburbs.—Architect, James J. Quinn, Grand Rapids, Mich.

amount of attention. Each furnace is brick set, and connected with the smoke flue in the chimney by means of a 20-gauge galvanized iron smoke pipe fitted with lever damper. Connected with each heater and the outside air is a cold air duct of proper dimensions and covered at the open end with a wire screen.

The house is wired complete for 16 candle power incandescent lights from the outside of the building. All wiring is concealed, consisting of rubber covered braided wire supported by porcelain knobs. The junction boxes from which all branches run are provided with hinged doors and lined with asbestos. All ceiling outlets have switch on side walls. Each tenement is wired from the front door and equipped complete with call bell in the kitchen. The house is also piped for gas from the local gas works.



Detail of Bay Window Cornice.—Scale, ¾ In. to the Foot.



A "Double" or "Twin" House for the Suburbs.—Side (Right) Elevation.—Scale, ⅛ In. to the Foot.

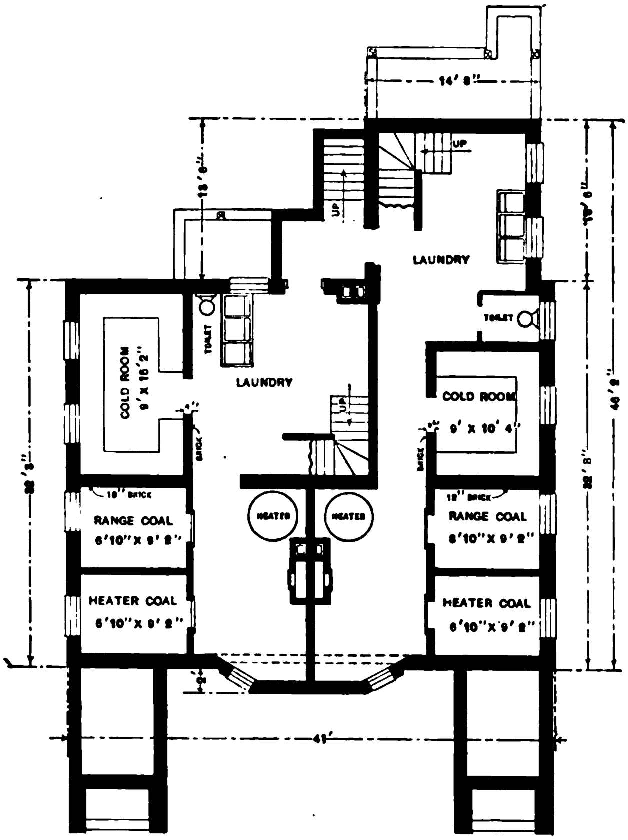
The house here shown was designed by Architect James J. Quinn, 224 Houseman Building, Grand Rapids, Mich., and was estimated in the winter of 1907-1908 to cost $8640, of which $1152 was for the mason work, $5075 for the carpenter work, $130 for the excavation, $236 for the interior and exterior plastering, $800 for the plumbing, $300 for the painting, $300 for the heating, $135 for the electrical work and $125 for the tinsmith's work. These figures, however, could probably be shaded somewhat at the present time, owing to the slight reduction which has occurred in some of the materials entering into the construction of buildings.

SOME IMPROVEMENTS are being undertaken in connection with the Flatiron or "Fuller" Building, at Broadway, Fifth avenue and Twenty-third street, New York City, which will tend to improve the fire resisting qualities of the structure. All the windows, of which there are upwards of 1000, will be changed, the new ones being fireproof, while the interior will be fitted with metal covered doors and metal trim.

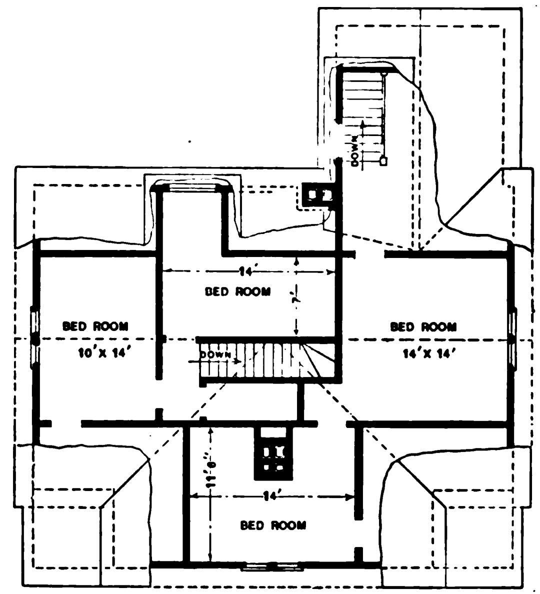
Tests of Paints.

Some interesting experiments are being conducted as to the durability of various paints and the properties they possess for holding color. These experiments are in connection with the recent movement towards paint legislation undertaken by the paint manufacturers of the United States. G. B. Haskel is the authority for the following, which was extracted from the Mineral Resources of the United States:

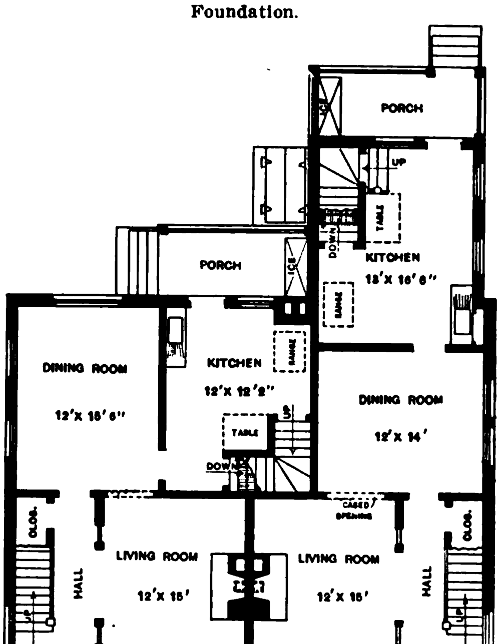
The first of these tests was begun nearly two years ago by the North Dakota Agricultural College at Fargo, N. D., and, in order to work under varying climatic conditions, additional tests, on a more comprehensive scale, have been initiated at Atlantic City, N. J., and Pittsburgh, Pa. Sixteen or more formulas furnished by the paint manufacturers, representing all the popular and successful types of prepared paints on the market, ranging from a base of straight lead and zinc, in varying proportions, to a combination of zinc and barium sulphate, are to be included, with the addition of a number of formulas representing the various pigments and combinations of pigments in common use for painting wood structures, including a dozen or more brands of white lead purchased in the open market, zinc oxides, sublimed white lead, zinc-lead white, lithophone, &c. A series of greens is also being tested at Atlantic City by request of the Philadelphia Master Painters' Association, which finds great difficulty in obtaining a green that will not mildew in this locality. In these formulas all the reenforcing or inert pigments were represented, including silica, calcium carbonate, calcium sulphate, magnesium silicate, &c., the object being to provide formulas which, without duplicating existing paints, would each stand as typical of its class.



Foundation.



Attic and Roof.



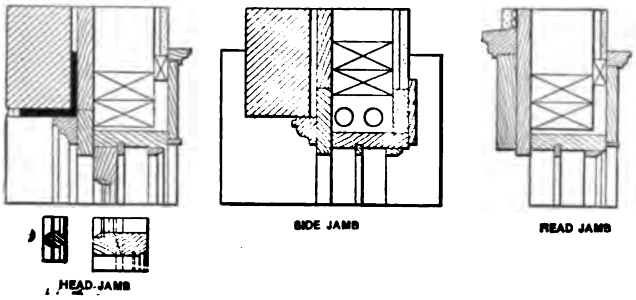
First Floor.

Second Floor.

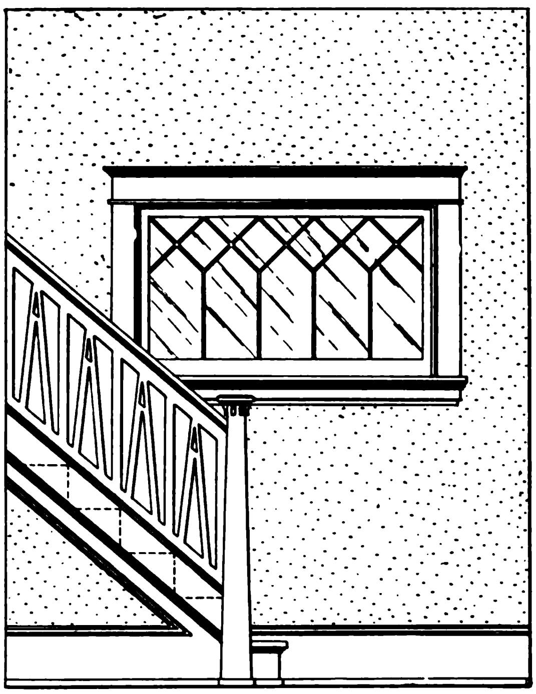
A "Double" or "Twin" House for the Suburbs.—Foor Plans.—Scale, 1-16 In. to the Foot.

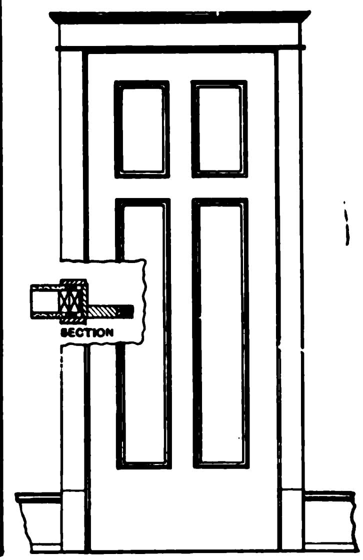
Duplicate test fences have been erected at Atlantic City and Pittsburgh, and the paint to be tested has been applied under uniform conditions to panels of carefully inspected wood. Three coats of paint were applied, and after complete drying of the third coat, the panels were screwed to the fence. This will permit their removal for laboratory inspection at any time. At one corner of each panel a small plate of clear glass and a duplicate plate of orange glass in a wood frame has been securely attached and sealed, so as to exclude atmospheric agencies, while allowing the light to reach the painted surface below. By this means it is expected to ascertain what effect, if any, the actinic rays of the sun have upon the durability of a paint film.

Great care has been exercised to secure absolute uniformity of conditions and impartiality of execution of the tests, and while it is not expected that the results of these tests will settle finally and conclusively the relative merits of competing pigments and types of paint, it is expected that they will afford much valuable information; and if such tests are extended to other sections of the country they may furnish valuable and suggestive cumulative evidence.

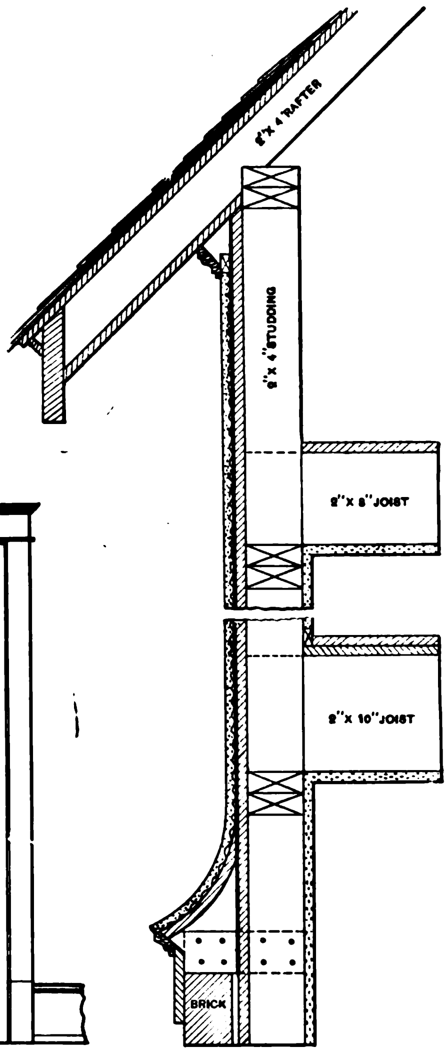


Horizontal and Vertical Sections Through Window Frames.—Scale, 1 In. to the Foot.


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



Elevation and Section of Interior Doors.—Scale, ⅜ In. to the Foot.



Details of Main Cornice and Belt Course.—Scale, ⅜ In. to the Foot.

Miscellaneous Constructive Details of a "Double" or "Twin" House for the Suburbs.

Statistics compiled by the New York State Labor Bureau show that on January 1 out of 66,120 members of 92 representative labor organizations in New York City, 22,627, or 34 per cent., were idle. The percentages of idle members of the same unions at the beginning of preceding years were 12.8 for 1907, 6.7 for 1906 and 17.8 for 1904. Over 90 per cent. of those idle January - reported lack of work as the cause. At a meeting of representatives of 200 labor unions held in New York recently reports as to the number of unemployed workers in New York were received. From these it was computed that about 175,000 workers in the city were idle. It was given out by the meeting that from 50 to 60 per cent. of the mechanics of the city were out of work.

Important Considerations in House Heating.

Altruistic specifications for the proper equipment and arrangement of house heating apparatus, so at least some may be regarded, are given in an interesting article by E. D. Sidman printed a short time ago in *Building Management*. From it have been taken the following notes:

The first thing to be done in our homes to bring about a better condition, no matter how they are heated, is to stop overheating our living and bedrooms. Therefore a thermometer is almost as essential as the heating apparatus itself. Where stove heat is used this will require some personal attention and care, but the result will amply repay it. With furnace, hot water or steam heat, in all cases a thermostat should be used, and under ordinary conditions the temperature in the living rooms should never be above 72 degrees F. If the directions regarding humidity are carried out, it will be found that a temperature of from 65 to 68 degrees is entirely satisfactory for comfort, and a considerable saving in the coal bill.

The next step is to always have the humidity in our homes as near normal or outdoor conditions as possible; to determine this, each home should have a hygrometer, or, preferably, a hygrodeik, as they are more reliable and easier understood, and use it. In stove heated rooms use the old-fashioned but serviceable open pot, pail or can filled with water and set on the stoves. On the ordinary base burner you can have an ornamental can made to set in between the stove and pipe if desired, or on the stove pipe of any stove can be fitted a round humidigiver with a perforated top. Keep these filled with water, and use enough of them till your hygrodeik shows from 60 to 65 degrees of humidity.

Automatic Humidifiers Recommended.

If your home is heated by a hot air furnace and you are the owner, equip your furnace with an automatic humidifier of the right size, and your proper degree of humidity is assured. If you are a tenant, and your landlord will not go to the slight expense to put you in a humidigiver, keep the water pan in your furnace full of water, and hang a small bucket or can full of water under each register, and keep them full of water, till your hygrodeik shows you the proper amount to use for best results. Meanwhile it would be a good idea to look up other apartments having a more liberal or humane landlord. Where your home is heated by either steam or hot water, and whether you are owner or tenant, equip your indirects (unless you use washed air) with a perforated pan humidigiver, which is not expensive, and is so made that while it will furnish a large volume of moisture to the air, it will not interfere with the heat. In connection with the indirects, or in homes where there are no indirects, use a sufficient number of either shield or knapsack humidigivers to get proper results, the shield form being preferred, as it is more tasty and ornamental and prevents the discoloring of walls and curtains caused by hot water and steam.

Last, but first in importance, comes ventilation. All ventilation must begin by removing the foul air. Homes with fireplaces, whether built solely for ornament or for use, have in each a first-class exhaust vent if properly used, especially so where several rooms open into that containing the fireplace. If the fireplace was built for ornament, the top of the flue should be capped with a nondown draft vent head; then in homes heated by stoves or hot air, a light fire of paper or shavings, built in the fireplace or flue, will start the draft upward, and the exhaust vent is completed, and will do fairly good work, though care must be taken to repeat this operation every time the house has been allowed to get cold. Much better results can be obtained where the fireplace can be used, as a light coal fire or the heat from a gas log creates a strong updraft. In homes heated by steam or hot water a positive updraft can be maintained in the fireplace by running an aspirating pipe up the flue; properly run so, it will circulate.

The living rooms in homes built without vent flues and heated by stoves will have to depend on window ventilators and the fireplace for fresh air and ventilation, and, where there is no fireplace, on the ventilators alone. Where possible place the window vents so as to get cross circulation, by putting a small vent in two windows placed opposite or at an angle to each other in each room, which will furnish sufficient air; if this is not possible, there should be two vents of a larger size distributed in two windows as far apart as possible. This method of ventilation is more expensive in fuel than where you can use aspirating vent flues, but will be found worth the price in health and general comfort in the long run.

Special Vent Flues.

In homes heated by hot air, in addition to the fireplace, even if there is one, build more or large flues at the baseboard of the lower floor (in a cottage heated by hot air the same method of ventilation will have to be used as in a stove heated house. A proper number of vent flues can be made by utilizing the space between the studding next to the hot air pipes running to the upper floors, letting these pipes furnish the heat to create the updraft, by boring a few small holes through, or by cutting away a piece of the plates. These flues can be extended from floor to floor into the attic, where they can be bunched into one, or be carried singly through the roof by means of tin or iron pipes, in all cases putting a nondown draft vent head on the top. Put in suitable sized registers in the baseboards, and your foul air vent flues are complete. The flue formed by the space between the studding and lathed and plastered both sides is practically air tight. The writer has used and seen vent flues made as above used with success for years, though the first time he was obliged to utilize this space for a vent flue, which was in an old hospital a number of years ago, he was really more surprised at the results than the mechanics that built them and had ridiculed the idea.

One bedroom at least should have an exhaust vent for cases of sickness. When the above exhaust vent flues are completed and working it will be found that the fresh air intake to the furnace can be run outside of the house for its supply, and that the air currents will not change, no matter from what direction the wind blows, but if this change should not be convenient to make, or be too expensive, a window ventilator in each room will furnish an abundance of fresh air.

In homes heated with steam or hot water, the above scheme for foul air vents can be used with an even better degree of success than with hot air by running an aspirating pipe to near the top of each vent, run so it will circulate. If there are indirects, or direct-indirects, in the house, a good supply of fresh air can be brought in through them, and if the house is so arranged that a number of rooms are open into each other, they may furnish all the fresh air necessary when stimulated to circulate by the foul air vents; if they do not furnish enough fresh air, or there are no indirects, use window ventilators.

Air for Sleeping Rooms.

Now a word regarding the proper ventilation of sleeping rooms. Although at least one sleeping room should have heat, exhaust vent and fresh air intakes, and be independent of the rest of the house to use in sickness or for very old and feeble people, as a rule, for good health, sound sleep and that fresh, young feeling in the morning, all heat should be shut off a sleeping room at night and the pure air let in practically unrestricted. This cannot be done by lowering a window from the top; the window should be opened from the bottom. But as this has its drawbacks in giving free access to burglars, or if the wind blows at all hard, creating a draft, and if it storms allows it to enter and do damage, or else chasing us out of bed "clothed in the chilly garments of the night" to shut them. It is preferable to use window ventilators of ample size. They are the ideal thing for this purpose, having a diffusion box inside that deflects the current of air upward so that there is no draft, and a stormproof hood on the outside so that neither snow nor rain can enter; these hoods are equipped with cleanable screens, which prevents insects or dust from blowing in. The windows can be as securely locked as ever, and the ventilators are an ornament and inexpensive.

Wages of Building Mechanics 15 Years Ago.

Some interesting statistics have recently been compiled by the chief of the Indiana Bureau of Statistics showing how wages in leading branches of the building trades now compare with those which prevailed in 1893. The figures, it may be remarked, apply only to the State mentioned, and great care has been taken in their compilation in order to render them correct in every case. The following table shows the changes which have occurred:

	1893.	1908.
Carpenters	$2.00	$3.15
Painters	2.25	3.00
Blacksmiths	1.21	3.50
Machinists	1.94	3.25
Brick masons	4.00	4.80
Plumbers	2.80	4.50
Hodcarriers	2.32	3.00
Plasterers	3.60	4.05
Coopers	1.20	2.75
Horseshoers	2.50	3.25
Lathers	2.00	3.50

From the table it will be seen that without exception the changes have all been in the nature of an advance.

PLANS HAVE JUST BEEN FILED for a new 12-story apartment house of the Renaissance type of architecture with façades of brick trimmed with limestone, and to cost in the neighborhood of $800,000. The structure will have a frontage of 104 ft. on Riverside drive, and 107 ft. on 113th street. It will have apartments for two families on each floor, with the exception of the basement and first story, which will be so arranged as to be jointly occupied by two families.

Carpentry and Building

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THE BUILDERS' EXCHANGE.

DAVID WILLIAMS COMPANY, - - PUBLISHER AND PROPRIETOR

14-16 PARK PLACE, NEW YORK.

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(Entered at the New York Post-Office as Second-Class Mail Matter.)

OCTOBER, 1908.

Employers' Liability Insurance.

A severe setback to the business success of a general contractor is often experienced when a suit is instituted for damages as the result of injuries sustained by some workman in his employ. This matter was the subject of an important discussion at the recent convention of the National Association of Master Plumbers. The insurance companies which operate in this field naturally are guided somewhat by experience in fixing their rates. It is felt, however, that the charges for protecting plumbers, steam fitters and sheet metal workers who are conducting business is above their reach and more excessive than their business will warrant them in paying. By exchange of experience it has also been discovered that the rate is by no means uniform, but varies with the intelligence and persistency of the tradesman in seeking to get a rate which he can afford to pay. Those who are interested in this matter have pointed out that in the large cities in particular tradesmen who have after years of labor accumulated sufficient capital to operate their business with some degree of comfort have been practically put out of business when the injury to some employee has resulted in a finding by the court for heavy damages. It has been suggested that all tradesmen engaged in the building trades give more attention to this subject and unite in the request on insurance companies for lower rates, which rates they feel can be safely made after thoroughly investigating conditions. Like all important achievements, it is improbable that the result will be immediately accomplished, but it should be a matter for attention at every convention of tradesmen until meetings between representatives of different associations are arranged and the matter is finally given such consideration as will secure the rates which every conscientious tradesman will be willing to pay.

Moisture in Building Materials.

There is such a tendency in the rush of things nowadays to occupy a new dwelling immediately after its completion that it is time a halt was called. Especially is this true of a building erected in any season but a warm, dry one, for not only is there present the moisture needed in the hydration of the mortar and plaster, but the stone masonry, brickwork and wood, particularly in the outer walls, is more or less saturated with water, received during and after the work is in place. The precipitate bivouacking into a building not uncommonly means the covering of inside walls with paper or coatings of paint, both tending to keep within the walls the excess of moisture. How serious a damp house is may be hard to set down in absolute, dogmatic assertions, but common sense dictates that wet walls can be productive of no great good, while they certainly are inimical to comfort. The quantity of heat that must be supplied during cold weather is in a large measure dependent on the rate of conductivity of heat possessed by the walls, and no argument is necessary to prove that a wet wall will carry from the inside to the outside surfaces of a wall more heat than a dry wall will. The finger, because more heat is lost from the body in a given time, makes a wet board feel cooler than a dry one, though both are in the same room, and, therefore, at the same temperature. Moisture sealed in walls through the medium of bricks laid in the rain has been known to remain as long as three years before final evaporation. The cure means provision for thoroughly drying the house interior, for painting or otherwise protecting the exterior to minimize the reabsorption of water every time it rains, the proper care in roofing gutter and conductor pipe work to insure a durable covering, and to prevent a veritable flooding of the walls every time something goes wrong, and last, but particularly important, the proper waterproofing or dampproofing of the foundation walls. Water has been traced in walls to a point 30 ft. above ground level, lifting itself through the property of capillary attraction. The reason why the summer time is especially advantageous in building work is that the air is in most places somewhat dry, and being warm has far greater capacity for carrying watery vapor than when it is at a low temperature. With a furnace heating system, however, or a direct radiation installation, the confined air is usually relatively quite dry and warm, and, therefore, capable of a high degree of moisture absorption. When the flame or fire is in the room the air is apt not to be so dry, for in addition to the moisture given off by the individuals and by the plant life that may be present the hydrogen of the coal or of the gas flame forms water with the oxygen of the air. The subject is not to be confounded with that relating to the moisture of the confined air in the living portions of a residence, a topic discussed some time ago in these columns. In that case the desire is to save the human mechanism from being subjected to such a sudden change as occurs when one leaves a hot, dry indoor atmosphere for a cold wet one outdoors.

Fall Painting Work.

Invaluable advice can be given to property owners by the painter who has been observing and who possesses reliable information in reference to the character of paint that is needed to protect exposed wood and sheet metal work from the ravages of weather and time. There is no better season to bring this information to the attention of property owners than before the winter sets in and while the weather will permit outside work to be done with comfort and safety. Invariably where exterior work, including roofs, gutters, eaves trough and such equipment are to be painted there is necessary also the services of an expert workman to make needed repairs before the painting is done. It is not enough to merely make the inquiry whether painting is needed; it is necessary that the owner be impressed with the importance not only of putting his property in good order, but with the fact that the tradesman has that invaluable knowledge which affords him the best possible qualifications to do the work for the customer so that it will be effective and lasting. This is a matter of confidence, and the man who has the real facts in his possession should be able to so impress his customer as to secure not only the present order but to insure that those in future will be sent to him. Doubtless many men have canvassed for work only to find that their enterprise has driven the customer to protect his interests, but through the agency of some other tradesman who at some earlier period had secured the customer's confidence. This should not be a discouragement, but rather the occasion for that self-preparation which will transfer the confidence from the other tradesmen to himself. It is the ability to do this which brings a larger measure of success to some men than to others, and the cultivation of such an ability should be the ambition of every enterprising tradesman. There is no want of evidence that some of the paints that are used on outdoor work instead of being a protection from the elements are an active agent of destruction. Possessed of these facts as well as information of cases where the right material applied at the right time has prolonged the service of some roofs or gutters within the knowledge of the customer should be very helpful in the canvass for business.

A Mammoth Apartment House.

The tendency at the present time seems to be in the direction of mammoth structures, whether it be in the way of apartment houses or buildings intended for business purposes. No sooner are the plans filed for some building, which when completed will eclipse anything erected, than it is announced that some individual or concern is contemplating a still larger structure and one designed to outrank anything in existence. The latest instance of this kind in the residential line is a 12-story apartment house to be put up by the Hoyt Estate on the block bounded by Broadway, Amsterdam avenue, Eighty-sixth and Eighty-seventh streets in the Borough of Manhattan, New York, in accordance with plans drawn by Architects Hiss & Weekes. The building will have a frontage on the avenues of about 200 ft. and in the streets of about 340 ft. It will be built up solidly in all sides of the block, but will have an interior court forming a summer garden, which it is planned to make one of the chief attractions for the tenants. All the sleeping rooms will face the court and each apartment will have an outside living room overlooking the streets, three of which are 100 ft. wide. It will be equipped with all the latest improvements in apartment house construction, and will be thoroughly up to date in all respects.

Building Activity in Argentine Republic.

A report recently submitted to the State Department by Vice-Consul-General Otto Hollender contains the following comment on the building situation in Buenos Aires, Argentine Republic, and the possibility of a market for American building materials in that city:

The rapid increase in the population of this city and the consequent demand for houses and apartments of all kinds has caused building to be very brisk in Buenos Aires during the year 1907. According to *Las Ventas*, a publication dealing with real estate transactions, there have been constructed during the year 1907 buildings to the value of $79,033,833 Argetine paper money ($1 Argentine paper equal to $0.42 1-3 American currency), the number having almost quadrupled within six years, the amount in the year 1901 being only $22,231,824. In spite of this enormous increase in building, rents continue very high, and apartment houses as well as office buildings are generally let even before they are finished, which would indicate that building will be quite brisk in this city for some time to come.

A decided change in the style of building is to be noted all over the city, and, while a few years ago the old Spanish style of building, consisting of one story only, with a large "patio" in the middle and fronting directly on the street, was in vogue, numerous buildings of three, four, and even five stories may be seen in the center of the city, while in the suburbs modern dwellings are gradually taking the place of the old-style houses.

At the present time there is an eight-story building being put up here by Americans, on the American plan and with materials from the United States, which bids fair to induce others to adopt that style of building.

Of the building materials, iron and steel, as well as cement, are mostly imported from England, Germany and France, although lately considerable quantities of steel have also been imported from the United States. Of the lumber, the white pine, pitch pine and spruce is nearly all imported from the United States, with an occasional shipment from Canada, while the hard woods are nearly all found in this country.

Sand is imported from Uruguay, there being hardly any in the Argentine Republic, but sometimes bricks are pulverized and used in lieu of the sand, the cost of transportation making the latter an expensive article. Bricks are nearly all made in this country, while tiles for flooring and roofing are mostly imported from France and Belgium.

Plumbing material has been imported lately to a small extent from the United States, but the bulk of it still comes from England. The United States certainly ought to be able to obtain a larger share of this business. This also applies to builders' hardware and sanitary appliances.

With the tendency for modern buildings prevailing at the present time there ought to be a good market here for fireproofing materials of all kinds, as well as sanitary appliances, plumbing material, builders' tools and hardware of all kinds.

Building Industries Association.

The leading building contractors, subcontractors and material men in the city of St. Louis, Mo., have just effected a permanent organization, known as the Building Industries Association, with temporary offices in the Century Building. The form of organization is a modification of the Cleveland and Philadelphia builders' exchanges, together with the establishment of an exhibit room for materials and specialties. It is planned in the organization to group the different subdivisions of the building interests in independent bodies within the larger organization, such groups to consider and act upon matters not of sufficient importance to require the action of the General Board.

The officers elected at the meeting of organization on Thursday, August 20, were as follows:

President, James L. Westlake.
First Vice-President, O. G. Selden.
Second Vice-President, W. H. Swift.
Third Vice-President, W. M. Sutherland.
Treasurer, S. M. Lederer.
Permanent Secretary, F. H. Littlefield.
Directors: C. L. Gray, R. M. Gillespie, John L. Mesker, Fred B. Adam, E. J. Hanley, H. Marquardt, John T. Bradley, C. A. Sinclair, John G. Hewitt, C. W. S. Cobb, John P. Larsen, Henry G. Rolfes, A. G. Fish, D. G. Scott, H. G. Eastman, F. W. Choisel and E. F. Lasar.

The association starts out with an excellent membership, embracing practically every one of the largest contractors, subcontractors and material men of the city.

Meeting of American Portland Cement Manufacturers.

As we go to press the quarterly meeting of the Association of American Portland Cement Manufacturers is being held at Hotel Pontchartrain, Detroit, Mich. Features of the meeting are the reading and discussion of papers, reports of committees and officers, and a trip down the river to Belle Isle, where dinner will be served. The trip has been arranged by the Michigan Portland Cement Manufacturers' Association.

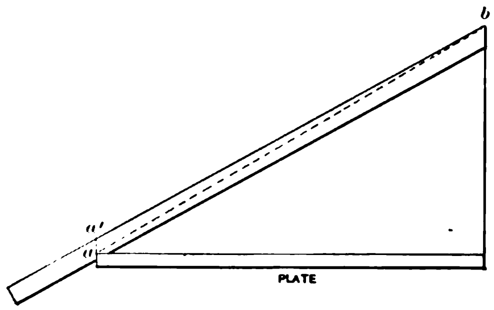
CORRESPONDENCE.

Addresses Wanted.

We have frequently mentioned in these columns the necessity of correspondents signing their communications with full name and address, in order to insure attention in this department of the paper, but many apparently overlook this fact, for their letters are often without signature, initials or any indication of the part of the country from whence they come. In many instances their inquiries are such as to call for attention through the medium of a personal letter before publication, yet the editor is without means of direct communication with them, owing to the lack of the information above referred to. Those correspondents who desire their names printed in full should so indicate in their letters; otherwise initials only are used. If the correspondents signing themselves "J. E.," "R. W." and "S. T.," Philadelphia, Pa., will furnish their full names and addresses we shall be very glad to give them the information desired relative to reading architects' drawings, &c., and "N. B. M.," Fort Smith, Ark., will learn of a method of remedying his difficulty in connection with veneered work.

Finding Length of Rafter.

From W. H. J. P., Philadelphia, Pa.—Will some of the numerous readers of *Carpentry and Building* tell me through the Correspondence columns how to find the length of a rafter? Referring to the accompanying sketch, is the length obtained from the point *a* to the



Finding Length of Rafter.—Sketch Submitted by "W. H. J. P."

point *b*, or from the point *a'* (plumb up from *a*) on top the rafter to *b*?

Also explain the term "work line" as applied to rafter cutting.

Plastering the Outside of a Brick Building.

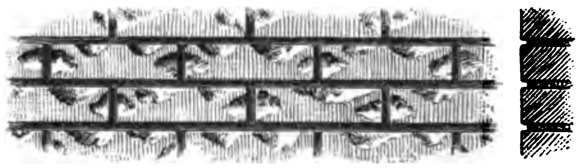
From Arthur W. Joslin, Boston, Mass.—Answering the inquiry of "J. O. S.," Terre Haute, Ind., on page 203 of the June number, I would say that it is entirely feasible to plaster old exterior brick walls, but care must be exercised if anything like permanency is expected.

The first step is the staging of the wall to be plastered with a double pole stage, standing the inside poles 5 or 6 in. from the building. This stage should be ledgered every 6 ft. 6 in. in hight and well braced. If several stories in hight, the stage can be tied to the window frames with short board stays.

The wall surface must now be prepared for the mortar. A new brick wall where either sand or water struck brick are used offers an excellent surface to plaster upon, but a wall of either of the above brick that has been standing some years will have lost its "suction," the pores of the brick becoming filled with soot and dust. All joints should be cut out from ¼ to ⅜ in. deep. This is easily done by unskilled labor, a cutting tool similar to a granite point and a regular hand drill hammer being used. Now wash the wall thoroughly, using coarse fiber brushes, and the wall is ready to plaster.

If the wall happens to be of face brick or has ever been painted, raking out the joints gives hardly "raw" surface enough to properly hold the mortar, and this defect is remedied by "spalling" the face of each brick, using granite points and hand hammers. It would be well to lift a spall from each end of the brick and a couple from the top edge, as shown in the drawing. If the first spall on the upper edge of the brick comes off large the second may be omitted.

There being no "grain" or "rift" to a brick, it is hard to tell the size and depth of the piece that will come off with each blow, but if considerable force is used enough of the brick face will be broken away with three or four blows to each brick to expose "raw" surface suf-



Plastering the Outside of a Brick Building.—Elevation and Section of Wall Prepared for the Mortar.

ficient, with the raked out joints, to give a good plastering surface.

We have treated painted brick walls in lofts and warehouses this way very frequently, where change in use of the building made plastering necessary, and have found that no other process answers. I have tabulated the labor and tool sharpening on a number of jobs, and the costs are practically all from 15 to 18 cents per square yard of surface, laborers being paid 30 cents per hour.

Now being ready to plaster, apply a thin "scratch" coat. The mortar for this would be the same as used for any ordinary interior plastering, except that the quantity of hair should be reduced one-half and a little Portland cement should be added. The cement should not be worked into the mortar until just before using, and not enough should be used to make the mixture "short." When this coat is partly dry the surface should be "scratched" or "scored."

A description of the tool and process for scratching can be found in an answer of mine to another correspondent on a similar subject in *Carpentry and Building* for December, 1907, pages 386, 387.

When this coat is quite dry (but not absolutely dry and set) apply the browning coat, same being composed of less of the hair mortar and more of the cement. Add all the cement the mortar will stand and still stay on the hawk and trowel.

This coat should be darbied, drawn up straight with long straight edges and all corners and returns shaped up square and true. Allow this coat to set enough so that it cannot be indented with the finger tips under considerable pressure, and then apply the sand finish, pebble dash or slap dash coat.

The composition and application of this coat is the same as would be the case on any kind of an outside plaster job, and is fully described in the article before referred to.

The staff beads of all windows should be removed before starting to plaster and be replaced before applying the final coat. The total thickness of the three coats should be about 1 in.

Occasionally a brick wall is furred with ⅝ or ¾ in. channels and wire lathed as a base for plastering, but this is more expensive (costing for materials and labor about 60 cents per yard, against about 20 cents for racking joints and spalling brick), and unless extremely well done, not as good.

If it should be desired to pilaster the wall or shape out belts with more or less projection, they should be built out in this manner. Considerable architectural treatment can be applied to a perfectly plain front by furring out quoins, belts, pilasters, &c. Capitals or ornamental panels of cast cement can also be used to advantage. These matters are within the province of the architect rather than the plasterer, however, except in the execution of the work.

It is possible to shape out sills, lintels and plain belts about 1 in. from the face of the general wall without furring, and these parts sand finished or scoured with the balance of the wall "slap dash" make a very effective front.

The cost of such plastering, except for variations mentioned, including staging, raking out joints, washing and spalling, varies from $1.25 to $1.75 per square yard, according to the wages paid, local cost of materials and experience of men employed.

From W. G., Brooklyn, N. Y.—In reply to the inquiry of "J. O. S.," Terre Haute, Ind., in the June issue I would say that he is not very explicit in his statement of the case, as stucco work applies to all external plaster work. However, I presume he refers to "pebble dashing," and assuming he is a plasterer, I would suggest that after removing all loose mortar from the joints and well watering the face to stop suction, he scratch-coat the job right down. When this has been done he should finish all architraves, quoins, string courses, moldings, &c., &c., and then commence at the top and float or brown a portion to a uniform surface. While still soft he should dash against the work his clean damp pebbles, which have previously been washed and passed through a ⅜ or ½ in. sieve. The dashing should be done with a flat scoop or a small stove shovel. In lifting the pebbles he should take a few at a time and shake them evenly on the scoop and give it an upward dash, working from the top left hand, taking all angles, &c., and leaving no joinings. The reason for this is that it is impossible to join up to work that has set. With a little care and patience the correspondent should make a fair job. Should this not be what he desires I will tell him how to "rough cast" in another issue.

Design for Small Planing Mill and Lumber House.

From J. Charles Valadie, New Orleans, La.—I think "R. E. B.," Clarksville, Tenn., is somewhat short of data regarding the design of a small planing mill and lumber house which he requests some of the practical readers of the paper to furnish. If he will send the editor for publication in the correspondence department a rough sketch indicating more exactly what style of building is wanted I will be only too glad to help him.

The request of "Information Seeker," Daysland, Ala., relative to plans for a packing house is not sufficiently specific and I would suggest that he give more definite information in order to determine the sizes of joists and supports necessary.

Method Wanted of Making a Secret Panel Under a Staircase.

From M. V., Vancouver, B. C.—I am a constant reader of *Carpentry and Building*, and have yet to find a paper published that can begin to compete with it as a carpenter's friend and guide.

Allow me to ask some practical reader to give a suggestion as to a simple and perfect method of making a secret panel. The paneling is under a staircase, is of plain pattern with no molding, and the loose panel can slide neither up nor down more than an inch or two, neither can it have any hinges. I shall greatly appreciate the information if some one will give me an idea of this bit of workmanship.

Calculating Diameters of Cone Pulleys.

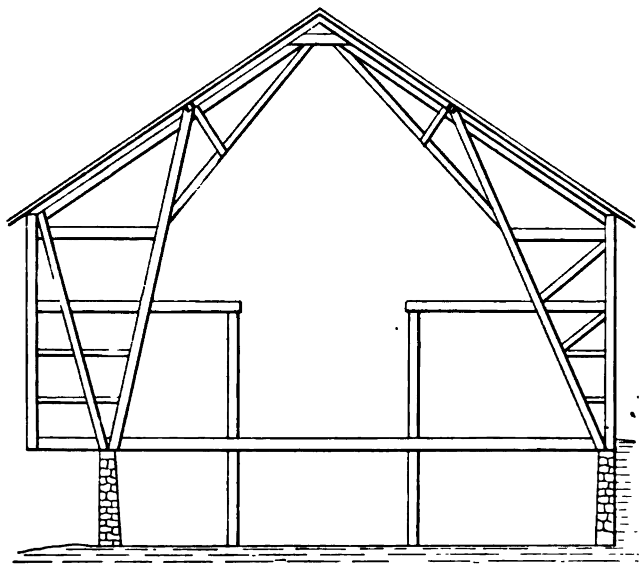
From J. P. A., Camden, N. J.—From a suggestion made by L. H. Hand in the issue for February last regarding the use of a lathe in the shop, I commenced to rig one, but failed in calculating for wheel and head pulley, being obliged to use foot power. Will some of the readers give the rule for calculating the relative diameters of a three-step foot power lathe wheel to the three-step head pulley, so that one belt may be used for all three pulleys.

Points on Construction of Bents in Plank Frame Barns.

From R. R. S., Lebanon, Pa.—I have been reading the articles of Mr. Shawver on "Plank Frame Construction" with much interest, and would like him, or some experienced reader of *Carpentry and Building*, to explain the construction of bents for a barn having a basement 50 ft. wide, with a 6-ft. forebay, so as to get as little weight as possible at the front of the forebay. The basement is to have a stone wall with three girders running the full length of the barn.

The barn is to be 92 ft. long with three driveways in the middle and one bay at either end. The middle driveway is to have an overhead floor of sufficient strength to fill with hay or grain in the straw. The barn is to have a slate roof.

Answer.—In reply to the above inquiry Mr. Shawver furnishes the following comments: In the construction of barns with projecting forebays, which is very common in some localities, we have been using the method illustrated in the accompanying sketch of starting the purlin



Points on Construction of Bents in Plank Frame Barns.

posts on that side of the barn from the cross sills directly over the wall or girder, as the case may be. Then to relieve the outside posts of all the weight possible we start a double brace of 2 x 8 in. from the foot of the purlin posts, and also over the wall or girder and to the top of the outside posts. This we do until the projection of the superstructure over the basement reaches 10 ft., then we advise the setting of posts to support the superstructure.

Now as to the overhead floor in the middle driveway, we insert joist bearers at the required hight and support by posts from the floor below or support by rods from the purlin plates, as one may prefer. In placing the joists over the forebay they should be long enough to reach from the outside sill across the wall to the first girder, and thus they aid in overcoming the difficulty of outside weight.

The Practical Value of Carpentry and Building.

From J. J. O'Brien, Elmhurst, Long Island, N. Y.—About four years ago I saw your publication, *Carpentry and Building*, on the news-stand in the Thirty-fourth street ferry house of the Long Island Railroad, and out of curiosity I bought a copy. At that time I knew very little about building, but that copy of the paper was interesting and I bought the next month's issue, and for several months thereafter I bought the paper as it came out. The following April I built a one-family Queen Anne cottage from a print from one of the issues. I took the print to an architect and had him draw me plans from your book. I followed the specifications from *Carpentry and Building* as closely as possible. I have been told that it was the prettiest house in Corona. The next year I built two two-family houses from plans that I found in *Carpentry and Building*, and I sold these houses, making a nice profit.

By this time I was taking no chance of missing a copy of *Carpentry and Building*, so I became a regular subscriber. In your issue of March, 1907, on the first few pages of reading matter, you published plans and specifications of what you call "A Typical Philadelphia Building Operation." Now I am not an architect and can hardly draw a straight line, but after studying *Carpentry and Building* every month for the past four years, I think I do not boast when I say that with the assistance of your publication, I can instruct other men to draw these plans for me. I have taken the plans of the Philadelphia houses just as you published them in the March, 1907, issue, and with a few changes built six of these houses without the assistance of any architect whatever. I would send a copy of the plans, but they are not like the houses as built, as I made improvements as the building progressed. For instance, I put the laundry in the cellar; where the kitchen is on the plan I have a library; where the plans show two sliding doors to the reception hall I have placed one sliding door with 3 x 3 bevel plate glass and a 2 ft. 6 in. x 4 in. frosted glass swinging sash. Where the cellar stairs were I have a hall leading to the kitchen from the dining room, the cellar stairs being placed under main stairs. Where the laundry was I have the kitchen. There are no coal ranges in the houses, but a laundry heater in the cellar. The kitchen is heated by hot water radiator, and for cooking there are gas ranges.

I had sideboards for these houses made from the drawing accompanying the first prize design in the Two-Family House Competition, and published on page 147 of the issue for May, 1908.

In conclusion I would say that in these matters *Carpentry and Building* has been the Master and I have only been the assistant. I have every copy of the paper since the first one that I bought four years ago, and if I could not replace them I would not sell them for $5000. The issue for March, 1907, to which I referred above, has been worth thousands of dollars to me, and I have the houses to show for it.

From C. H. E., Marshalltown, Iowa.—I have been a reader of *Carpentry and Building* for several years, and consider it the best paper published for the carpenter craft. I used to work at the trade myself and was raised in it, but since I have gone into the business of architect and superintendent I have had several of the boys come to me and ask for help in learning how to estimate, &c. I have always had pleasure in telling them to take *Carpentry and Building* to start on and read it every month. I notice that those who have ambition enough to read it and anything else for which they have the time soon become capable of "taking off" their own work and make better carpenters. I myself have always appreciated the detail work that goes with the various house plans published, as it shows how difficulties are overcome in different parts of the country.

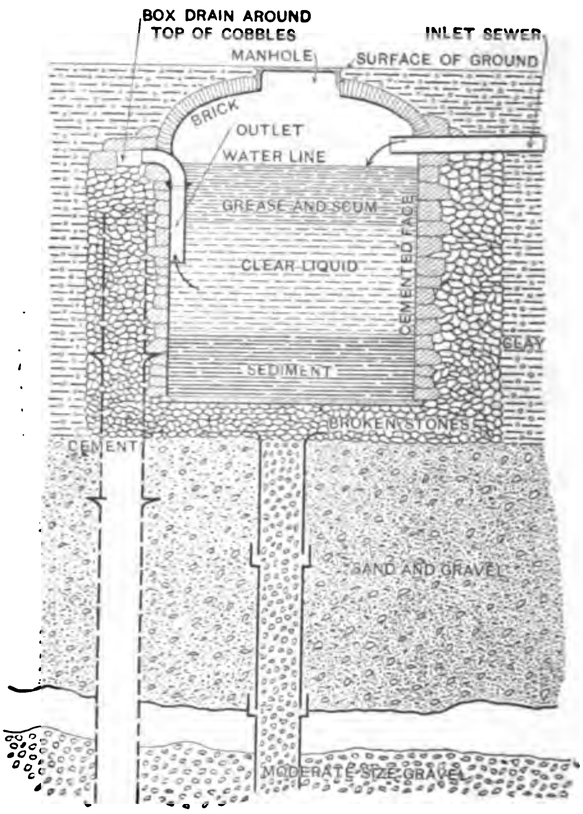
I take this occasion to express thanks for the extended reply to my inquiry relative to concrete work in a recent issue and for the interest manifested in the questions propounded by correspondents generally.

An Application of the Septic Cesspool.

From J. W. W., Alberta, Canada.—What is the best way to build a cesspool to receive sewage from an ordinary house having a four-fixture plumbing installation? The town where the house is located is in a low, flat place, the soil being a heavy blue clay and alkaline water will fill a hole to a level of three feet below the top. There is no sewage system in the town, but water works are being installed.

Answer.—In answer to the inquiry of the correspondent above we present a sectional view of a septic cesspool which may possibly afford a solution of his problem. The main points are that the sewage is delivered by a sewer pipe from the house into a water tight chamber, where mineral matter and other substances which will not dissolve may gradually settle to the bottom, and any grease, such as would be delivered from the kitchen sink, may rise and float on the top, leaving an intermediate portion with clear liquid, the latter to be carried away as fast as fresh supplies of sewage arrive. It is suggested that the space surrounding the water tight pool should be filled with broken stone, and that this broken stone region be extended downward by means of a dry well to some substratum containing large size gravel. A general idea of the arrangement of the septic cesspool and its immediate surroundings may be gathered from a careful study of the sectional view.

The idea is that the sewage on being delivered to the



Suggested Application of Sceptic Cesspool.

pool is given a chance to liquify and stratify, the grease rising to the top, as mentioned, and the mineral matter falling to the bottom, leaving clear liquid between. The use of broken stone will give the liquids a chance to gravitate to the gravel stratum, where the liquid wastes can leach or otherwise become purified. It is essential that the outflow pipe from the pool should take from the intermediate or clear liquid point as indicated, and it is desirable to have the discharge into the broken stone region take place in an open channel or drain which can extend around the pool.

In providing such a scheme for sewage disposal it will be necessary first to drive the well until proper size gravel is obtained, the boring probably showing that after the clay is passed through the sand and gravel stratum is reached, and that below this comes gravel with the stones as large, say, as hens' eggs. Of course if such size gravel is not reached after a reasonable attempt a septic cesspool, with a large amount of broken stonework surrounding it, would doubtless serve for a considerable time.

The dry well is shown constructed of tile piping, and its interior is filled with broken stones. The idea of the broken stone is to give a maximum amount of aerating surface should it be possible for air in any way to reach them, and also to allow the liquids to reach leaching levels gradually rather than in great flooding quantities, which might result in clogging. An object in having the outflow dip into the clear liquid section is also to prevent c ogging of the stonework.

It is obvious that an arch top such as shown is unnecessary, but it is desirable to have some means at the surface for reaching the pool should for any reason the amount of sediment grow so great as to need removing. However, it may be stated that an ordinary septic tank, which provides for a separation of sediment and also of grease and scum from the clear liquids, does not show that the sediment clogs in any great quantity and that cleaning is not necessary for years at a time.

Some idea of the size of the pool may be gained in the following way: Suppose with kitchen sink and bathroom equipment and the like 25 gal. of water are used per person per day. For a family of six persons this would mean 150 gal. per day, and as there are 7½ gal. in a cubic foot this would mean that the total daily supply of water is about 20 cu. ft. A pool 4 ft. in diameter, with its cement water tight bottom 7 ft. below ground and a space allowed between the top of the liquids and the ground level of 2 ft., would probably be satisfactory, although the volume in terms of the amount delivered in a given time is yet a matter of controversy among those who know most about the subject. With these depths the clear liquid strata would probably measure about 2 ft., and as the area of a 4-ft. circle is about 12 sq. ft., the volume of clear liquid would be about 24 cu. ft. This would mean that the tank is large enough to have its contents emptied at the rate of once every day.

The tile pipe shown dotted indicates an alternate idea of placing the dry well. To what depths such wells should be driven depends on the persons paying the bill and the conditions.

Design for a Portable Storm Door.

From a Constant Reader, Morris Park, N. Y.—I shall take it as a favor if some reader of your valuable paper will furnish for publication a working sketch showing a neat design for a sectional and portable storm door to have glass sides and glass door. The hight should be 8 ft., the width 4 ft. 6 in. and the depth 3 ft. 6 in.

Finding Side Cut of Valley Rafter Between Roofs of Two Different Pitches.

From G. L. Smith, Temple, Ind.—In the June issue of *Carpentry and Building* I note the criticism of "J. A. K." of Detroit, relative to my method of cutting side bevel for valley rafter between roofs of two different pitches, and am glad the correspondent called attention to the error. The problem is not a difficult one if mechanics will only get at the fundamental principles involved. As the writer has stated in previous letters to these columns, framers are not making enough distinction between valleys backed and those that are not backed. So long as the roof has only one pitch this difference amounts to little, but when a roof of two pitches is encountered this difference begins to show itself.

The young mechanic should first learn to cut the common hip correctly, then apply these principles in cutting a common valley. Having mastered this part of the subject, the problem here under discussion will be much simplified. Look at an ordinary hip roof with all rafters in position, and it will be seen that the top end of each rafter is an angle in some form. Moreover, this same bevel or angle is a part of some triangle. In most instances the various roof lines themselves form these

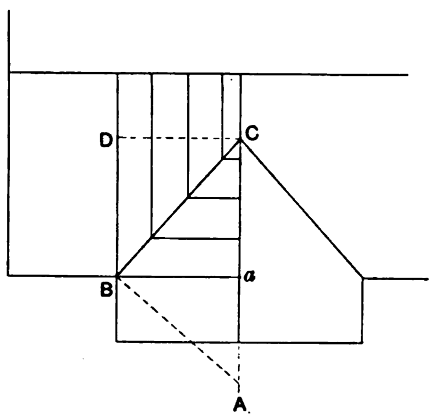


Fig. 1.—Valley Rafter Between Gables of Two Different Pitches.

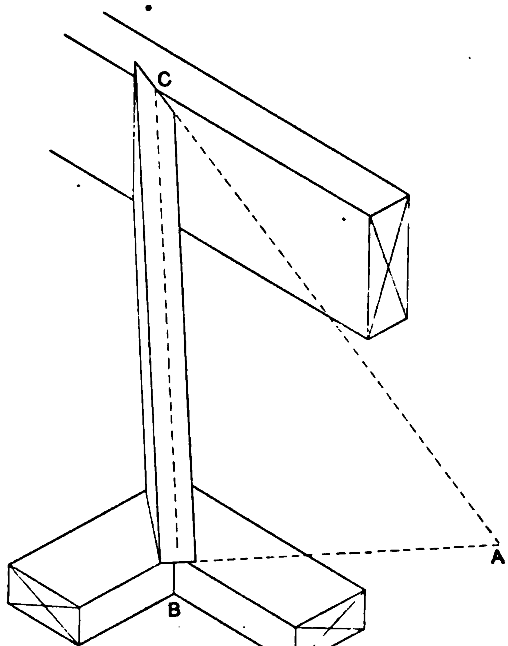


Fig. 3.—Detail of Fig. 2.

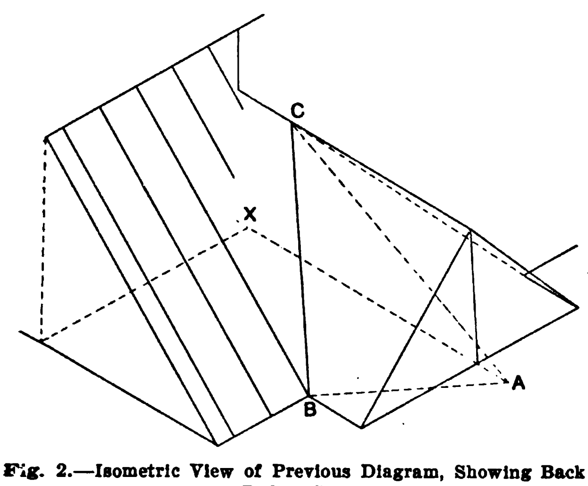


Fig. 2.—Isometric View of Previous Diagram, Showing Back of Rafter Square.

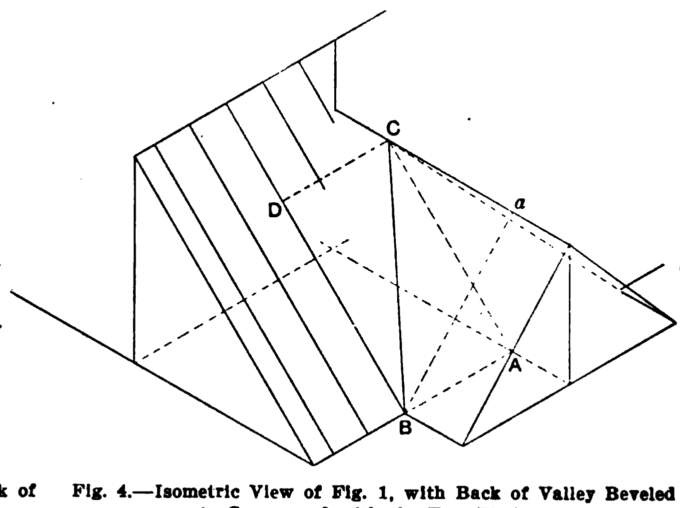


Fig. 4.—Isometric View of Fig. 1, with Back of Valley Beveled to Correspond with the Two Pitches.

Finding Side Cut of Valley Rafter Between Roofs of Two Different Pitches.

triangles, but when not so formed, as in the case of these hips and valleys, it becomes necessary for the mechanic to develop other triangles that will contain these bevels. Up to this point most all writers agree, but in the development of these triangles the methods are as numerous as the mechanics themselves. I shall not attempt to discuss the best method for doing this. Any method is good enough that will hold the "yob and bring home the money." I will say, however, that a foreman with 10 to 15 men at his elbow sawing, marking, stacking, &c., will have very little time to make elaborate drawings, to say nothing of figuring the lengths and bevels of all these cripples. This system of beveling has been developed under just these conditions.

If the plan shown in Figs. 1, 2 and 3 were handed the writer to frame, I would (after figuring lengths) draw just one line, B A, square with the seat of the valley and cutting the center of the ridge in A. The work would then be on. Isn't this brief enough? And is that a hard thing to do? I would then scale this line for length, or figure it, and note it down. Then we have the triangle B A and B C. Mark by B C and we have

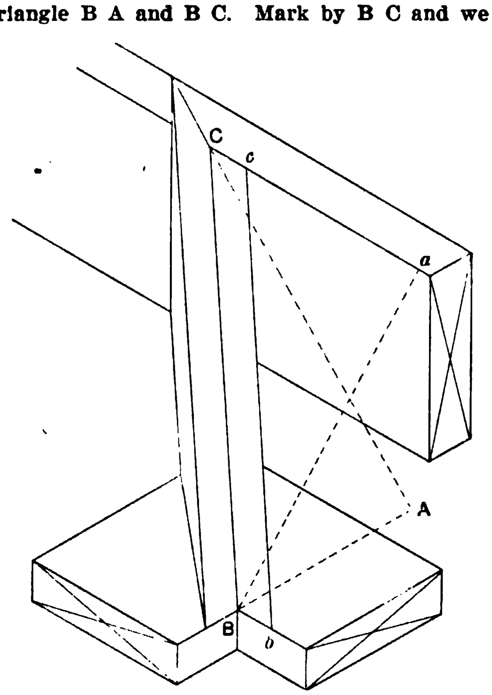


Fig. 5.—Detail of Fig. 4.

An inspection of Figs. 4 and 5 will show the proper development of these triangles. The line A C in Fig. 5 should be the center of ridge. Looking at the lines in Fig. 4, it will be seen that B A = D C and A C = B D; also that the triangle B A C = triangle C D B. It may therefore be used to obtain the bevel at C, the development of triangle B A C being dispensed with entirely.

Before leaving this figure, however, I wish to point out that B A is the run of rafter in small gable; that A C is length of rafter in large gable. Then the run of rafter in the small gable and the length of rafter in the large gable gives the bevel at C to fit against the ridge.

This is the rule that bothered "J. A. K." in the June issue. The bevels at both top and bottom of the piece *b c* of this valley are the same and are contained in the triangle B *a* C marked by the side *a* C. This also cuts sheathing boards for this side of valley as well as cripples to fit against the valley on this side.

A third condition which sometimes arises is that shown in Fig. 6. Here one valley is shown out against the main ridge and beveled the same as in Fig. 1. The other valley, B C, has a kind of butt joint at C. If the roof be of one pitch this joint will be square, but where the roof contains two pitches B A and C A approach each other and form the usual triangle. Then B A on one side and B C on the other will give the required bevel when marked by B C.

In conclusion I will say that I have used the fore-

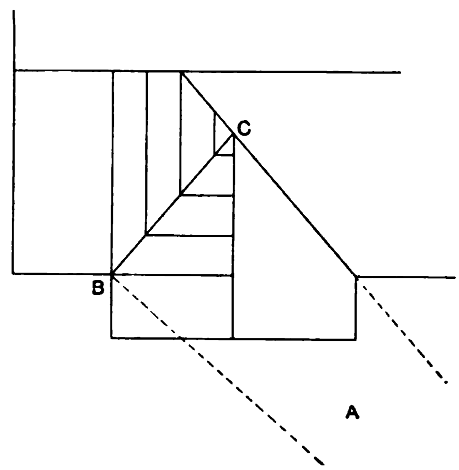


Fig. 6.—Showing a Third Condition in Framing Which Sometimes Occurs.

Finding Side Cut of Valley Rafter Between Roofs of Two Different Pitches.

the bevel to fit against the ridge. One may ask why this is done. Let me call attention to Fig. 3, where this rafter is shown with square back and fitting against the ridge at C. Project or extend its upper surface beyond A. Now project the surface of joint C. This intersects the former surface and forms the line A C. Next project the joint B, forming the horizontal line A B. These lines enclose the triangle A B C, which contains the angle C which forms the required bevel. It only remains to transfer the bevel from the drawing to the rafter to complete the job. This may be done by using the steel square as above described.

It would probably be well to add that the line A C should be the center line of ridge.

The next condition to this problem will probably be met with in Figs 4 and 5, where the rafter is built up of two pieces and some 25 or 30 ft. long, carrying heavy slate or tile roofing. Roofs of this character will be found in court houses, universities, public libraries, churches and other public buildings. The writer has met with a number of such jobs and almost invariably finds two or more pitches in such roofs. With this rafter backed as shown in Fig. 5 it will not be necessary to make a single drawing or add another line to the ordinary roof plan. The triangles which contain these bevels are all shown in the ordinary roof lines, and only need to be selected and used on the sides of the steel square.

going method of roof framing for more than 20 years, and during that time have framed and erected about 100 difficult jobs. Within the past few years have framed one roof covering a building 200 x 450 ft. with a rise of 15 to 12, and intersected with more than 20 different gables and dormers of six different pitches, the whole being supported by 47 trusses of large dimension. This method never failed me in any of these operations. It is not only good when applied to this problem, but will cut the truss joint of "J. A. K." with equal facility. It will also cut both faces of the purlin to miter under the hip. It will cut both facia and planceer joints of a raking cornice, as well as make the miter box cuts for the crown mold for jobs of this character. It will do more than this!. It will frame that most difficult problem known as the hood for the hay barn, and if carried further will lay out the tangents for the stairbuilder. What more can you ask of a system of beveling that is done only with the steel square?

Constructing a Balcony Floor.

From J. M. B.—I am building a porch with a balcony over it and I would like to ask some of my brother chips through the correspondence columns how they would construct the floor of the balcony. There will be no roof to it and the roof of the porch will be of tin.

WHAT BUILDERS ARE DOING.

THE fact that building operations in July were on a scale closely approximating that of the same month a year ago led to the quite general belief that the building situation was rapidly assuming a normal condition, and thenceforward would show constant improvement. The returns from the leading cities of the country for the month of August, however, show that such belief was premature. According to the figures available there has been a very appreciable falling off in the volume of operations as compared with July and a marked decrease as compared with August last year. In a few of the leading cities, such as Chicago, Denver, Indianapolis, Louisville and St. Louis, satisfactory gains are shown, but the great majority of cities indicate a loss ranging all the way from 2 to 89 per cent., as compared with the same month a year ago. The decrease in New York has been particularly marked, the figures falling in the boroughs of Manhattan and the Bronx from $14,163,550 in July to $5,931,530 in August, and from $9,140,270 in August, 1907. The labor situation has developed no unusual feature and at present there is ample force of hands for the amount of work offering.

Atlanta, Ga.

The month of August was a fairly busy time for building contractors throughout the city, and the amount of new work projected was slightly in excess of that for the same month a year ago. The permits issued from the office of the buiding inspector covered improvements valued at $389,305, which is a gain of $46,633 over the month of August last year. For the eight months of 1908 the value of the improvements for which permits were issued was $3,795,573, while in the corresponding months of last year their valuation was $3,569,547.

It seems to be the general opinion among those who know whereof they speak that the total building operations for the year will approximate $4,500,000.

Chicago, Ill.

There has been a marked increase in the construction of dwellings and small flat houses, this being especially noticeable when a study of the August report of the Department of Buildings is made. According to these figures permits were issued for 922 buildings, estimated to cost $5,641,050, while in August, 1907, permits were taken out for 872 buildings, calling for an estimated outlay of $4,492,275. The greatest activity was in the southern section of the city, where 327 buildings were projected, estimated to cost $2,008,750. Next in point of activity was the northwestern section where 294 buildings were projected, to cost $1,397,800. The southwestern section of the city ranked third in point of activity, 186 buildings being projected, involving an outlay of $1,294,750.

Present indications seem to warrant the conclusion that the increased activity will continue during September.

Cleveland, Ohio.

The building outlook in this city shows considerable improvement as compared with the early summer months, and new construction is expected to be fairly active during the balance of the year. During August there were 674 permits issued by the city Building Inspectors' office, amounting to $921,701. During the same month a year ago, when the condition of the building industry was regarded as very satisfactory, there were issued 741 permits for buildings to cost $1,027,545. August showed a fair increase over July, when 622 permits were issued for $859,524.

Of the August permits, 284 were for frame buildings to cost $484,993, while 40 were for brick and stone buildings to cost $301,600, and 350 were for additions to cost $135,108.

While no large building projects have been started during the past month, more small construction work has been commenced than during any previous month of the year. Considerable impetus has been given to building activity because of the fact that some lines of building material is 15 to 20 per cent. cheaper, and in some cases labor in the building trades is paid less, and contractors are figuring much closer on jobs, making it a very favorable time to build.

The Brotherhood of Locomotive Engineers, who have their headquarters in Cleveland, have purchased a site and will erect a 14-story building in this city, to be used as their headquarters and an office building. The building will be 125 x 180 ft. and will cost from $600,000 to $800,000. It is announced that work on the building will probably start in October.

Denver, Colo.

Activity continues to be the watchword in building circles throughout the city, and the total amount of capital involved in operations for August was appreciably in advance of the same month last year. Building Inspector R. Willison shows in his report of the business transacted in the Department of Buildings that 248 permits were issued for improvements, involving an estimated outlay of $664,810, as compared with 218 permits for August last year for improvements, estimated to cost $533,209. Of the total for August 130 permits were for brick residences, costing $310,350, and six were for apartment buildings, involving an outlay of $164,000.

For the first eight months of the current year 2105 permits were issued, involving an outlay of $6,556,695, while in the corresponding period of last year 1783 permits were issued for building improvements, costing $4,649,369.

Detroit, Mich.

A reduced volume of building operations characterized the month of August, when permits were issued calling for an outlay of $861,950, as compared with $1,055,000 in the corresponding month last year.

The members of the Builders' and Traders' Exchange held a joint outing and basket picnic with the members of the Toledo Builders' Exchange at Sugar Island on Tuesday, August 11. The weather was ideal and a large delegation from Toledo was present. The first event was a baseball game between representatives of the two exchanges, the result being in favor of Toledo. The field events consisted of races, jumping, boxing, tug-of-war, &c., honors being about equally divided.

Los Angeles, Cal.

Construction work fell off somewhat in value during August, when 676 building permits were issued, with a total valuation of $954,271, these comparing with 730 permits, with a valuation of $1,342,006 in August, 1907. For the same month in 1906 the record was 791 permits, with a total valuation of $1,476,522. Building operations in Los Angeles for the eight months of this year amount to 4800 permits, with a gross valuation of $6,838,003. The prominent feature of building activity throughout the present year is the large number of residences erected. August held up well in this respect, there being a total of 289 permits for one-story structures, which will cost $337,602. The one and one-half story houses number 29, and will cost $59,325, while the two-story buildings are 46, and have a total cost of $209,751, making a gross total of 364 permits, and a valuation of $606,678 for residence work.

The new residence of George F. Winters, designed by Myron Hunt and Elmer Grey, occupies a large lot on the West Adams Street Car Line. The general style of architecture is Spanish Renaissance. The exterior finish is of waterproof cement plaster on wire lath, the house being of heavy frame construction. It is two stories high, and is roofed with real red tile. The interior finish is of rich old mahogany, with tastefully decorated walls and hardwood floors.

New Orleans, La.

There was a slight falling off in building operations in the city during the past month, but this is not surprising, as business generally is rather slow. During August permits were taken out for improvements, valued at $296,784, while in August last year the amount was $311,992.

Something over 60 members of the Contractors' and Dealers' Exchange gave their first annual outing to Pineland Park on the Tchefuncta River on August 19, the party going to its destination by steamer. Arriving at the park a game of baseball was played between the Loblollies and the Long Leaves, resulting in a victory for the former by a score of 13 to 6. After the game the excursionists engaged in foot races, wrestling matches and other contests until about 4.30 when dinner was served. It was late in the evening when the excursionists again reached the city, all well pleased with the outing. The committee in charge of the affair were: J. P. Jourdan, chairman; J. W. Gorrondona, Gilbert Durand, and J. J. Reiff.

New York City.

The summer dullness continues in building circles and the amount of new work projected in August shows a heavy falling off not only from the previous month, but also from the corresponding period a year ago. The shrinkage from July is due to the absence of permits for expensive office buildings which was a feature of that and the previous month. In the Borough of Manhattan the number of individual operations was larger in August, but the amount invested was much less than that appropriated for the same purpose in August a year ago. Sixteen apartment houses, mostly in the Washington Heights section, were planned last month, as against 22 apartment houses and flats in August last year. The number of office buildings planned was six, which was the same as in August, 1907, although their estimated cost was $1,248,750, as against $2,241,500. The number of permits granted for new buildings in Manhattan during August was 80, involving at outlay of $4,042,200, while in the same month last year 67 permits were taken out for buildings costing $6,956,800.

In the Borough of the Bronx 165 permits were taken out for improvements estimated to cost $1,507,450, while in August last year, 179 permits were issued for improvements costing $1,511,500.

In the Borough of Brooklyn building construction has progressed at about the same rate as was the case a year ago, there having been 538 permits issued in August for work estimated to cost $4,447,780, while in August last year 541 permits were taken out for building improvements costing $4,831,849. The total from the first of January, however, shows a very marked shrinkage when compared with the first eight months of last year, the figures, which include alterations, being $25,068,338 and $55,055,613 respectively, for the two periods.

Philadelphia, Pa.

August, usually a dull month, proved itself no exception this year. Building operations showed a considerable decline as compared with the previous month, and when the same month last year is taken as a basis of comparison it is found that the amount of work undertaken in August this year is nearly 33 per cent. below that for the same period in 1907.

Statistics compiled by the Bureau of Building Inspection show that 735 permits for 1127 operations, at an estimated cost of $2,024,330, were issued, a decrease in value of nearly $900,000 as compared with the previous month, or a falling off of nearly 30 per cent. The customary decline in dwelling house operation work is again noticeable, the month of August showing but 96 permits for 400 operations in second-story dwelling houses, at an estimated value of $841,500; while during July $958,835 was the value of the work of this class that was started. We still continue to fall sharply behind last year in this class of work, the records at the close of August showing that we were $3,326,320 behind the total for the same period last year.

It must be said, however, that while this class of work continues to decline, it has been replaced to some extent by flat houses and apartments, of which character of building there is now work under way, amounting to about $500,000.

The total for all classes of building work so far this year amounts to $18,704,320, an extremely poor showing, as compared with the same period last year when the total aggregated $29,797,870, a decrease of $11,093,870, and it now seems improbable that, during the remaining months of the year, the deficiency can be very greatly decreased.

Suburban work, which comes to a large extent to local contractors and builders, but is not shown in the statistics of the local Bureau of Building Inspection, continues fairly active. In some sections contracts for several elaborate suburban residences were closed, while there has also been an increase in moderate size houses, and estimates are being made on a fairly large proportion of work, so that suburban operators and builders have had but little complaint to make about work of that class.

The baseball team of the Philadelphia Master Builders' Exchange played a return game with the team of the Baltimore Builders' Exchange in this city on August 19. A large delegation of Baltimore builders accompanied their team to this city. On their arrival they were taken to the Builders' Exchange, where luncheon was served, after which the ball game was played at the Philadelphia Ball Park. Although the local team succeeded in winning from the Baltimore aggregation it was easily defeated on recent visit to that city by a score of 9 to 6. After the game the Baltimore builders were given a dinner at Belmont Mansion, in Fairmount Park, returning late in the evening to Baltimore by special train.

Pittsburgh, Pa.

The record for the month of August is appreciably behind that of the same month last year, although it may be said that in the aggregate a fair amount of work is in progress. According to Superintendent S. A. Dies permits were issued for building improvements estimated to cost $1,528,683, while in August last year, the value of the building for which permits were issued was $2,076,428. The largest number of new structures being built in any ward is 20 in the Nineteenth, while nine new buildings are under way in each of the Tenth and Fifteenth Wards on the North Side.

San Francisco, Cal.

There is still great activity in building construction notwithstanding the predictions that have been made of a slump this fall. Ground has been broken recently for sevaral large business structures and many more are in plan, so that the architects are not suffering from lack of work. The financial situation is steadily improving, which means that more buildings will be started this fall and winter than had been expected. The building permits issued in August numbered 564, with a total estimated valuation of $2,450,000, and the building contracts entered into aggregated a total of $2,597,110, divided as follows: Brick, $1,427,396; frame, $1,002,556; alterations, $167,158.

A local statistician says: "The total of building contracts entered into since the fire amounts to $107,558,577. As nearly all buildings erected have cost fully 10 per cent. more than the original contract price, it is estimated that the total value of buildings erected since the fire amounts to not less than $118,000,000. Building permits for a total of $113,122,947 have been issued since the fire."

The Bankers' Investment Company has been granted a permit to erect a $200,000 building on the corner of Geary street and Grant avenue. William Mooser prepared the plans for the building, which is to be a four-story Class A structure, finished in terra cotta, brick and stone.

A modern six-story and basement business block will be erected on the south side of Mission street, between Third and fourth, on the site of the old Hancock House, by Mrs. Elizabeth Hancock. The front of the building will be finished in glazed terra cotta. The structure is to meet the requirements of manufacturers' agents and jobbing houses, such as are rapidly filling the Mission street buildings.

Work has begun on the foundations of a six-story and basement business building which H. L. Peterson is erecting on the south side of Market street, directly opposite Grant avenue. This building will be ranked among the many new structures which will greatly improve the appearance of the street architecturally. It will be constructed in reinforced concrete and finished in elaborate style, with a glazed terra cotta exterior. Its frontage is 50 ft. and depth 170 ft. through to Stevenson street. The first floor will be divided into stores, the hight of which will be 20 ft. and the upper floors will be in lofts, 14 ft. high each. Two fast-running elevators will accommodate the upper stories. The estimated cost of the building is $125,000. T. Paterson Ross and A. W. Burgnen are the architects.

The Board of Public Works has received seven bids for the construction of the new infirmary on the Almshouse tract, for which $240,000 of hospital bond money is available. The lowest bidder was the Condon-McFlynn Company, $119,100.

Topeka, Kans.

During the month of August there were issued from the office of the Fire Marshal in Topeka, Kan., 63 permits for building improvements estimated to cost $135,900, making the amount of building for which permits were issued during August the largest for the present year. In August last year permits were issued for new buildings involving an estimated outlay of $137,611. During that month, however, there were two permits totaling $100,000, these being for the addition to the National Hotel and for the new Elks' Building. During August of the present year the only large permit was that for the new St. Francis Hospital, estimated to cost $60,000.

Notes

During August there were issued from the office of Building Inspector Dugger in Chattanooga, Tenn., 184 permits for building improvements valued at $69,010, while in the same month last year 174 permits were taken out involving an estimated outlay of $70,760.

The building report for Newark, N. J., for the month of August shows permits to have been issued for improvements estimated to cost $668,252, while in August last year the value of permits issued was $1,035,700.

The Bureau of Buildings for the city of Syracuse, N. Y., issued permits for building improvements during August involving an estimated outlay of $217,540, as compared with $172,875 for August last year and $249,275 in the corresponding month of 1906.

Bungalows and How to Build Them.

The subject indicated by the above title is one which at the present time is attracting a great deal of attention in many sections of the country, the style of dwelling indicated being such as to afford interesting variety of treatment, yet at the same time is commonly understood to relate to inexpensive dwellings. The cost, however, will naturally vary with the character of the design and the style in which the structure may be finished. Some interesting comments on bungalows and the manner of building them are contained in the fortieth anniversary number of the *Record and Guide*, the author of the article being William Jeffery, who has been a leader in the bungalow movement and is connected with the New Jersey and New York Real Estate Exchange. He says:

The American bungalow was originally designed by the writer to induce city people to live comfortably in the country during the summer. It was important, in order to meet the popular needs, to offer a simple structure at a low cost, where the housework could be reduced and comforts increased. People's earnings vary, but the rent expense amounts to about the same in proportion, so a variety of styles of bungalows were in order at different prices. Great care was exercised in the details of construction to prevent the building of ugly, pretentious structures which could result only in reducing land values and make a veritable shanty town. So suitable restrictions are enforced to avoid these difficulties.

Many people are learning how to discard the old-fashioned parlor and carpeted halls, for these are not a part of bungalow equipment—just a few small rugs. No dress suits and costly garments are needed in this simple life; the children don't have to be kept extra neat and clean to suit the neighbors. Bungalow neighbors are wise, and the children too busy in the fresh air to bother with whims and notions of silly people.

Servants like bungalows because there is less work and no stairs. Most bungalow folks manage very well without servants—they send out the wash; and they always have available land for the hennery and garden.

The bungalow for summer use is simply a shell; to make it suitable for winter costs about as much again. The shell bungalow is incased with wood, using sheathing and siding, or is built of concrete or cement blocks. If a wooden structure, the sills may rest on stone or brick piers set at least 4 ft. into the ground, so that the frost will not disturb the structure.

I am building cement block foundation walls under all now instead of the piers, with concrete to grade level and cement blocks above to sill; chimneys of rock-finish cement block, using the block foundation. Screens at each end for ventilation keep out rats and mice and prevent dry rot. Sods can be placed right up close to the wall. The kitchen is an annex to the bungalow, and a cellar is put under that alone.

The items necessary to complete the transformation are as follows: Another floor, set on strips placed a foot apart to provide air space between the two floors and to keep the bungalow warm.

Low lines are more attractive, showing the beams, which, when filled and varnished, together with the ceiling and interior decoration, look beautiful. Adjustable stairs; trap door over them in two sections, one for persons to go up and down, and both open, permits large articles of furniture to be taken up and down.

Lath and plaster or plaster board and muslin, base board, wainscoting, moldings and closets, door saddles, paper for walls and picture molding, doors and casings.

When real cold weather comes the dear old open fireplace is closed and a modern stove installed, having heat radiation; open fires give too little heat and require too much attention, and in most cases drafts are affected by varying winds.

Cement block and concrete bungalows are popular on account of durability and few outside repairs and cost but little more.

The Cost.

I figure $1 to $2 per square foot of floor space for bungalow shell, and an additional $1 to $2 per square foot for converting into permanent all year round bungalow. This includes range, boiler, sink, wash and bathtubs and the builder's profits. A bungalow 30 x 30 shell would cost $900 and $900 more to finish—total, $1800. This would be about doubled by elaborate finish and insertion of many angles and acute lines. A smaller bungalow having the same improvements would cost more in proportion; everything is the same in the smaller bungalow, except that the rooms are smaller.

Ordinarily, the cost of a small bungalow shell, say, one 20 x 20, would be just $1 per foot; $400 plus $400 for completing, exclusive of plumbing; this costs about $250. Total, $1050. These are not Western prices, but are those prevailing right here at Berkeley Heights, N. J., inside of 27 miles from New York.

After living last winter in our bungalow here we liked it so much that we have just completed another bungalow within 30 ft. of ours, for our six boys. They make their own beds, and attend to the work of their own quarters—in this way, with their workshop, a fitting opportunity is given the boys to learn on sound, independent lines. Each boy does what he likes best to do, and consequently does it well.

THE restoration of the great Bell Harry Tower of Canterbury Cathedral having been completed, the work of demolishing the scaffolding has been commenced. For the past four years the tower has been enveloped in a network of scaffolding, said to be unique. The scaffolding alone cost over £1000 to erect, the money being contributed by the Ecclesiastical Commissioners. The total length of scaffold poles employed in the work was over 20 miles.

The Luxury of a Porch.

For the woman of to-day the porch, be it at the front, back or side of the house, should be a place which serves as a pleasant morning room whenever the weather permits. It should be so built that by means of the useful bamboo curtain it can be screened into a certain privacy; here she can have her work table, her sewing chair, her birds and her flowers, here she can enjoy a bit of the life-giving sunlight and fresh air of out of doors without interruption to her duties. It is a little luxury which even a tightly built city can afford, and Manhattan is no exception. I have seen a porch room which was fascinating beyond words done entirely in delft blue and white, says a woman writer in the Chicago *Inter-Ocean*. The hammock of blue and white cord furnished the keynote of the furnishing scheme. In it were great comfortable pillows of blue denim, blue denim cover on the table was worked in white and above the hem and on some of the pillows was cross stitching.

A large armchair of wood was cushioned and petticoated with blue and white Japanese crepe and the wicker chairs held cushions of crepe. On the floor a Colonial cotton rug of blue and white "hit-or-miss" stripes completed the effect.

In a cottage porch which faced the sea I have seen these deep, strong blues used most effectively with the brilliant scarlet of Turkey red cotton. A bit of this scarlet is almost always acceptable on a porch whatever the color scheme, but forms its happiest combination when used with scarlet and white East India cotton. For a house of brown shingle a combination of orange and brown lights up the porch charmingly and various shades of cool greens always form an attractive summer scheme. In using the green coloring an excellent idea is to paint the bamboo curtains pea green also.

I can never forget the impression I once received of a porch done in these colors; it has remained with me as a delightful color picture in which there was not struck a single false note. It was an old abode in Southern California, the walk to which led through double rows of orange trees. The house itself stood under the shadow of tall olive trees, and its whitewashed walls glimmered under the green. Across its front ran a deeply sunken porch and here all was pale green and white.

On the floor there was a grass cloth mat, and in one end of the porch swung a Mexican hammock of knotted cords. This was filled with pillows of green and white. Scattered about were low pillow chairs with pale green cushions and several substantial wooden armchairs beautifully enameled in a light shade of green.

Two pale green bamboo curtains were half unrolled, and gave the suggestion that the whole of this fascinating place could at any time be totally screened from the sun or from the outside observer. My reflection was that this house without its porch would have been comparatively uninteresting and a poor thing, but having it, it fairly bewitched me!

It is a simple matter in planning a house in which the cost must be closely counted to place shelves over the window casing at the top of the window and to put a board shelf on brackets flush with the window sill, to hold plants, books or work.

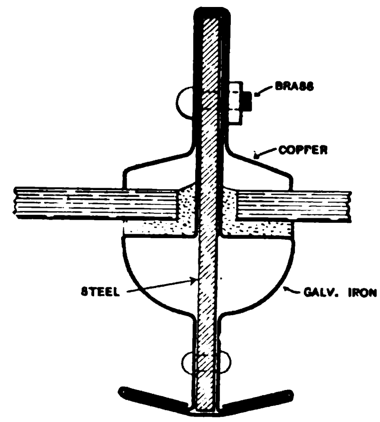
How much cheaper is this device than the building of thick walls in order to secure recessed windows or wide sills, can easily be seen.

The shelf at the top of a commonplace window metamorphoses it and removes that flat and common look from the side wall which is often a fault of the cheap house.

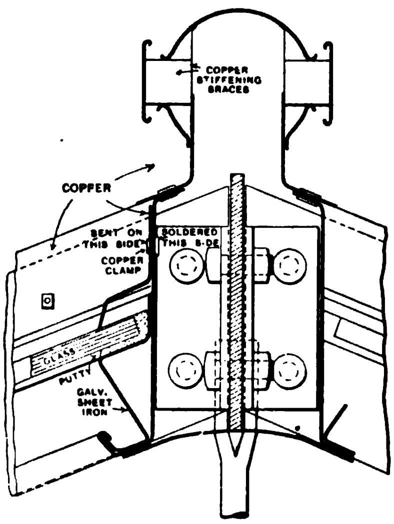
I would here also reiterate what I have often said that the position of the windows in a house influences its success or failure more than any other single feature of the building.

A Large Movable Residence Skylight.

Movable skylights, such as used above stages of theatres in many of the larger cities, being connected with fusible links, and so adjusted that the skylight will roll away should a fire start in the building, allowing an outlet for the smoke, are more or less common. Recently, however, this scheme has been applied to private houses,



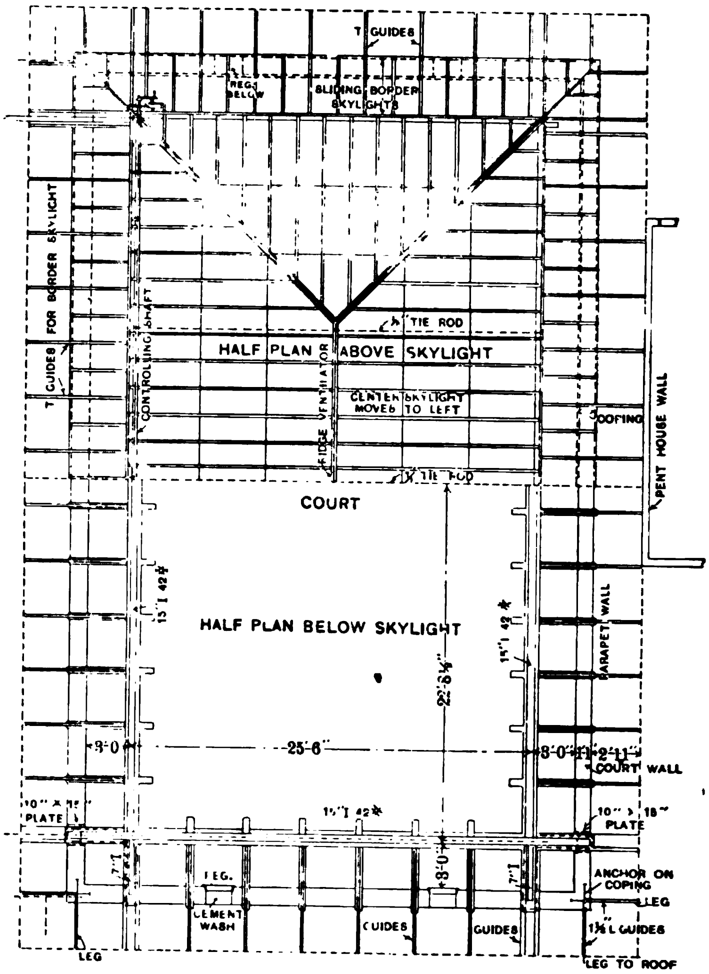
Section of Rafter Bar.

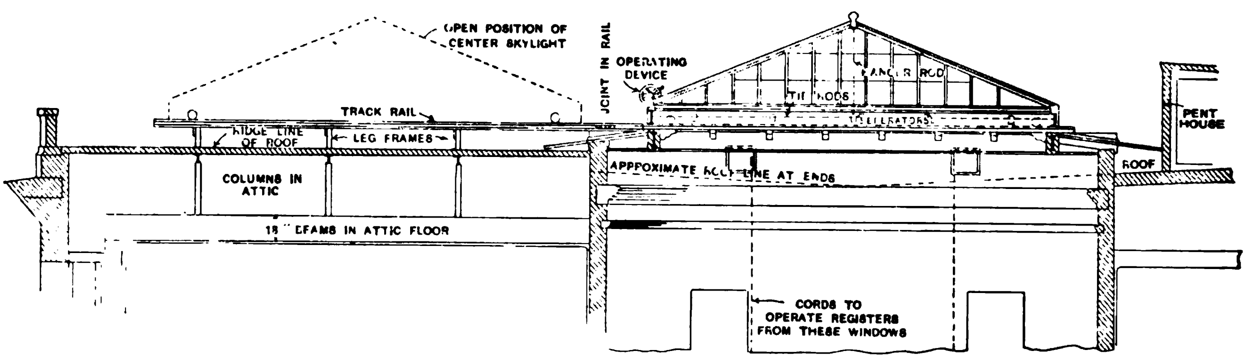


Section of Ridge Bar.

rods; hangers were dropped from the extreme peak to support the tie rods, making it a specially stiff construction. All portions exposed to the elements were made of copper, while the under side was constructed of galvanized iron. It was necessary that stiffening bars be used, and these are shown in another illustration in connection with a section of rafter bar.

To allow a circulation of air and thus remove a cause of condensation a continuous ridge ventilator was provided the entire length of the skylight, this being also shown in the illustration of the ridge bar. The skylight





Elevation Showing Track on Which the Skylight Can Be Moved.

A Large Movable Residence Skylight.

and a movable skylight to cover the court of a residence has been constructed in this city for a dwelling in Cincinnati. The size of it is such as to make it notable even if it were in a fixed position, as the extreme measurements of the movable part are 25 ft. 6 in. x 45 ft. 5 in.

The plan of the skylight, as well as the roof and the operating mechanism, are shown in the accompanying illustrations. Surrounding the main one is a border of sliding lights 3 ft. wide, making the extreme dimensions of the lighted vault 31 ft. 6 in. x 51 ft. 5 in. Owing to its large size it was necessary to provide against the skylight spreading and the ends were tied together with entire, which weighs approximately 6000 lb. without the glass, rolls on 60-lb. railroad rails, but the operating mechanism is so designed and adjusted that it can be moved with ease by two men. The border skylights are fastened to the building itself by steel bolts imbedded in reinforced concrete beams. All bolts in the main skylight are of brass, the entire work being put together in a most substantial manner.

It was constructed by the G. Bickelhaupt Skylight Works, 243 West Forty-seventh street, New York City, and after being temporarily erected at the shops in order to test the operating mechanism it was taken apart and shipped to Cincinnati, where it was used for the residence of Peter G. Thompson on College Hill, that city.

New Publications.

Electrical Contracting. By L. J. Auerbacher. Size 5½ x 8½ in.; 156 pages and 225 illustrations. Bound in board covers with gilt back title. Published by the McGraw Publishing Company. Price $2 postpaid.

This little work was prepared for the wire man and contractor with a view to giving him not only practical hints as to the latest construction methods, but also of suggesting to him means whereby his income might be increased. Only devices and wiring methods approved by the Board of Underwriters have been described, but the Underwriters' rules have been omitted, as copies can be obtained free of charge from either the New York, Boston or Chicago offices of the National Board of Fire Underwriters. Many special devices have also been described as being of interest in this connection.

The work is comprised in 12 chapters, the first and second of which deal with shop system for electrical contractors and estimating on contract work. The author then takes up various wiring systems, giving in connection therewith the layout for circuits and feeders, also wiring formulæ; then treats of exposed circuit wiring touching upon outdoor wiring, damp-proof wiring, &c. A chapter which will appeal strongly to the readers of *Carpentry and Building* is that on residence wiring. Here the author points out that the electrical equipment of a residence presents a number of problems which if successfully solved add much to the income of the contractor and to the comfort of the inmates of the building. The method of equipping and wiring a house depends first, on the cost of the installation, and second, on the construction of the building. Frame structures, especially those in the suburban districts, are often wired by means of the open wire, porcelain knob or tube method, this being the least expensive and very largely employed. One of the most important and profitable branches of residence work is doubtless the wiring of old houses which are being remodeled, and the author gives sample specifications for the electrical equipment of a four-story and basement house, having wooden floors and partitions. This phase of the subject is handled in a way to prove of great interest to builders who desire to know how to install electric lights and call bells in suburban and rural dwellings.

Among the latter chapters in the work attention is given to wiring for direct current and alternating current motors and to the installation and operation of direct current belted generators and switchboards, showing how connections are made and how to start and stop the generators. More or less is said about electric signals and telephone systems, and in the last chapter special lighting devices are considered. The work is one which appeals to a large class and appears to meet a want which has for some time existed. A comprehensive index alphabetically arranged greatly facilitates reference.

Cement Houses, and How to Build Them. By W. A. Radford; 160 pages. Size 8 x 10½ in. Bound in paper covers. Published by the Radford Architectural Company. Price 50 cents postpaid.

In view of the extent to which cement and concrete block houses are being erected in various sections of the country the above work is both timely and interesting by reason oi the suggestions which it contains both as to designs and method of executing the work. There are perspective views and floor plans of concrete block and cement plaster houses with illustrated details of construction; specifications for cement and for concrete blocks; much general information concerning waterproofing, coloring, reinforcing, foundations, walls, steps, chimneys, porches, floors, &c., &c.

The first half of the book is devoted to descriptive particulars as to how the work should be done, while the second portion is given up to illustrations of designs of dwellings covering a wide range of treatment. It is to be regretted that the pictures showing perspectives are not from photographs of the finished houses rather than from wash drawings, as the former are calculauted to give the prospective builder a more satisfactory idea of just how the structure looks after it has been built. Floor plans and brief text accompany each perspective. The preface states that the volume is presented as an epitome of all the latest investigations on the subject of cement and concrete.

Chestnut Oak as a Substitute for White Oak.

Chestnut oak is constantly becoming more valuable as a timber tree because its wood is being used as a substitute for white oak, says Forest Service Circular 135 of the Department of Agriculture. It is already utilized for many purposes for which white oak alone was formerly deemed suitable; in fact, the best grades of sawed chestnut oak are now mixed with white oak lumber and sold under the name of the more valuable wood. In western Virginia half of the cross ties on local railroads are chestnut oak, where white oak was once the only wood accepted; in Tennessee and western North Carolina the chestnut oak tie is being more and more used, as white oak there becomes scarcer and dearer. In Northern factories, also, the wood is being put to uses for which only a few years ago white oak was considered essential, as for furniture, farm implements, tool handles, oil barrels, interior finish and wagon stock. Furthermore, with the diminishing of the supply of the better grades of chestnut oak, lumbermen are exploiting the poorer timber left in inferior stands, with the result that chestnut oak forests, which until a short time ago were regarded as useful only for the tanning material in their bark, have acquired a value for lumber.

The wood is heavy, strong, hard, rather tough, close grained and durable in contact witb the soil. It is inclined to check in drying. It is dark brown in color, with the sapwood lighter. As it is somewhat softer than white oak, it does not take so high a polish, and since the pith rays are not so broad as those of white oak the quarter-sawed wood does not present as pleasing silver grain. It is somewhat lighter in weight than the other common kinds of oak. The weight of dried lumber is about 4000 lb. per 1000 ft. board measure, while that of white, red and black oak is about 4250 lb. It is considered quite as durable in contact with the soil as white oak, and much more so than any of the red or black oaks.

Chestnut oak is used chiefly for low grade lumber and for tanning material from the bark. Until 1900 from 85 to 90 per cent. of the chestnut oak was cut for the bark alone. The timber, except a small proportion of the best and most accessible trees, was left unusued after the bark was peeled. Since 1900 there has been a rapid annual increase in the use of the lumber, but the custom of removing the bark and leaving the wood is still practiced in many sections of Tennessee, North Carolina, Virginia and West Virginia, where low grade timber cannot be marketed at a profit.

The largest and soundest trees of chestnut oak are usually put to the same uses at white oak—tight barrel staves and graded lumber. It is mixed with the superior wood and marketed with it under the trade name of white oak. Some of the chestnut oak lumber from central Tennessee, extreme southwestern Virginia, and south central West Virginia is sufficiently high in quality for export with the best grades of white oak. On account of its poor silver grain, however, it is seldom quarter-sawed, even in the large sizes. The poorer grades are used locally for framing, sheathing, fencing and rough building lumber. Some mills make a practice of sawing butt logs into boards for shipment as plain sawed white oak, and the poorer top logs into framing for local use.

Chestnut oak is more immune from fire attacks than any other of the important species of the Southern mountains. All of the oaks, with their thick, firm bark, are comparatively resistant to fire, both old and young, but chestnut oak, with its particularly rugged bark, is the best protected of them all. Cases of hollowness or other serious fire injury are infrequent except in the most exposed situations. Even in early life the bark is comparatively thick, and surface fires, except during the growing season, do little damage. This, and its excellent sprouting capacity, explain why chestnut oak is usually the last tree to disappear from areas repeatedly burned.

Death of E. B. Pike.

A few days after an operation for appendicitis Edwin B. Pike, president of the Pike Mfg. Company, Pike, N. H., died at his home at the place named on August 24. He was born in Haverhill, N. H., April 7, 1845, being the youngest of six children and the last to survive. Thrown upon his own resources at the age of 14, he worked energetically to educate himself, studying for a while at Haverhill Academy and also at Newbury Seminary, Newbury, Vt., working as he studied. When only about 17 years old he made his first trip selling whetstones, but the Civil War breaking out, he enlisted and when 18 was assigned to the supply and railroad department of the army, where he continued for two years.

In the early 70's he accepted a position with the Enterprise Mfg. Company, Philadelphia, Pa., being sole salesman for this firm for a while and afterward their head traveling salesman. In 1878 he was obliged on account of his health to give up traveling for a time, and, with his brother, A. F. Pike, again took hold of the scythestone business. In 1884 the business was organized as the A. F. Pike Mfg. Company, at which time was added a general line of oilstones and other abrasives for sharpening tools. In 1889 the business had increased to such an extent as to necessitate further expansion and the Pike Mfg. Company was incorporated, with A. F. Pike as president and E. B. Pike vice-president and general manager of the sales department. In 1891 the death of his brother placed the full responsibility of the business on his shoulders, and from that time until his death he was president of the company.

The funeral services were held at his late home Wednesday morning, August 26, conducted by his lifelong friend, the Rev. John Barstow, assisted by the Rev. Maurice J. Duncklee, until recently the pastor of the Bethany Church at Pike.

Death of Architect Alfred Stone.

The architectural profession will learn with deep regret of the sudden death of Alfred Stone, senior member of the firm of Stone, Carpenter & Sheldon, Providence, R. I., which occurred at the home of his niece in Peterboro, N. H., September 4. Mr. Stone was born in East Machias, Maine, July 29, 1834, and obtained his early education in that place and in the public schools in Salem, Mass., where he graduated in 1850. After studying surveying and drawing for a time he spent six years in the offices of Boston architects, and he designed and superintended the building of the first section of Hotel Pelham, 1856-1858. In 1859 he entered the office of A. C. Horse of Providence, where he remained until the breaking out of the Civil War. In 1864 he opened an office in Providence, and in 1866 he took into partnership W. H. Emmerton. The latter was killed in a railroad collision in 1871, and in 1873 Mr. Stone took into partnership C. E. Carpenter. In 1882 E. R. Willson was taken into the firm, remaining a member until his death in 1906, and 1901 Walter G. Sheldon became associated with the firm, the style being Stone, Carpenter & Sheldon.

In 1870 Mr. Stone became a member of the American Institute of Architects, and was its secretary from 1893 to 1898, when the headquarters were established in Washington. He served on the Board of Directors until his death. Many prominent buildings in and about Providence were designed by Mr. Stone and his associates, including the Providence County Court House, the Public Library, Union Railroad Station, Y. M. C. A. Building, State Alms House, Industrial Trust Company Building, Union Trust Company Building, Slater Hall, Lyman Gymnasium, Pendleton Museum, Central Police Station and District Court, together with numerous business structures and many private dwellings.

Duplication of Plans by an Architect.

A case has recently been decided in Marin County, California, in which a Superior Court judge ruled that an architect may supply identical plans to two residents of the same city. The question of architecture came up in an injunction suit brought by an attorney to restrain his architect from constructing for a local butcher a home near the lawyer's dwelling and designed on the same general lines that had made his mansion a unique and attractive example of domestic architecture. The lawyer claimed that the peculiar style of his house should not be duplicated; but the judge, in ruling to the contrary, stated that if the injunction were granted it would have the practical effect of putting the architect out of business "because his personality expressed itself in a certain type of house, and this injunction seeks to restrain him from constructing that type."

A new Masonic Temple, which, when completed, will be an architectural credit to the city, is about being erected in Youngstown, Ohio, in accordance with plans prepared by Thayer & Thayer, architects, of New Castle, Pa. The structure will be one of the largest in the city and have the appearance of being seven stories in hight, although containing but four floors. The structure will be of brick, steel and terra cotta, will cover an area 135 x 64 ft. and will cost in the neighborhood of $110,000. Much of the structural work will be furnished by the Expanded Metal Fireproofing Company, of Pittsburgh. The building will be occupied exclusively by the Masonic Order.

CONTENTS.

Carpentry and Building

NEW YORK, NOVEMBER, 1908.

A Three-Family Apartment House in a Boston Suburb

(With Supplemental Plate.)

IN order to meet the needs of the increasing population of the suburbs of leading cities and enterprising towns of the country where the price of land is high, houses so designed as to provide accommodations for two or more families are rapidly growing in favor. We have recently presented to the attention of our readers several designs of two-family houses, and with a view to showing a typical New England arrangement for a three-family apartment house we have taken as the subject of our half-tone supplement plate this month a building of this class, lately erected in a suburb of Boston. The picture shows the appearance of the completed structure, while the plans afford an excellent idea of the general arrangement of rooms.

In planning houses of this nature many points must carefully be considered, the principal of which are the following: The arrangement must be such that the occupants of the several apartments are kept apart as much as possible, each tenant having his own private front and back hall, rear piazza, cellar compartment, &c.; all of the rooms in each apartment should open into a corridor, so that access may be had to any room without passing through another, and most important, the rooms should be so arranged as to enable the household duties to be performed with a maximum of comfort and ease. On restricted city lots it is somewhat difficult to secure all that is to be desired in plan, and at the same time ample light and air, with the proper exposure to all rooms.

Front Elevation.—Scale, ⅛ In. to the Foot.

A Three-Family Apartment House in a Boston Suburb.—Arthur W. Joslin, Architect.

The lot on which the house here illustrated is situated has a frontage of 40 ft. with a depth of about 125 ft. and faces south. The foundation is of local rubble laid in one-half cement mortar, the underpinning, porch and step walls and buttresses being of selected stone laid in broken coursed ashlar, no joints being over ⅝ of an inch thick. On completion of the house the joints in exposed stonework were raked out, neatly tuck pointed and striped with white lead. The cellar floor is of concrete 3 in. thick troweled to a true and smooth surface.

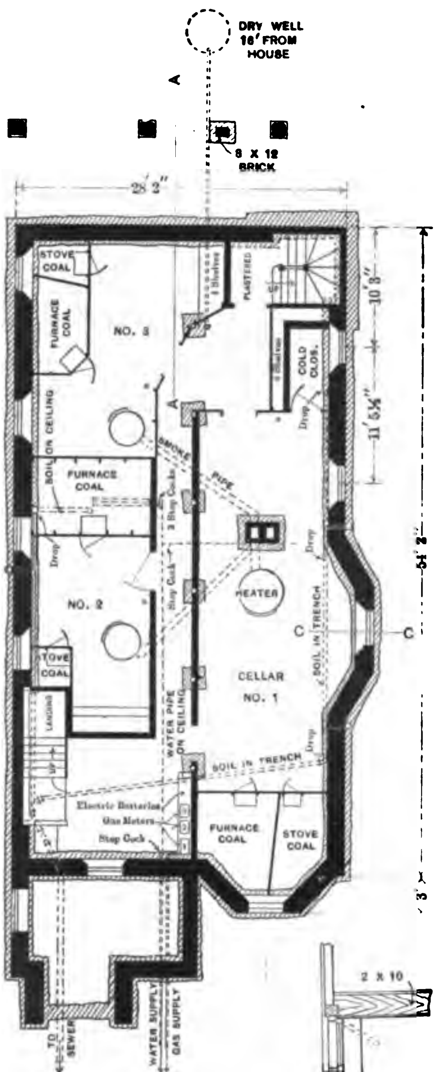
The first floor frame is shown by the framing plan, and the others are similarly timbered. The posts and girts are 4 x 8 in. mortised and tenoned together; the outside studding is 2 x 4 in. placed 16 in. on centers, the studding around openings being 3 x 4 in. The studding is 2 x 4 in. in the bearing and 2 x 3 in. in the cross and minor partitions. The studs of the main partition are footed on the girder in the first story, and in the other floors on the cap of the partition below. The caps of bearing partitions are 2 x 4 in. hard pine.

All underfloors and main roof are covered with sound narrow square edged spruce, while the walls and flat roofs of piazza and porch are covered with narrow matched spruce boards. The main roof is covered with cedar shingles laid 5 in. to the weather, and all walls are covered with extra redwood clapboards laid over black Neponset paper. All outside finish is of cypress following the details as shown herewith.

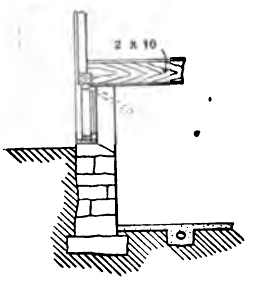
The house is plastered throughout in two coat work on wood lath, except the cellar ceiling, which is one coat work. Outside walls behind sheathing are back plastered. The inside finish is of white wood, cypress or North Carolina pine, except dining rooms, which are finished in chestnut. The front stairs are of ash and the rear of North Carolina pine. The clothes closets and pantries are fitted up in the usual manner, and the china closets have drawers below and shelves and leaded glass doors above. The dining rooms have beam ceilings and the reception halls and vestibule have wood cornices. The rear stairs lead to the attic, where there is space for each apartment for trunk storage, but no finished rooms.

The upper floors are of slash North Carolina pine in the parlors and sleeping rooms with white wood finish; of quartered oak in the reception halls with cypress finish; of Georgia pine in the dining rooms with chestnut finish, and Georgia pine in the kitchens and rear halls with North Carolina pine finish. The bathrooms have rift Georgia pine floors with North Carolina pine finish.

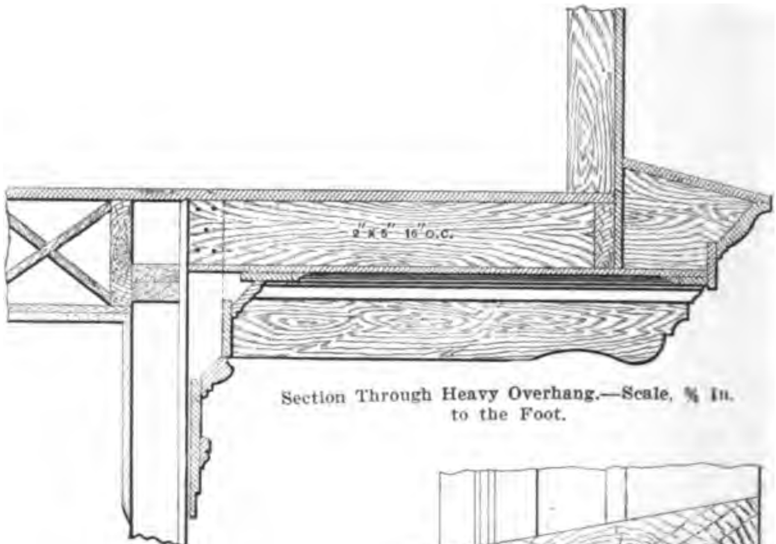
The front doors are quartered oak, while all other chinaware having hardwood seat and cover attached, all the plumbing being of the latest type of open work and all exposed piping nickeled. The sinks and washtubs in the kitchens are of soapstone with 12-in. backs and ends of the same material. All pipes for hot and cold water above the cellar are of brass. The ice chests are provided with a drain running to a dry well in the back yard. All



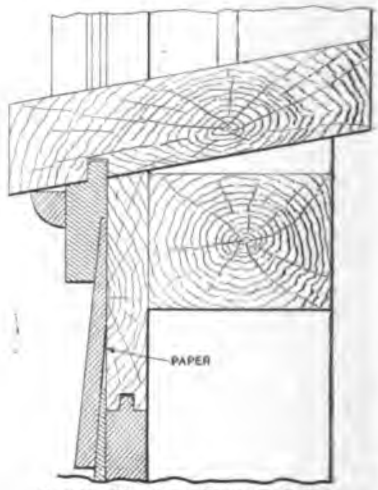
Foundation.—Scale, 1-16 In. to the Foot.



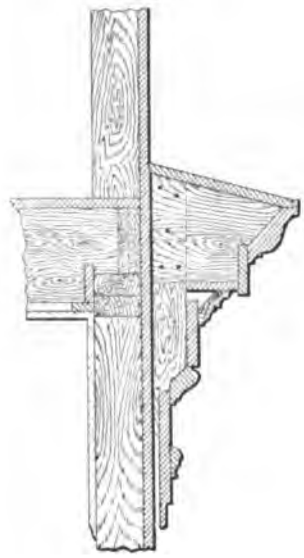
Section of Foundation on Line C-C.



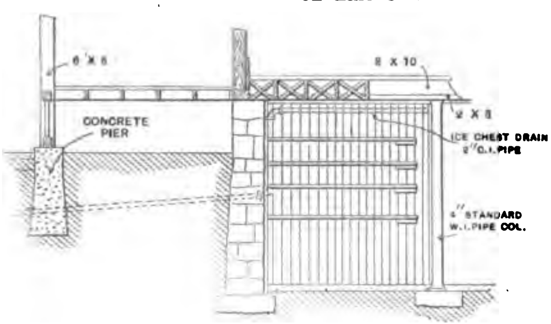
Section Through Heavy Overhang.—Scale, ¾ In. to the Foot.



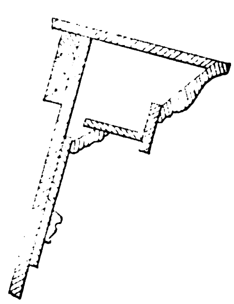
Section Through Window Sill.—Scale, 3 In. to the Foot.



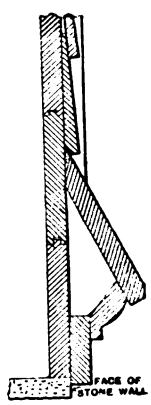
Section Over Center of Bay.—Scale, 1½ In. to the Foot.



Section Through Foundation on Line A-A of Plan.—Scale, ⅛ In. to the Foot.



Detail of Rake Cornice. —Scale, ¾ In. to the Foot.



Detail of Water Table.—Scale, 1½ In. to the Foot.

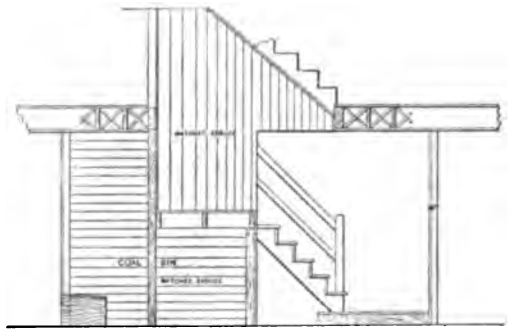
A Three-Family Apartment House in a Boston Suburb.—Foundation Plan and Details.

doors throughout the house are of cypress of A. T. Stearns Company's make. The windows are No. 1 Boston stock pattern, all glazed with first quality glass, the large lights being double thick. There are two mantels in each apartment located as shown on plans.

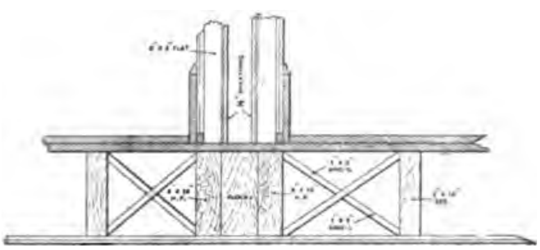
The bathrooms are equipped with enameled iron bathtubs, marble lavatories and water closets of embossed soil pipe is extra heavy as required by the city building laws.

The architect points out several features in the arrangement not usually found in houses of t[illegible]aracter. In the average house, after leaving the ves[illegible]r front stair halls, entrance is into a long corridor. In this case, however, there is a reception hall of sufficient size to permit the hanging of some pictures on the walls and placing of appropriate furniture, and access is had from this hall immediately into the principal rooms of the apartment, these being the parlor and dining room. A beam across the opening from reception room into corridor makes it possible to hang a portiere, cutting off the corridor when it is desirable to do so. The reception hall serves to cut down the length of the corridor, thus increasing its apparent width.

The back stairs are common to all tenants, but the inner hall gives space for the ice chest, with a shelf over it high enough to permit of opening the top to put in ice, and at one side a closet for mops and brooms. The wall

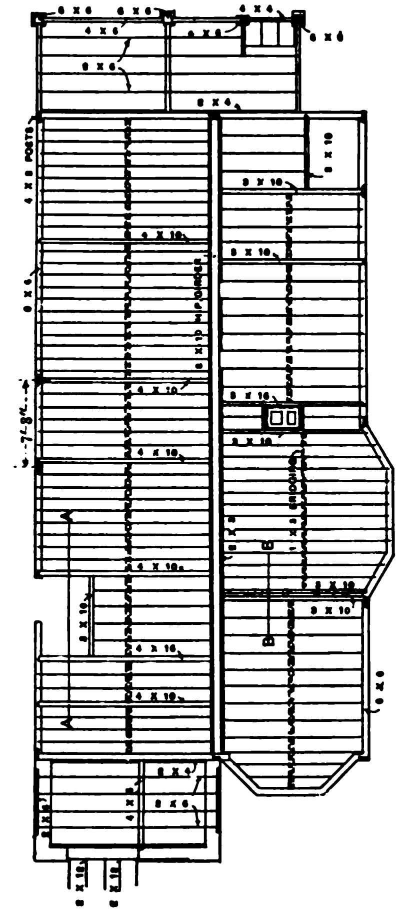


Section on Line A-A of Framing Plan.

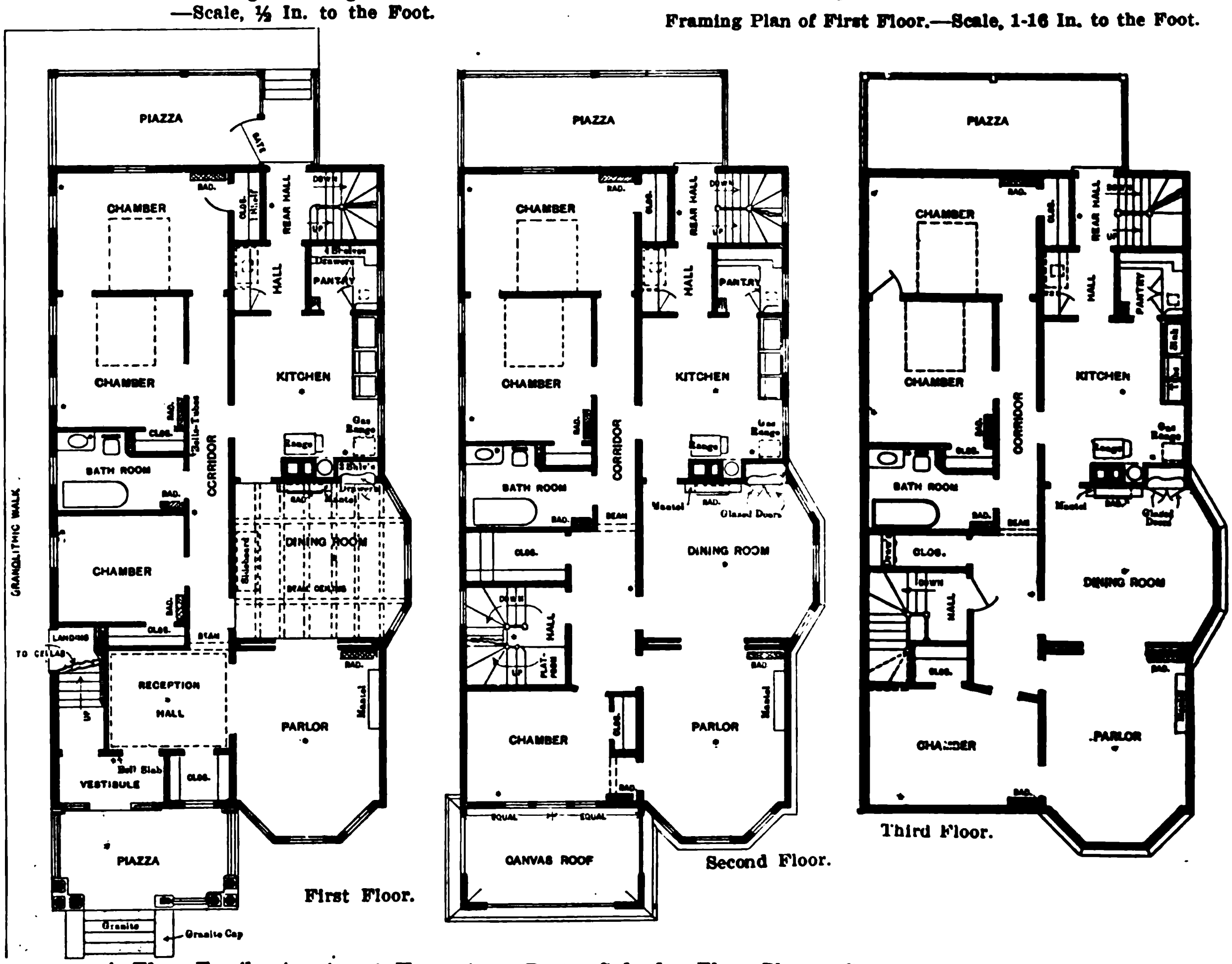


Section Through Framing on Line B-B. —Scale, ⅛ In. to the Foot.

nected, which is very convenient when there are children in the family. The bathroom, while located with especial reference to the chambers, is central to the entire apart-



Framing Plan of First Floor.—Scale, 1-16 In. to the Foot.



A Three-Family Apartment House in a Boston Suburb.—Floor Plans.—Scale, 1-16 *In. to the Foot.*

opposite the ice ch[illegible] has a cleat and hooks for hanging outdoor wraps a[illegible] [illegible]ilar articles.

The three bedroom[illegible] are close together and all very near to the bathroom. Two of the chambers are connected, which is very convenient when there are children in the family.

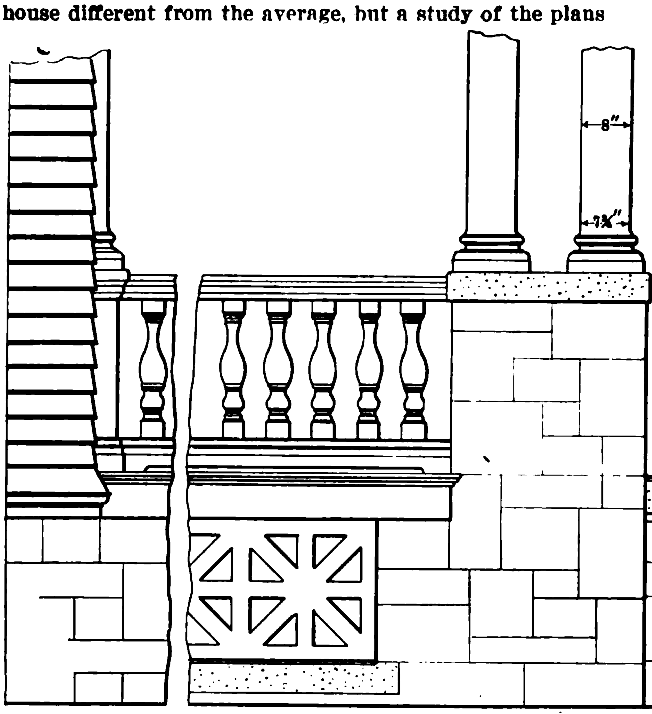
ment and sufficiently near to the kitchen to make the problem of piping easy and efficient.

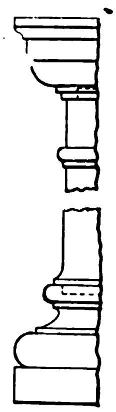
The apartments are amply provided with large closets, which is unusual in the average flat house.

Ordinarily the cellar stairs in this class of house have a door at the top, or first floor level, to cut off the cellar. Back stairs are always comparatively narrow, and the space occupied by door jambs usually reduces the width so that at the most only a 2 ft. 4 in. door is possible. By finishing the stairs right down to the cellar bottom and having a plastered hall in cellar with a door to the unfinished part of the cellar, ample room is obtained. Most cellar stairs are also spoiled by the thickness of the foundation walls. As will be seen by the section through foundation at this point, the wall has been thinned without loss of strength.

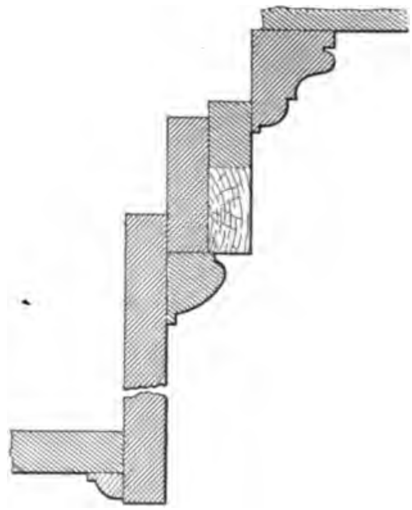
The cellar arrangement, with a corridor running from this rear hall to the front, where the bulkhead stairs go up under the front stairs, with a door going out on to the walk at grade, give access from either direction to each cellar compartment. This arrangement also does away with the ordinary bulkhead.

The gas meters are located in this common part of the cellar, also the electric bell batteries, thus access may be had to them at any time without entering the tenants' private cellars. There are other points which make this house different from the average, but a study of the plans

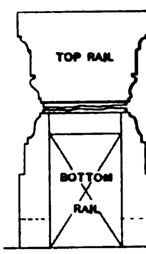




Column.—Scale. 1½ In. to the Foot.



Section of Piazza Cornice.—Scale. 3 In. to the Foot.



Sections of Top and Bottom Rails of Front Piazza.—Scale. 1½ In. to the Foot.

Details of Front Piazza.—Scale, ⅜ In. to the Foot.

A Three-Family Apartment House in a Boston Suburb.

will show them. The front elevation shows front porch built out to the outer corner of the bay window, but as will be seen from a study of the photograph this was not done, the floor plans of porch having been followed.

The house is piped for gas and wired for electric bells and door openers and equipped with speaking tubes. The heating is by means of three separate hot water systems, the Smith & Thayer "Winchester" heaters being used. The plumbing and heating work was done by M. J. Kelly, 2762 Washington street, Roxbury, Mass.

The house is painted two coats outside and finished in three coats inside except the hardwood, which has four coats.

This house was built in the spring of 1903 for John W. Webb, and is located on Aspen street, Roxbury, Mass. According to the architect, Arthur W. Joslin, 161 Devonshire street, Boston, Mass., the total cost, including gas fixtures, wall paper and moldings, ranges, shades and all other accessories necessary to a complete modern apartment was $8000. Such apartments in good localities in and around Boston rent for from $32 to $36 per month each. The land in most cases costs from 35 to 60 cents per square foot, thus if the lot is not too large such houses offer a sound and attractive investment.

THE T-Square Club of Philadelphia, Pa., has issued an announcement to the effect that in the near future volume two of "American Competitions" will be issued. The tentative list of competitions includes for this year the Porto Rican Capitol, New York State Prison, Y. M. C. A. Building, Pittsburgh, and the Municipal office building of the city of New York. The committee which has been appointed by the club to carry on the work consists of A. B. Lacey, editor, Alexander M. Adams, treasurer, and Virgil L. Johnson, custodian of drawings.

American vs. Foreign Building Methods.

Some very interesting light has been thrown upon foreign methods of building construction by a member of the firm of Marc Eidlitz & Son, building contractors, Borough of Manhattan, N. Y., who has recently returned from visiting the principal cities of Europe. In an interview with a representative of the *Record and Guide*, he stated some of the impressions which he had received while abroad and from his comments we quote the following:

"Observation and some investigation of construction work in London led me to believe that, though ahead of the Continent, they are considerably behind Americans in the quality of almost everything done. The putting together of the materials, the finished appearance of the buildings and the stability of construction are not up to the best standards in our large cities. The work proceeds very slowly in almost any part of Europe.

"I made some investigations in connection with the erection of a comparatively small addition to a building in Munich and discovered conditions that could hardly exist in an American city. The addition was to be four stories, and had a floor space of about 30 x 60 ft. When I visited the place the second-story beams were being put in place. The director of the work said that he hoped to finish the structure in about one year. Apparently there is no one to correspond to our general contractor. The architect takes full charge of every detail, being in immediate touch with the construction, and either he or a personal representative, also an architect, is constantly on hand to superintend the work.

"I was struck in London by what might be called the permanent character of the temporary structures. For instance, when a building is erected on a business thoroughfare the covering over the sidewalk, our 'sidewalk bridge,' which here is a crude but strong affair made of rough beams and lumber, is built to remain until the structure is ready for occupancy. Here we shift this temporary protection, as conditions require, but in England it remains in its original place until the work is completed. Since it stands in the one place so long there is some attempt at making it look sightly. A ceiling is frequently added, bases are put on the posts, and the entire surface gets several coats of paint.

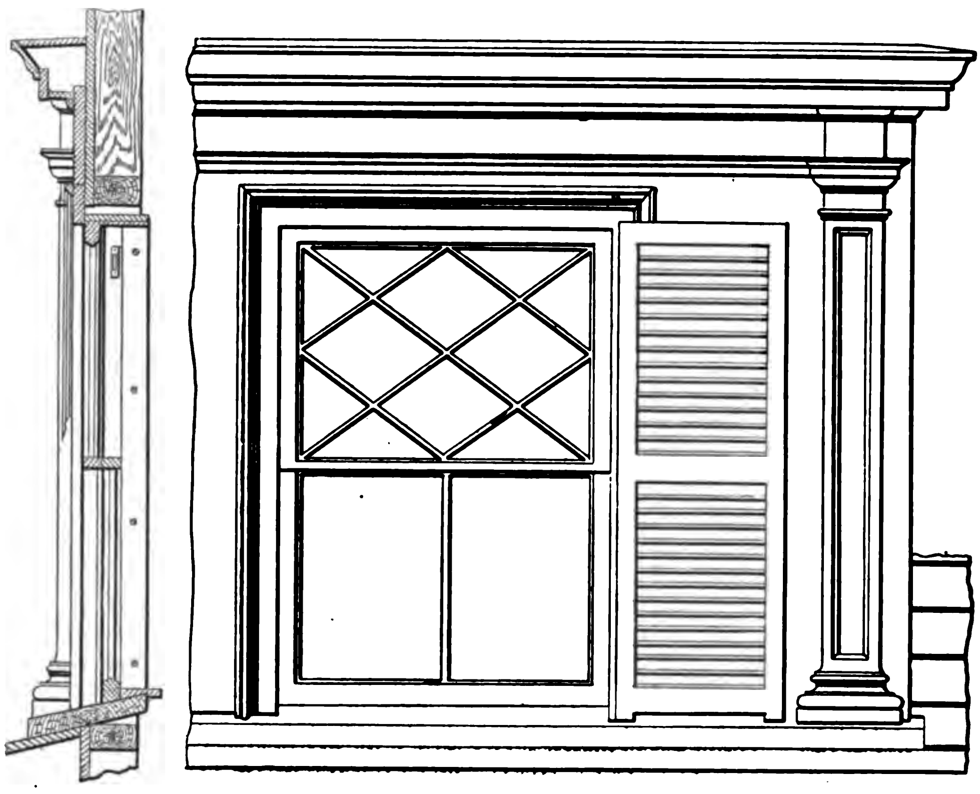
"The slow progress made in construction is indicated by features which are readily noted in connection with the Palais de Justice now being completed in Rome. It was started 17 years ago, and will not be finished for several years. It would take approximately five years to erect such a building here. The great site is surrounded by a stone fence 18 in. thick, this being erected for the same purpose that a contractor would put up a temporary wooden fence around a similar undertaking in New York City. When the work was started it was expected that it would take a long time, hence the stone fence. This will be removed when the building is ready for occupancy.

"Abroad, they are restricted by the authorities in the use of the sidewalk and pavement, but as there are seldom many different mechanics at work at the same time these restrictions do not form such a hardship as they would here. For instance, the sidewalk can be used on which to place material for the building. The line is drawn at the curb. Such a restriction would be intolerable here, and would make practically impossible the speedy erection of very large structures. Public comfort is provided for by the construction of a footway around the operations on a level with the curb.

"I think that it can be safely said that the value of the elevator for business purposes has not been realized in Europe. The inadequacy in this respect is glaring. In many of the best buildings the gates on the shaft open outward, instead of sliding sideways as in America, and the operator even steps out of the car as he opens the gate. Those who wish to enter have to keep at a distance from the elevator until the gate is in a proper position for them to enter. The loss of time and apparent inconvenience is obvious.

"In one of the best and most modern hotels in Paris there were two elevators, one about 60 ft. from the other. A person could not watch both elevators at the same time. Frequently a sign was on one elevator shaft to the effect that the guest should take the other elevator. Between only one of the cars being in operation much of the time and so many ascending and descending to and from the upper floors, I walked up to my room on the fourth floor three times out of five and almost invariably walked down. As the buildings in Europe are seldom higher than six stories, the necessity of the elevator is not felt so much, but even in the most modern structures its convenience and commercial value have not been appreciated."

Main Entrance and Porch.



Section and Elevation of Front Gable Window.—Scale, ¾ In. to the Foot.

A Three-Family Apartment House in a Boston Suburb.

THE Tenement House Department of the city of New York has recently adopted a rule to the effect that no bathroom in a dwelling erected within its limits shall have more than one door.

SELECTING HEATING APPARATUS FOR DWELLINGS.

BY S. HAMPTON RIPON.

THE selection of the proper heating apparatus for the home, the business block, the church or the school is a matter of much importance to those who have the letting of the contract. It is fair to assume that the average owner of a home or the average member of a church or School Building Committee has too much business of his own to look after to qualify fully as a heating expert. It is also reasonable to assume that prejudice may exist favorable to a certain system or opposed to another system, due either to a fortunate or unfortunate experience of himself or some neighbor with a certain type of apparatus, or to the perusal of the advertising literature of the persistent advocate of some one system of heating. The object of the writer is not to advocate this system or that system, but to frankly explain the advantages and limitations of each in the hope that it may aid the prospective purchaser in deciding what is best for his particular use.

Four methods of house heating are in general use everywhere, viz., by stoves, by furnaces, by hot water and by steam. Of the first, by stoves, we need say little. There are of course rooms that can be fairly heated with stoves, and where for economic reasons it may not be wise to consider any other system, but the owner needs no suggestions of ours in such a case, and what we say is therefore confined to heating by a central plant furnishing either warm air, hot water or steam.

Next to stoves, heating with a warm air furnace has been longest before the public. An owner of an investigating turn of mind will be deluged and distracted if he undertakes to investigate all the assertions made by the biased champions or opponents of warm air heat. There must be, however, sound and substantial reasons why the furnace has so long retained its supremacy as a heating medium, and also some reason for the criticisms so often heard. Briefly then, warm air furnaces are adapted to heat:

Buildings Adapted for Warm Air Heating.

Small and medium sized homes, single stores, two, four or eight room school buildings and certain types of church buildings. They are not well adapted to heating large, rambling houses, especially those where the apparatus cannot be centrally located, or for blocks, apartment buildings, hotels, large school buildings, theatres or most types of modern city churches. It is for the small, compact built home of the average well to do citizen that the warm air furnace is particularly adaptable, and will be considered here. Almost any 6 to 10 room house that is rectangular in shape, with few projecting bays or ells, and that has a cellar 6½ ft. or more in depth, can be satisfactorily and successfully heated with warm air.

The advantages over steam or hot water are a pure, fresh warmed air (when the fresh air inlet is taken from out of doors) that in a properly constructed apparatus transforms the Arctic temperature without to a June day's balmy atmosphere within. Another great advantage is that no large, unsightly radiators cumber the room and take up valuable space. And lastly, the cost is less than by any other system.

But heating with a warm air furnace has suffered at the hands of its friends as well as of its enemies. The fact that, unlike steam or hot water, it will still work, even when poorly installed, or that a cheapened construction, omitting many of the essential features of a good apparatus and using inferior material, does not entirely overcome its usefulness, instead of being used as it should be as a favorable argument, actually is used to condemn its use.

The cold air box may be omitted entirely, or, as is true in a large number of instances, be very poorly constructed, and there will naturally be complaints that the registers are dusty inlets and the system a dirty nuisance, but the fault is not in the system, for it works (heats) in spite of the defective air supply. The air in the room may be so dried that it even affects the furniture, but if the apparatus was large enough to properly warm the building and the vapor pan provided by the manufacturers carefully attended to, there would be none of this difficulty.

To decide whether your house is adaptable to being successfully warmed with a furnace:

The space to be heated must not have too many or too large projecting bays or ells.

The cellar must be so arranged that the heater can be centrally located.

The partition pipes must admit of comparatively direct runs without too many turns or bends.

The cellar must be of sufficient depth so that the heat pipes can be run with a good upward pitch: 1 ft. rise in 10 ft. run is none too much.

The rooms must be arranged so that no important first-floor room requires a cellar pipe exceeding 12 to 15 ft. in length to reach it. Remember that warm air resembles many people in action—it can be coaxed, not driven.

Some provision for exhausting the air from the rooms either by a fireplace or ventilator or by circulating it back to the furnace is also essential.

Character of Furnace Itself.

The selection of a furnace is a matter of prime importance, and here again the owner is often confused by conflicting claims. Do not select a pattern or make of furnace that is not manufactured by a well-known, long established company. Select a heater of ample dimensions. One just large enough may perfectly heat the home 355 days in the year, but if there are 10 days when the house is cold or the heater must be unduly forced the apparatus is far from being a success. If you are building a home to live in, select a high grade heater, even if it pinches your pocketbook. If you are building houses to sell or rent it would seem to the writer that the same policy would be good business economy, but the ethics of competition seem to be "how cheap," not "how good." One word regarding an argument often raised when the question of a good, high grade furnace is broached to a prospective buyer. The answer is, "If it costs as much as that I had better add so much more and install steam or hot water." Not at all. If the house is suitable for heating with warm air a slightly increased expense over what an indifferent job costs will install one that will be found to equal in durability, efficiency and economy that of steam or hot water. Finally, do not think this is an argument for the use of warm air in all homes. Far from it. For many it is not suitable at all.

Hot water is often referred to as an ideal heating medium, and no better term can be used to describe it. Its modern application in the open tank system is the final development in extreme efficiency. It is adapted to all homes, from a small cottage to the pretentious mansion. It possesses unusually desirable features for warming large, rambling houses with deep bays and long ells. For old houses that are being heated from a central plant for the first time it possesses great advantages over warm air, inasmuch as pipes can be run to almost any point with little cutting or disarranging existing decorations. The heat is mild and equable and can be controlled to almost any degree required, and since radiators are almost invariably placed against the outside walls or under exposed windows there is little liability of any one part being overheated while another lacks in warmth.

Two limitations should be mentioned that must be taken into account in the owner's decisions. In some houses it is hard to find space for the large radiators required. This is especially true of rooms having large areas of glass exposure and where pieces of furniture seem to require certain definite spaces.

The initial cost. Hot water heating is comparatively expensive, and it is not a system that can be "cut" with impunity. If the owner has decided that his home can best be heated with hot water he should make his financial appropriation with a view to getting the best apparatus purchasable.

If the investigating owner will remember that the cost of the boiler in a well designed hot water system is less than the cost of the radiation in the rooms, it will tend to make him insist on having a good one. For homes requiring not to exceed 600 to 800 sq. ft. of direct radiation, and this covers by far the large majority, the writer strongly advises the adoption of a round cast iron boiler. In such a boiler the fire does not die down in the corners as in a rectangular firebox. It is well, too, if the type selected has a corrugated firebox, since the coal does not lie quite so closely against the sides of the water surface, and, therefore, burns better. There should be enough flue travel to utilize the heat contained in the smoke and gases as they pass in their way to the smoke flue, and all joints connecting the various sections of the heater and exposed to the fire should be cast iron, not wrought, so that the expansion and contraction may be equal. One thing should especially be looked after—the openings provided for cleaning should be ample and of easy access, as it is of prime importance that all surfaces exposed to the heat of the fire or gases should be kept clean.

In the selection of the radiators the house owner has a wide choice in pattern and style. Much time and thought has been expended in designing and decorating these, and it will be well for him to carefully study the patterns offered and their capacity and limitations as a part of the decorative scheme of the home.

Heating with Steam.

Since we have reserved what we have to say regarding heating by steam until the last, some reader will probably draw the inference that it is because we consider it of the least importance. Not at all. No medium has as wide a field in heating as steam, but, like both warm air and hot water, the field is not a universal one, and it is much better adapted to some conditions than others. To illustrate—most small modern homes are better heated with warm air or hot water than with steam. Now this is not the fault of steam as a medium, but because ordinary methods of construction simply plan to heat each room with a single radiator of a size sufficient to warm it in zero weather or colder. Now to heat with steam in the ordinary gravity system the water must boil, giving a temperature of at least 212 inside the radiator. If this radiator is turned on in mild weather the room is soon overheated, while if it is shut off it is soon chilly, and thus having to open and close the radiator valve with the rise or fall of the temperature in the room is a source of constant annoyance and discomfort in an ordinary house.

If, however, the radiation required in such living rooms had been divided into two settings, one double the size of the other, an adjustment could be maintained that would be nearly perfect. In mild weather using the small radiator, as it grew colder shutting this off and using the larger, and in severe weather using both.

One prime advantage of steam over either hot water or warm air is that in all well constructed boilers a diaphragm regulator is provided, which is automatically accurate in its control of the fire. Set the diaphragm for ½ lb. pressure and ½ lb. pressure will be maintained, and no more as long as the fire has reasonable attention. Set it at 2 lb. or 5 lb. and the same is true. Another signal advantage of steam heating is that small radiators only are required, just about one-half the size of those necessary for hot water, and this requires correspondingly smaller piping.

Selection of Boiler.

What we have said regarding the selection of a hot water heater applies with equal force to steam boilers. A cast iron boiler should always be selected on the score of safety.

Do not select too small a steam boiler. If you had, say, only 160 sq. ft. of radiation to heat, a steam boiler having a 15-in. grate will easily furnish all the steam required, but a 15-in. grate is too small to carry coal enough to maintain a fire for a long period unattended, and so it would be reasonable to expect to find the fire nearly burned out in a winter's morning, and the rebuilding and reheating of the water already cooled down requires 1 or 2 hr. time. On the other hand, had an 18 or 20 in. grate surface been used the quantity of unconsumed fuel contained would have been sufficient to quickly heat up when the drafts were opened.

In what the writer has said he has almost entirely confined his suggestions to the owner of the home, but it is not to be forgotten that the subject is far from exhausted. Combination heating, either with warm air and hot water, or warm air and steam, has very much to commend it under certain conditions. Indeed, there are homes where it is by far the best system that can be employed.

A Tall Concrete Chimney.

A striking example of concrete construction in the shape of a chimney which not only tapers from the top to the bottom on the outside, but also increases in thickness of shell as the load from the wind pressure and weight of chimney increases, is that recently erected in Birmingham, Ala., in connection with the power plant of a terminal railroad company. It is 4 ft. 6 in. in diameter at the top and rises to a hight of 115 ft. The shell at the top is 4 in. thick and increases in thickness ¼ in. for each 5 ft. of hight, making it 10 in. at the base. The concrete in the chimney is composed of one part Portland cement, two and one-half parts sand and three parts gravel.

The horizontal reinforcement used is a wire net placed around and wired to vertical bars 1 in. from the outer surface of the concrete. This net consists of ¼ in. longitudinal steel wires spaced 4 in. on centers and woven together at intervals of 2 in. with wires. These rings, it is pointed out, not only absorb the tension on the outer surface of the concrete caused by expansion from heat, but also assist the concrete with the shear.

The chimney was started with 94 ¾-in. round steel bars for the vertical reinforcement. The number decreased proportionately, with the sectional area and the taper of the chimney which gives practically a uniform distribution of steel throughout. There are no offsets or abrupt changes in the thickness of the shell at any point, the taper being symmetrical both externally and internally. The outside diameter decreases 1½ in. for every 5 ft. of hight.

The lining of the chimney is composed of a hard shale brick built without taper to about one-third of the hight of the chimney, making a large air space at the bottom which decreases to ½ in. at the top where it is covered with a concrete cap built independent of the chimney in order to permit free expansion. The air space having no connection either with the outside air or the interior of the chimney is without circulation, and as it decreases in size permits the gradual heating of the chimney shell to a point where the lining ceases and the chimney gases come in contact with the concrete, thus eliminating any sudden changes in temperature. This is said to have been the first chimney constructed according to this system and was a complete success. The form of construction was possible through the perfection of a metal form devised by Carl Stieler, president of the General Concrete Construction Company, Memphis, Tenn., who has devoted many years to the study of chimney construction.

Speaking of tall chimneys, it may be interesting to state that the one of brick constructed for the Eastman Kodak Company, Rochester, N. Y., is 366 ft. high, and the one for the Orford Copper Company, at Constable Hook, N. J., is 365 ft. high. The foundation is carried 30 ft. below the surface of the ground, and is built of concrete. This chimney is octagonal in shape, is 38 ft. in diameter at the bottom and 11 ft. at the top. What will be the highest chimney in the world when completed is in course of erection for the Amalgamated Copper Company, at Great Falls, Mont. This will be 506 ft. from foundation to top, with a diameter of 74 ft. at the base and 54 ft. at the top, the whole requiring 5,700,000 brick, which will be of a special radial type.

SOME PROBLEMS IN STAIRBUILDING.—II.

BY MORRIS WILLIAMS.

THE plan of a newel-and-platform-stairway containing three flights, four newels and two curved steps at the bottom of the first flight is indicated in Fig. 9 of the illustrations. The rail having easements and goosenecks is illustrated in the elevation, Fig. 10. The type of stair presented in these figures may be seen in all sections of the country, located usually in reception rooms of first-class residences.

In constructing a stair of this kind special care must be taken to secure the correct relative dimensions of the treads and risers for the steps. The risers should never be more than 7 in. in hight, but a 6 or 6½ in. riser is preferable. Having determined upon the size of the riser it is placed on the compasses, and the story rod is divided into the number of risers required to reach from the first floor to the second floor. The story rod in this example indicates a total hight of 11 ft. 6 in. from floor to floor, all as shown in Fig. 10. If the compasses indicate 6½ in. for the assumed risers by stepping the story rod its full length, it is found that 21 risers will be required to reach from the first to the second floor, and also that a 6½-in. riser 21 times is just a trifle too small to cover the distance between floors, as indicated on the story rod. By trying again the stepping on the rod with the compasses expanded a little over 6½ in. we find the exact dimension of the riser, and also find the number of risers required. This method is presented here to show how stairbuilders generally in practice find out the dimension of the riser. As before stated, however, the better way is to divide the total length on the story rod by the assumed required dimensional riser.

In the flight shown in Fig. 9, the total hight on the story rod is 11 ft. 6 in., or 138 in. Assuming a riser of 6½ in. we divide 6½ into the total hight 138, giving 21 3-13 in. We thus find that with an assumed 6½-in. riser, it will require 21 risers to reach from floor to floor, and also that it is a trifle too small. Now by dividing 138, the total hight by 21, the number of risers, we find the exact depth of the riser to be 6 9-16 +.

Now to find the relative proportional dimension of a tread for this riser to guarantee safety and comfort in ascending and descending the stairway, we will make use of one of the three rules already explained. One rule was to double the depth of the riser and deduct the dimension from the figure 24 as follows:

$$6\ 9\text{-}16 \times 2 = 13\tfrac{1}{8} \quad 24 - 13\tfrac{1}{8} = 10\tfrac{7}{8},$$

which will be the exact width of a relative proportional tread for a riser 6 9-16 in. in depth.

The pitchboard for the steps is shown at A in Fig. 10, and at B a fence is shown nailed to the pitchboard, while C represents a sectional view of the pitchboard and fence. At D the pitchboard is shown applied to a cut and mitered stringer. The fence, as shown is placed against the upper edge as a guide, and the pitchboard is moved along as many times as there are steps required to be marked on the stringer.

In Fig. 11 it is shown that the risers are tongued into a groove on the under side of the tread, and that the tread is tongued into a groove made on the face of the riser. At A and B the tread and the riser are shown separately. Templates representing these sections are prepared by the stairbuilder to be used by the mill man as patterns in running the stuff through the machine.

In Fig. 12 is represented a sectional view of a few steps indicating the method of dovetailing the balusters into the treads and also at *a a*, &c., the blocks that are placed behind the risers and under the treads for the purpose of reinforcement.

The manner in which the treads are prepared to receive the dovetails on the balusters and the cut on the nosing to miter with the return nosing which is to be nailed on the finished end of the treads to cover up the dovetails is clearly indicated in Fig. 13. In Fig. 14 is presented the under side of a step showing the method of placing the blocks indicated at *a* of Fig. 12.

Referring again to Fig. 9, the wall stringers for the middle and upper flights will be noticed. At B on the stringer of the upper flight is shown a method of treating the intersection of the stringer with the base board. The figures 1, 2, 3, 4 on the stringer and 1, 2, 3, 4 on the base are equal di[illegible]ions. Draw a line from 2 on the stringer

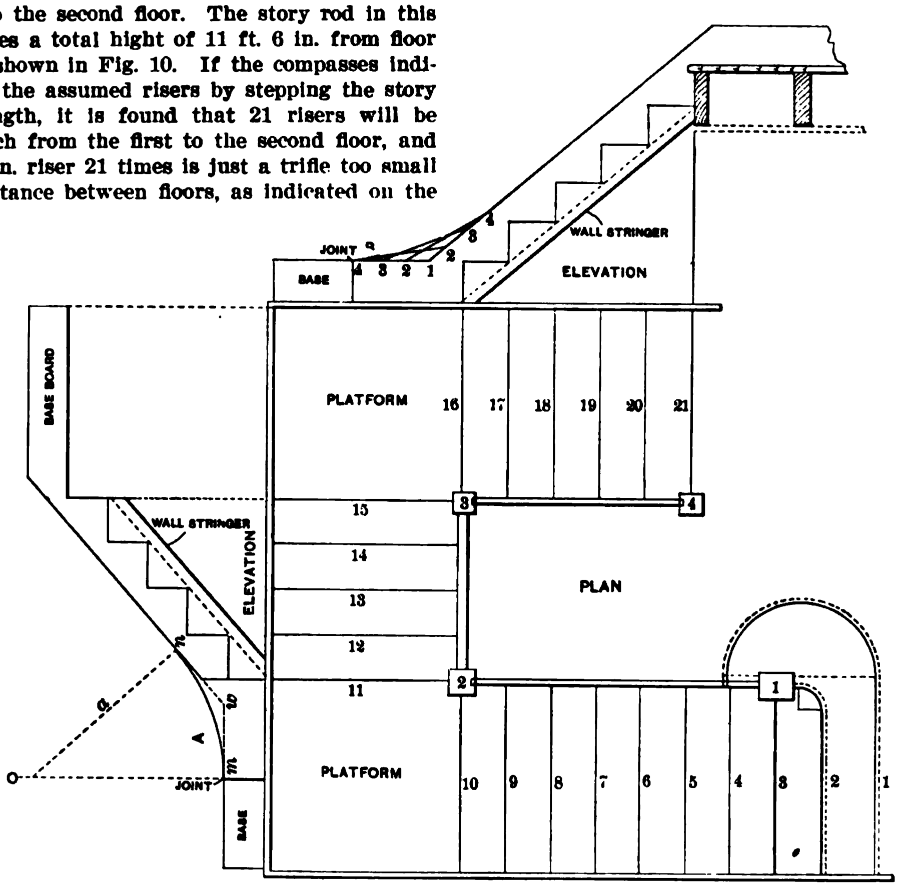


Fig. 9.—Plan of a Newel and Platform Stairway; Also Elevation of Wall Stringers.

Some Problems in Stairbuilding.—II.

to 4 on the base, also one from 3 on the stringer to 3 on the base and one from 4 on the stringer to 2 on the base. The intersection of these lines, as shown, will form a curve tangential to both stringer and base.

At A on the wall stringer of the middle flight is shown another method of treatment in use by stairbuilders. Measure from *w* to *m* and *n* equal distances; draw the line *m o* square to the baseline and the line *n o* square to the pitch line of the stringer. These lines will intersect at *o*, which will be the center point from which to describe the curve with the radius *o n* or *o m*. It will be observed that either of these methods may be used also at the top landings of the flights.

Fig. 15 is a view of a prepared semi-circular curved block to bend the veneered riser shown to be the first riser on the plan, Fig. 9. A section through the block indicating the method of its construction is presented in rangement considered necessary in order to support the two platforms shown in plan, Fig. 9. The newel marked 4 is finished at the top landing with a drop a little below the ceiling line as indicated in Fig. 10. The latter figure also shows how the easements and goose necks are laid out. From *a* below the easement of the bottom flight a level line is drawn to the newel post; the length of this line being measured on the rail to *b*. From *b* a line is drawn square to the pitch of the rail to *o*, which will be the center from which the curve of the easement from *b* to the newel is described.

The easements for the rail over the second and third flights may be described by the same method, as shown in the figure.

It should be remembered that the easements in all cases should be described before the goose necks, because as shown in Fig. 10 the hight of the goose neck is determined by the intersection of the easement with the newel.

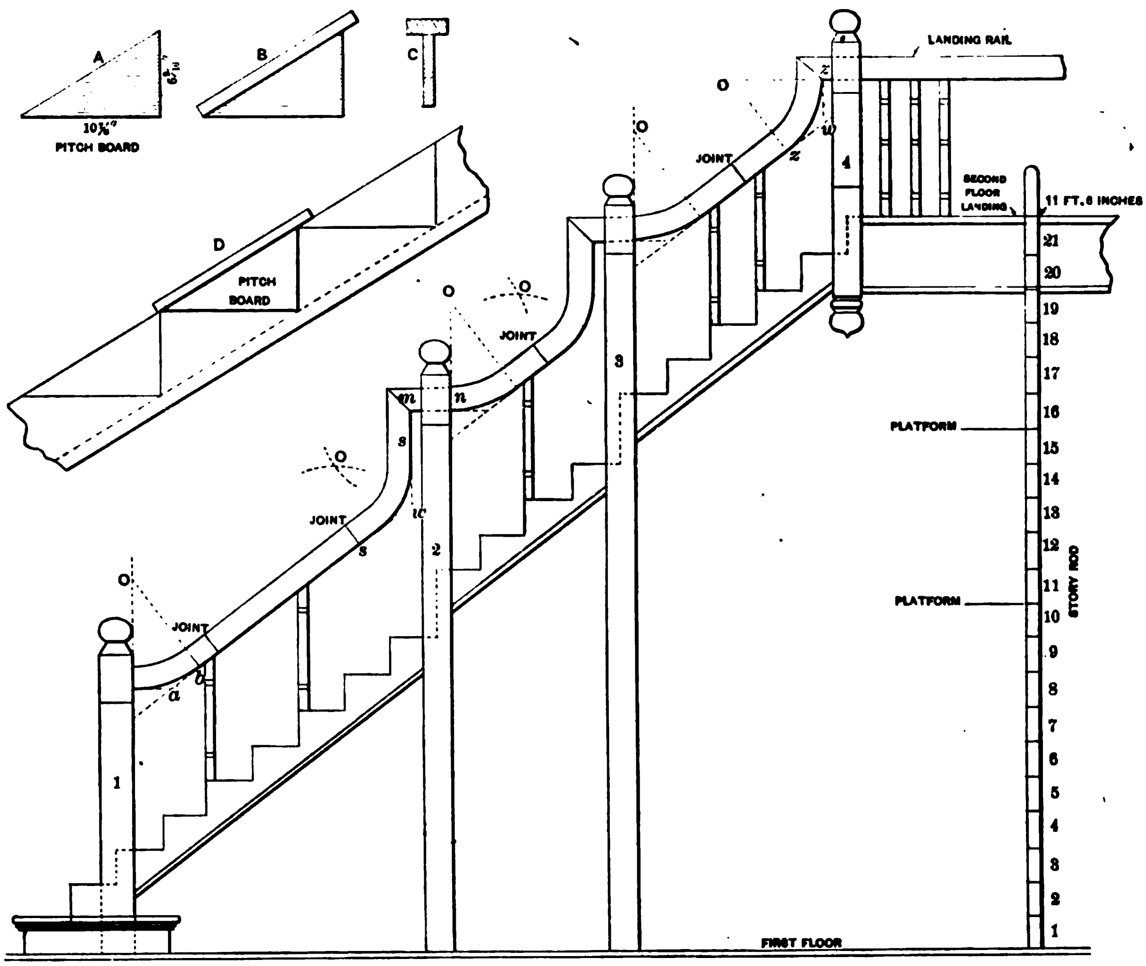


Fig. 10.—Elevation of Newel and Platform Stairway, Showing Pitchboard and Its Application.

Some Problems in Stairbuilding.—II.

Fig. 16, while in Fig. 17 is a view of a block for a quarter circle turn for bending the second riser, shown in the plan, Fig. 9.

The method, as shown in this figure, of preparing the riser for bending, is known as "kerfing." A definite number of saw cuts are made across the back of the riser from springing to springing of the curve, as shown from *a* to *a* in Fig. 17, leaving a thin veneer on the front face, also shown in the figure.

In Fig. 18 is shown how to find the exact distance between the saw cuts or kerfing lines. The letter *w* in this figure indicates a straight edge made of a material equal in thickness to that of the riser. At *a* there is a saw cut made to a depth within about 3-16 of an inch of the opposite face. The straight edge is nailed fast from *a* to *w*, then the part from *a* to *c* is gradually moved in the direction of *a* until the cut at the lower *a* is closed. The distance shown between *c* and *a* on the curve indicates the space between the saw cuts or "kerfing" lines.

It is shown in Fig. 10 that the newels 2 and 3 reach down from the stairs to the floor line, which is an ar- The easement of the rail over the second flight is shown to connect with newel No. 2 at *n*.

To describe the goose neck for the rail over the bottom flight proceed as follows:

First draw the lines of the knee, as shown at *m* in continuation of the lines representing the top and bottom of the easement on the rail over the second flight, shown at *n*. From *m* draw a line parallel to the newel to *w*, as shown; measure from *w* to *s* on this line and to *s* on the straight rail equal distances. Place one leg of the compasses in *s* on the line *w m;* extend the other leg to *w* and draw the arc shown at *o*. Again place one leg of the compasses in *s* on the straight rail and with the same radius draw the arc as shown intersecting the other arc in *o*. Now from *o* as a center, describe the curve of the goose neck as indicated from *s* on the rail to *s* on the line *w m*.

Another method of laying out the goose neck curve is shown over the upper flight connected with newel No. 4. The center, *o*, is found for this method by drawing a level line in continuation of the bottom of the landing rail and another line from *z* on the pitch rail and square to it to intersect the level line in *o*. Taking *o* as a center, the curve may now be described with the compasses, as shown from *z* to *z*.

Rules for Furnace Heating.

The following rules for furnace heating, contributed by a correspondent to a recent issue of *The Metal Worker, Plumber and Steam Fitter* may not be without interest to some of our readers:

For the average type of construction of buildings in this country the following rules for determining the size of pipes for furnace systems of heating will be found satisfactory:

For first-floor rooms:
  Divide exposed wall surface in square feet by 3.
For second-floor rooms:
  Divide exposed wall surface in square feet by 5.
For third-floor rooms:
  Divide exposed wall surface in square feet by 6.

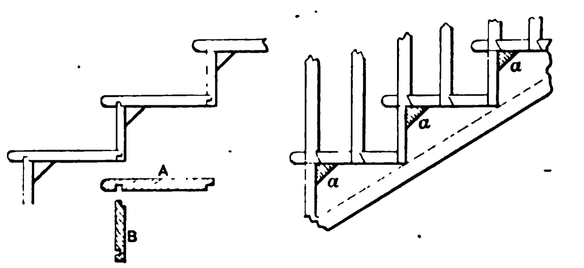
These quotients in each case give the number of square inches of cross sectional area that the wall stack should have. For the cellar air pipe or leader the diameter of pipe whose area is next larger than that of the calculated size of the wall stack will suffice. To what degree of refinement one adheres in the case of selecting the size of wall stack depends on the furnaceman himself. If one using wall stacks no deeper than 3 in. arranges to use them in widths of 9, 10, 12 and 14 in., he can, where a room requires no more than 27 sq. in., use a 3 x 9 in. stack; and where the cross sectional area as calculated lies between 28 and 30, a 3 x 10 in. stack, and where the area is more than 30 but not more than 36 in., he can use a 3 x 12 in. stack. All of these stacks can be supplied by a 7-in. diameter cellar pipe, which has an area of 38.5 sq. in. All the horizontal pipe is for is to connect the furnace with the vertical pipe. So long as the cellar pipe is fully as large as the wall stack there should be no great trouble.

The accompanying table gives the sizes of wall pipes and also of the corresponding cellar pipes which should be used for the different calculated areas of wall pipes, ascertained according to the rules given. The table is classified according to the depth of flue used. If it shows anything it shows how limited is the capacity of the 3-in. depth wall stack.

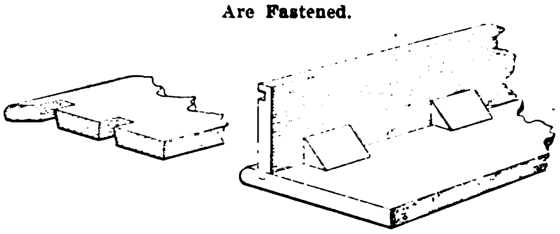
TABLE OF WALL PIPES AND CELLAR PIPES.

Flue area required.	Width of flue. Inches.	Cellar air pipe. Inches diam.	Flue area required.	Width of flue Inches.	Cellar air pipe. Inches diam.
Wall Pipes 3 In. Deep.					
Up to 27 sq. in....	9	7	31 to 36 sq. in....	12	7
28 to 30 sq. in....	10	7	37 to 42 sq. in....	14	8
Wall Pipes 3½ In. Deep.					
Up to 33 sq. in....	9	7	46 to 49 sq. in....	14	8
34 to 37 sq. in....	10	7	50 to 52 sq. in....	14	8½
38 to 45 sq. in....	12	8			
Wall Pipes 4 In. Deep.					
Up to 38 sq. in....	9	7	46 to 50 sq. in....	12	8
39 to 40 sq. in....	9	8	51 to 54 sq. in....	12	8½
41 to 45 sq. in....	10	8	55 to 62 sq. in....	14	9
Wall Pipes 5 In. Deep.					
Up to 38 sq. in....	10	7	64 to 70 sq. in....	12	9½
39 to 50 sq. in....	10	8	71 to 78 sq. in....	14	10
51 to 56 sq. in....	10	8½	79 to 83 sq. in....	14	10½
57 to 63 sq. in....	12	9			
Wall Pipes 6 In. Deep.					
Up to 38 sq. in....	10	7	64 to 72 sq. in....	10	9½
39 to 50 sq. in....	10	8	73 to 78 sq. in....	12	10
51 to 56 sq. in....	10	8½	79 to 84 sq. in....	12	10½
57 to 63 sq. in....	10	9	85 to 98 sq. in....	14	11

The operation of the rules is as follows: The exposed wall of a given room is measured; that is, its hight and length is taken and the product obtained, without regard to the area of the windows, and this product is divided by 3, 5 or 6, according to the story in which the room is located. There is this important addition that if there is an unusually large amount of glass surface in the exposed wall, like the case of a bay window in one wall of a room in which that wall is the only exposed wall, the product of the hight and length should be increased one-quarter and the result regarded as giving the proper cross sectional area of the pipe needed to do the work. If the resultant area should be 55 sq. in., for example, the accompanying table shows that where one uses wall stacks 4 in. deep a stack 4 x 14 in. would be necessary and the cellar pipe should be 9 in. in diameter. If the wall pipes are 5 in. deep it will be seen that a 5 x 10 in. wall stack would do the work and that an 8½-in. cellar pipe could be employed, although there is no great objection to having the cellar pipe a little larger.



Figs. 11 and 12.—Showing How Treads, Risers and Balusters Are Fastened.



Figs. 13 and 14.—Showing Framing of Ends and Underside of Step.

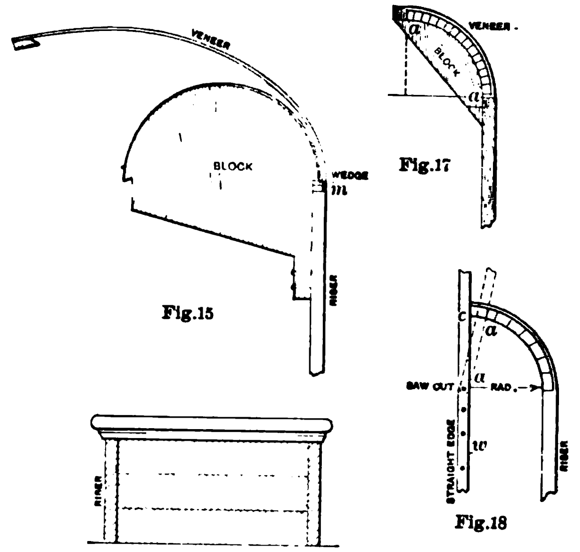


Fig.16

Fig. 15.—Curved Block Over Which to Bend Veneered Riser.
Fig. 16.—Section of Block Showing Construction.
Fig. 17.—Block for Bending Second Riser.
Fig. 18.—Showing How to Find Distances Between Kerfing Lines.

Some Problems in Stairbuilding.—II.

Building a House in a Day.

With a view to proving it possible by modern methods to build a house in a day, finishing it ready for occupancy by the owner, W. C. Carl of East St. Louis, Ill., recently put up a substantial four-room frame cottage containing parlor, dining room, kitchen, bedroom and bath, doing the work with 30 men in 12 hr. To construct the building 11,000 ft. of lumber were cut and fitted; 12,000 shingles were put on the roof; 75,000 nails were driven; 6000 lath were used on the walls and ceilings, and 375 yd. of plaster applied.

RELATIONSHIP BETWEEN ARCHITECT AND CONTRACTOR.

AT a meeting of the Carpenter Contractors Association of Cleveland, held in that city a short time ago, some remarks were presented on the above subject by Albert E. Skeel, a prominent architect of the city named, and from which we quote as follows:

We, as architects, often hear complaints from builders as follows:

1. That plans and specifications are not prepared in a sufficiently clear and definite manner.

2. That full size details should be furnished with scale plans from which to figure.

3. That details are not furnished in time to enable a contractor to secure proper figures on the various parts of his work, and that architects put a great deal more work on full size details than is shown on scale drawings. Also that architects are unreasonable in the superintending of work and at times for reasons apparently very trival—from the standpoi t of the contractor—demand changes often entailing great expense, then as to the ever-rising question of extras, these architects often ask for changes and additional work, not called for by the plans or specifications, and are not willing to allow a proper payment for same.

These are questions which I know are very vital to you all as builders, and I believe you have often good grounds for your complaints; also architects do not allow contractors time enough to go over plans carefully and give an intelligent estimate, &c.

Various Causes of Complaint.

From the architect's point of view, we find also various causes for complaint. To start with, an architect will send out notices to certain builders, stating that he is ready to receive estimates on work; some answer very promptly, others do not, neither do they send notice that they cannot figure.. I have known at times that the men who do not figure have been largely of one trade, and the architect who receives from his office assistant a group of bids, when opening them with clients, finds that there are no bids, or, at most, only one bid on a part of the work, and sometimes on the most important trades is very much disappointed, as is also his client, who is often ready to award his work at once and go ahead, but cannot do so.

Then there is the man who will come into an office and look over the plans of a large contract for ten or fifteen minutes, and put in an estimate which may be either ridiculously high or low. There is also the builder who evidently deliberately figures to put in something entirely different from what plans and specifications call for, judging him from what he tries to afterward put in the building. Then there is the builder who takes a great deal more work than he can attend to and the man who is not qualified to make an estimate on certain class of work and puts in a figure for much less than it is worth to do the work and blames the architect. He squeals and wants to be let out of this and allowed to omit that.

Next is the man who expects the architect to notify him all the time when his work on building is ready to be done, and if he gets an unexpected jolt says: "I did not know you were waiting for me." Another man knowingly figures low and then lays awake nights scheming how to get "extras." He is little better than the contractor whom the material men size up very soon as one who will pay the price for materials and will take most anything that they may send and make no protest as to quality. Then the man who has no pride in his work, but whose whole object is to put the lowest possible grade that the architect will pass and to get out of his job at the cheapest possible price, without reference to what plans and specifications may call for. Then there is the builder who goes between the architects and his client, and who tries to discredit and upset certain ideas and plans of the architect by saying: "This can be done much cheaper this way or that way."

We sometimes find the builder who thinks the owner is legitimate prey, and who asks from three to five times the value of any extra work done and wants to allow on work omitted about one-half or one-third of its value.

These are some of the troubles that architects have with builders. These and many others are the reasons for much trouble and friction between architects and contractors.

Now, I have thought this matter over carefully, and I do not see any way in which either the architects as an organization or the builders as an organization can force the other party to do thus and so, and it seems to me to be a question of individual effort. The architect should spend more time and effort to make his plans and specifications complete and realize that the plans that he has spent months in preparing are not easily read in a few hours, which is sometimes all the builder can get. He should furnish very complete, large size scale drawings, so the contractor may know what to expect for interior work and for any special features on the exterior. As to preparing full size details to figure on, I do not think that is fair to architects, as we all know that very few jobs go ahead as figured, and changes or cutting down is very often done.

As to ordering of extra work, I believe it is not often among the better class of architects that any deliberate attempt is made to evade the payment of reasonable extra work, but to avoid misunderstanding an agreement should always be made clear as to whether certain work is extra or not. I have had men suggest certain ways or methods of doing work different from what plans or specifications called for, and then found myself confronted with an extra bill which there was nothing on earth to justify. These are irritating things. If a contractor has any reason to expect an extra, he should so state to the architect before doing the work and get an order to do the same.

The builder should demand and get time enough to figure plans carefully before putting in his estimate. He should also notify the architect promptly, should he not be able to go over plans after receiving invitation to estimate. The builder should return plans at the time stated so as not to disappoint and keep waiting other builders, who have arranged to use the plans, and then after returning plans get in bids promptly and not keep architects waiting day after day through neglect which is often without cause.

The Undesirable Builder.

There is a class of builders that architects dread, that is, men who persistently haunt their offices to figure. I do not mean men who legitimately solicit work at offices, but the man who usually, for some good reason on the architect's part, is not acceptable to him, who, hearing of a job being figured, will go down to the owner or others interested and try to compel the architects to allow him to figure on the work, and will put up all sorts of reasons, except the right reason, as to why the architect will not allow him to figure.

You all know of the men who figure in a hurry and repent at leisure. It would in most cases be a real favor to an architect to have a contractor call him up and say, should he be very busy: "Pass me by on this job, but let me hear from you later." It would be much better than to put in ridiculous "guess bids" instead of figuring.

If you all knew the load that is lifted from the architect's shoulders when certain men get the job, you would not cry "favoritism," as is sometimes done. These are the men who, when they get work, give it their personal attention and who take pleasure in doing the work in the best possible manner, and delight in doing the work well, because it is worth so doing. These are the men the architect does not forget when work is not so plentiful; men who, if poor material comes on the job, do not wait for the architect to obect or put same in building and cover it up, but insist on having what they pay for.

It is not fair to the contractor who figures all that is called for in a job for an architect to take any less than plans and specifications fall for. In fact, this whole situation resolves itself into the old principle—"Do Unto Others as You Would Have Others Do Unto You." Let the architects and contractors enter into the spirit of these contracts with the wish and effort toward a mutual good fellowship based on a spirit of fairness to all concerned.

We, as architects, are particular as to who is admitted to our chapter. We have applications from architects that do a large amount of business, but who we do not believe will practice in harmony with the established ethics of our profession. We cannot compel them to do so, and therefore we do not want them as members, while we admit men who do less work, but who, we think, will work harmoniously with us.

I believe your organization can do some good among its members along this line. I do know that the spirit of good will between architects and builders is on the increase; for instance, the joint dinner to Frank Miles Day, of Philadelphia, president of the American Institute of Architects, given last winter by the chapter and the Builders' Exchange. But I am frank to say that I believe more can be done from the builder's standpoint to bring about desired results. An earnest endeavor on the part of contractors to carry out the small incidental parts of their contracts is always fully appreciated.

These small things are the uncomfortable things that turn up and trouble the architect. All these small things are worth doing well, and I believe it to be the contractor's duty to see that such things are well done on his part of the work. Almost any contractor expects to do the work in some shape, but it is the man that has the ability, experience and willingness to stick by his job and complete these things that constitute the difference between poor and good work. This is the type of man that the architects are looking for.

That the architect is arbitrary and unreasonable at times I believe to be true, but if the two parties can approach each other with the spirit of fairness it will obviate much trouble. That the architect is the friend of the good builder there is no question, and the better the reputation of the builder the more reason there is for this friendship.

I imagine you will think I have made much of the small things and passed up any mention of the larger incidents, but it is the small happenings that make or mar most things in this world. It is the small things that are happening all the time that sow the seeds of dissension, and when we study and get down to a science the doing well of small things, I believe we shall have solved our problem, as the large things will take care of themselves.

Convention of the Architectural League of America.

The tenth annual convention of the Architectural League of America, as intimated in our last issue, was held at the Hotel Ponchartrain, Detroit, Mich., September 17, 18 and 19. A large and highly representative gathering was present to hear the address of welcome by Frank P. Baldwin, president of the Detroit Architectural Club. In the course of his remarks he outlined the programme of entertainment for visiting members, and pointed out for what the Architectural League stands and how it differs from the Institute of Architects.

After a roll call of delegates and the appointment of a Committee on Records and Publicity, the election of chairman and secretary of the convention was held. The result was the choice of Prof. Newton A. Wells as chairman and H. V. von Holst as secretary.

After the appointment of two auditors the remainder of the session was devoted to a discussion of the Beaux-Arts System of Education. This brought out remarks from a number of those present, including Professor Lorch of the University of Michigan, J. Lyle of Toronto, L. C. Newhall of Boston, Frank C. Baldwin of Detroit, H. Dercum of Cleveland, H. K. Holsman of Chicago, P. Hynes of Toronto and Mr. von Holst of Chicago.

At the second day's session President P. Hynes read the report of the Executive Board, after which the report of the Committee on Education was read and considered at great length.

The last day's session opened with a report of the special Committee on University Fellowship, of which Emil Lorch was chairman.

A communication was read from Glenn Brown of the Board of Regents of the National Academy of Art, the purport of which was to suggest a federation in all the art societies of the country to hold regular meetings at Washington. It was suggested that the incoming president of the League appoint a committee to take charge of the matter.

Chairman Wells then appointed committees for 1908 on Education, Traveling, Scholarships, University Fellowships, Publicity and Promotion, and Architectural Annual.

The election of president was then taken up, and Mr. Newhall of Boston placed in nomination the name of Frank C. Baldwin, which nomination was seconded, and Mr. Baldwin was unanimously elected president of the Architectural League of America. The new president expressed his appreciation of the compliment tendered, and expressed the hope that he might be able to discharge the duties of the office with as much success as his predecessor.

The report of the Committee on Education was read, which urged the carrying out of the suggestions made for attaining a higher standard of education subject to the action of the special Committee on Education. These recommendations are that the clubs endeavor to stimulate an enthusiastic activity among their members, which will banish from the clubrooms the commercial spirit and establish a closer relationship between the older and younger members of the club. It was suggested that this can best be accomplished by the "Atelier System" of working, in which the older men give their time and energy to teaching the younger men by criticism or working shoulder to shoulder with them. The committee expressed the belief that the education of draftsmen should include a thorough training in designing, in historical and technical knowledge, and to this end establish club "Ateliers" and maintain and require attendance upon classes in construction, history of architecture and free hand drawing from cast and life. The report of the committee was adopted as read.

It was decided to hold the next meeting of the League in the city of Boston. A vote of thanks was tendered to the Architectural Club of Detroit, and also to a number of people for their kindness and for courtesies extended during the convention.

The entertainment provided for the visitors included an automobile ride throughout the business and residence districts and Belle Isle Park, terminating with a banquet at the Country Club House. Visits were also made to the Packard automobile factory, a building of reinforced concrete construction designed by Architect Albert Kahn, who was also the architect of the Country Club House. Another trip was a boat ride down the Detroit River and Lake St. Clair, given by Berry Brothers, occupying practically all of Thursday afternoon. Another was a boat ride and lunch at the establishment of Hiram Walker's Son at Walkerville, Canada.

Convention of the Northwestern Cement Products' Association.

At a general meeting of the Executive Committee of the Northwestern Cements Products Association, called by President Martin T. Roche at the Nicollet Hotel, Minneapolis, Minn., it was unanimously determined to hold the fifth annual convention on March 2, 3 and 4, 1909, the place to be determined later by a committee composed of J. C. Van Doorn, C. A. P. Turner, O. U. Miracle, R. O. Miracle and Harvey B. Smith.

The association has decided to present to the Minnesota State Fair a concrete building to be used solely for cement product exhibits. A committee composed of H. A. Rogers, E. Cobb, J. C. Van Doorn and D. L. Bell has been appointed to select a site on the fair grounds for the building in question. A committee consisting of C. A. P. Turner, O. U. Miracle and L. V. Thayer has also been appointed to draw the necessary plans. The president of the association will act in conjunction with the different committees ex-officio.

A LOS ANGELES DWELLING FOR TWO FAMILIES.

IT is always interesting to contrast ideas of house design and arrangement as they appear to exist in one section of the country with those which are exemplified in another by work from the offices of various architects in those particular communities. The prevailing popularity of dwellings intended for occupancy by two families has afforded excellent opportunity for such a study, and in the recent past we have published designs from architects in different parts of the Eastern and Central Western States, clearly indicating their respective ideas of the requirements of a house of this nature. In the present number of the paper we illustrate the conception of a Los Angeles architect as to a two-family dwelling, the elevations clearly showing the up to date treatment of the exterior, the plans indicating the general arrangement of the several rooms and the miscellaneous details, the method of construction and style of finish.

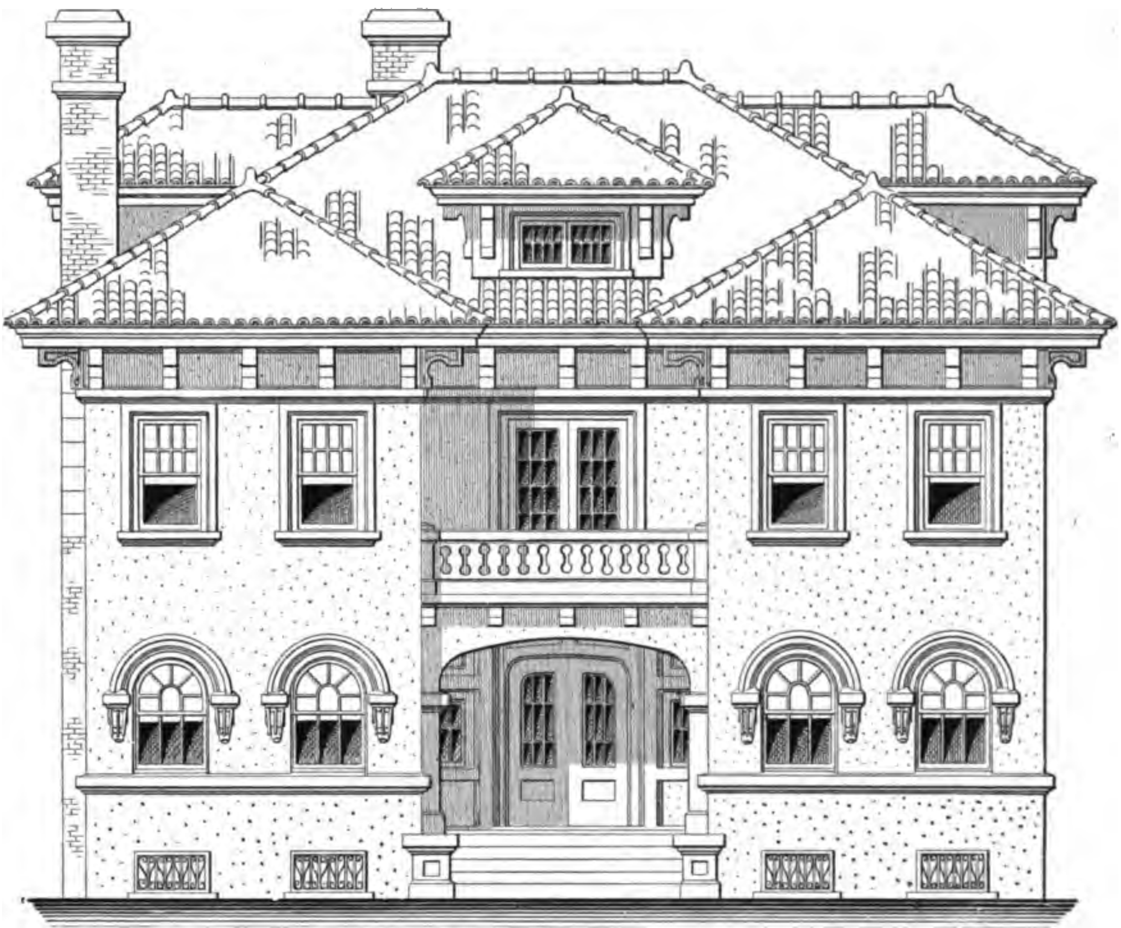
According to the specifications of the architect, the foundation is of concrete mixed in the proportion of one part Portland cement, two parts clean sharp sand, and five parts sharp gravel. The outside walls are 12 in. thick, with 21 in. footings, and all inside bearing walls are 8 in. thick, with 14 in. footings, while the nonbearing walls are 6 in. thick, with 10 in. footings.

The principal framing timbers are of Oregon pine, the first and second floor joists being 2 x 10 in.; the third floor joists 2 x 8 in., and the ceiling joist 2 x 4 in., all placed 16 in. on centers. The outside wall studs are 2 x 6 in., and the inside wall studs 2 x 4 in., also placed 16 in. on centers. The sills are 4 x 6 in.; the plates are 2 x 6 in., doubled on top, and the rafters are 2 x 6 in., the latter being placed 32 in. on centers.

The outside walls are sheathed solid with 1-in. material, laid diagonally, this in turn being covered with heavy rosin sized paper, over which is placed galvanized metal lath and then plastered with a rough sand finish. The roof is sheathed solid with 1-in. material, and covered with Muerer's galvanized tile. All exterior trim is of redwood painted and sanded.

The plaster covering the body of the house is a deep cream color bordering on the yellow, while the sash, jambs and window molds are white. The roof is a Venetian red.

The first and second story floors are doubled, the subfloors being of No. 2 tongued and grooved Oregon pine laid diagonal. The finish floors of the principal rooms, both up and down stairs, are of quarter sawed oak, while all other floors are of vertical grain Oregon pine. A layer of heavy rosin sized paper is laid between the sub and finish floors. All headers and trimmers are doubled, and all vertical partitions are "fire stopped" every 5 ft. The joists are cross bridged once in every span of 10 ft. or over.



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

A Los Angeles Dwelling for Two Families.—D. W. Harris, Architect.

The entire cellar floor is covered with 1/2 in. coat of equal parts cement and sand over an aggregate 3 1/2 in. thick of the same mixture as is used for the foundation walls. The chimneys are of brick, plastered the same as the balance of the house, and all flues are lined with terra cotta. The fireplaces are provided with ash traps, those on the second floor having flues to carry ashes to the cellar. Each kitchen ventilator has a separate flue. The interior walls and ceilings are covered with hard wall plaster. The living rooms, dining rooms and halls are finished with a plaster of Paris coat to allow for papering. The balance of the rooms have a sand finish and are tinted.

The interior trim of the living rooms, dining rooms and halls is of quarter sawed oak, and of the other rooms slash grained Oregon pine. The mantels are of pressed brick with tile hearths. The clothes chutes are lined with galvanized iron and the inside of the doors or covers to them are covered with metal.

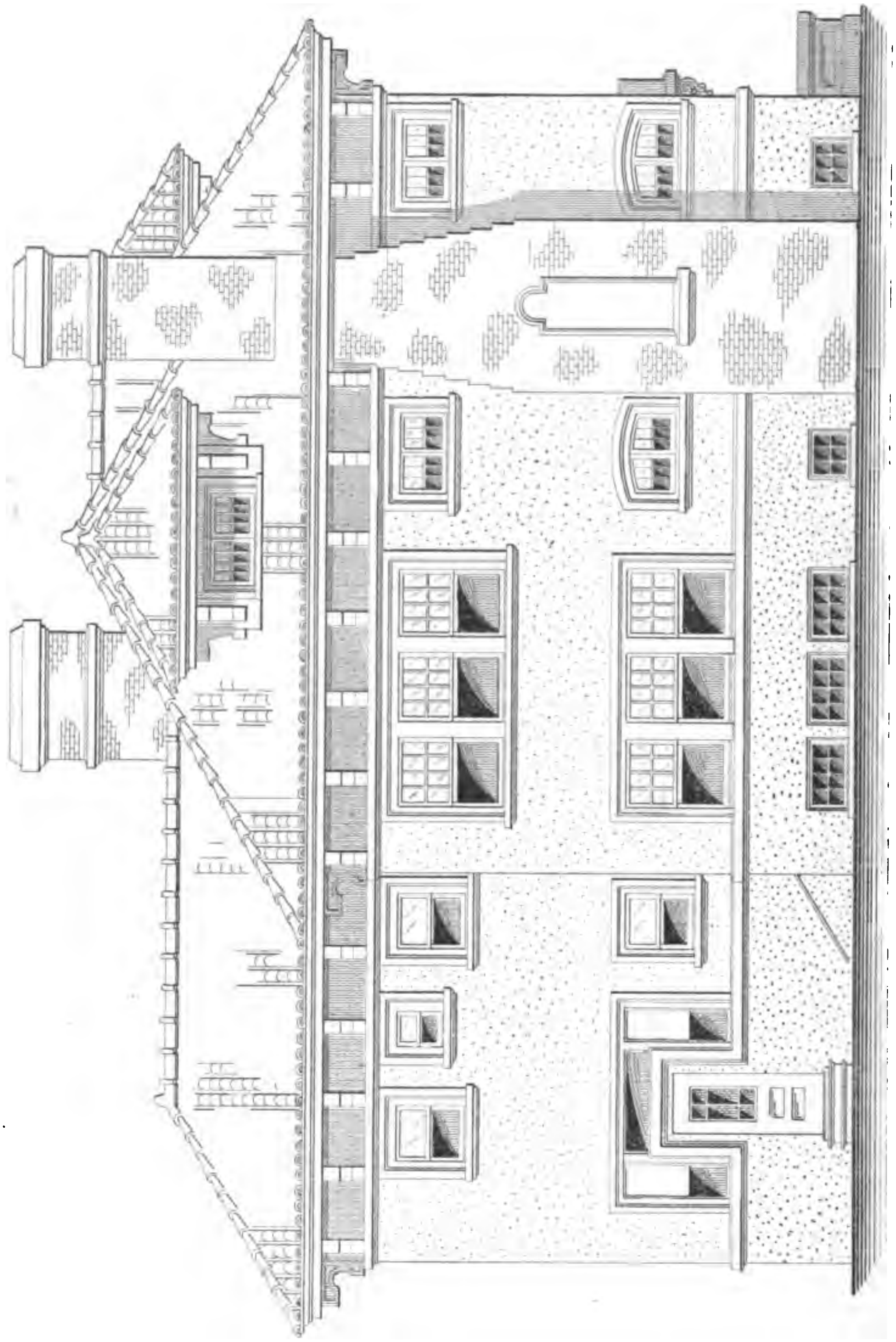
The walls of the cooling closets are insulated with "Nonpareil" cork insulation, and the doors are also insulated and made with rabbeted edges, while the jambs are covered with strips of heavy felt. The cooler windows are doubled.

The floors are waxed and the hardwood trim filled and covered with two coats of Sherwin & Williams' varnish, well rubbed between each coat, and "the last coat flatted with pumice stone and water." The woodwork of the kitchens and pantries is filled and varnished one coat, while the bedrooms and bathrooms are primed and painted three coats of lead and oil and finished with a coat of enamel. All exterior woodwork is primed and painted two coats of lead and oil, while the cornice brackets, window casings and belt courses are sanded.

All plumbing is strictly modern, the fixtures being of "Standard" porcelain enamel type.

Fuel gas is piped to the kitchens and to the fireplaces.

The house is wired complete for electric lights, use being made of the two-wire system with a 110-volt circuit. All work is done strictly in accordance with the rules and regulations of the National Board of Underwriters and of local ordinances. The ceiling lights in the principal rooms are connected on switches placed at convenient points, while upper and lower hall lights belonging to the upper apartment are placed on three-way switches. The lights in the vestibule are controlled by switches placed inside of the halls. All switches are of the Perkins' flush snap or flush push type, with plates to match the balance of the hardware. Electric bells are placed in the kitchens connected with push buttons at the front doors, also buzzers in the kitchens connected with floor push in dining rooms at a point convenient to the head of the dining tables. Telephone wires are installed from the front of the house to the rear halls, and an electric door opener is installed for the convenience of



A Los Angeles Dwelling for Two Families.—Side (left) Elevation.—Scale, 1/8-in. to the Foot.

the occupants of the upper apartment. Each apartment is wired separately, and has separate meters and cutouts. is wired separately, and has separate meters and cutouts.
air generators, equipped with fresh air duct from two sides of the house, this duct being furnished with dampers so that cool air may be drawn from either side of the house at will. The system is guaranteed to thoroughly heat the house with an outside temperature of 28 degrees.

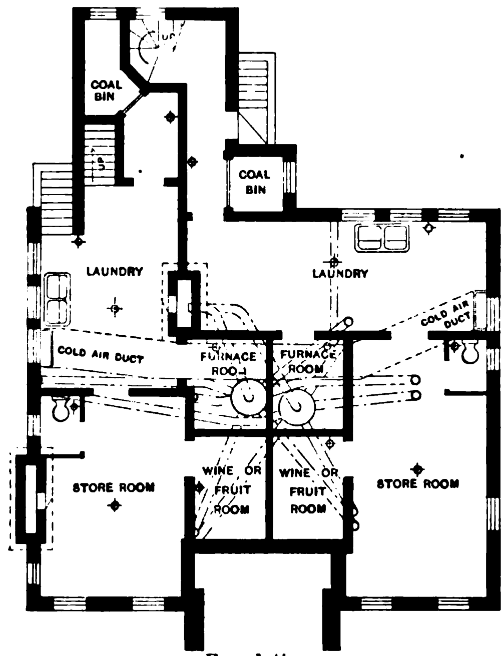
The estimate of cost is such a striking example of what is desirable as an estimate in detail that we give the figures herewith:

EXCAVATION.

286 yd. at 47 cents		$166.38
Based on following cost per cubic yard:		
One man can pick 15 yd. per day: Wages being $2 per day, 1 yd. will cost	$0.133	
One man can throw out 15 yd. per day: With wages at the same rate, 1 yd. costs	.133	
One man with team can haul 20 cu. yd. per day: wages at $4, 1 yd. will cost	.20	
Total	$0.466, or say 47 cents.	

MASONRY.

Foundation walls, 80.6 yd. concrete at $8.05		648.83
Based on following cost per cubic yard:		

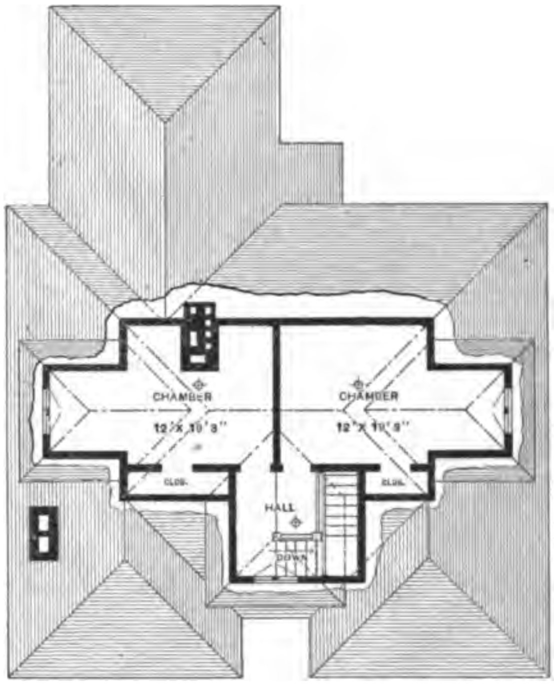


Foundation.

Cement, 1.2 bbls. at $3.20	$3.84	
Sand, 0.35 cu. yd. at $1.25	.44	
Gravel, 0.95 cu. yd. at $1.50	1.42	
Forms	.55	
Labor at $2 per day, 90 per cent	1.80	
Total	$8.05	
Cement floor and steps, 1,648 sq. ft. at 13 1-9 cents...		216.07
Based on following cost per square foot:		
Concrete, 3½ in. thick, at $8.05 per yard	$0.80	
1-12 bbl. Portland cement for top coat	.27	
1 cu. ft. sand at $1.25 per yard	.05	
Mixing and spreading surface layer	.06	
Cost per yard	$1.18	
Cost per foot = $1.18 ÷ 9 = 13 1-9 cents.		
Chimneys, 29 M brick at $15 per M		435.00
Based on following data:		
1,000 brick delivered	$5.50	
One brick mason laying 1,000 brick in 7 hr. and wages at 62½ cents per hour, the cost of laying per 1,000 will be	4.37½	
One helper 7 hr. at 43¾ cents per hour	3.06¼	
200 lb. lime at $1.50 per barrel	1.36	
⅝ yd. sand	.78	
Total	$15.08	

PLASTERING.

Exterior two-coat work, 618 yd. at 56 cents		290.08
Based on following data:		



Attic and Roof.

First Floor.

Second Floor.

A Los Angeles Dwelling for Two Families.—Floor Plans.—Scale, 1-16 in. to the Foot.

100 sq. yd. metal lath at 25 cents	$25.00	
10 lb. brads at 5 cents	.50	
Labor putting on lath, carpenter one day	3.50	
800 lb. lime at 68 cents per C	5.44	
6 lb. hair at 7 cents per pound	.42	
Coloring	.50	
Plasterer, 2¼ days at $5	11.25	
Helper, 2¼ days at $3.50	7.87	
Cartage	1.00	
Cost of 100 yd	$55.48	
Cost of 1 yd., 56 cents.		
Interior three-coat work, 500 yd at 48 cents		240.00
Based on following data:		
1,440 lath at $3.25 per M	$4.68	
10 lb. 3d nails at 5 cents	.50	
Labor putting on lath	5.00	
1,000 lb. lime at 68 cents per C	6.80	
8 lb. hair at 7 cents	.56	

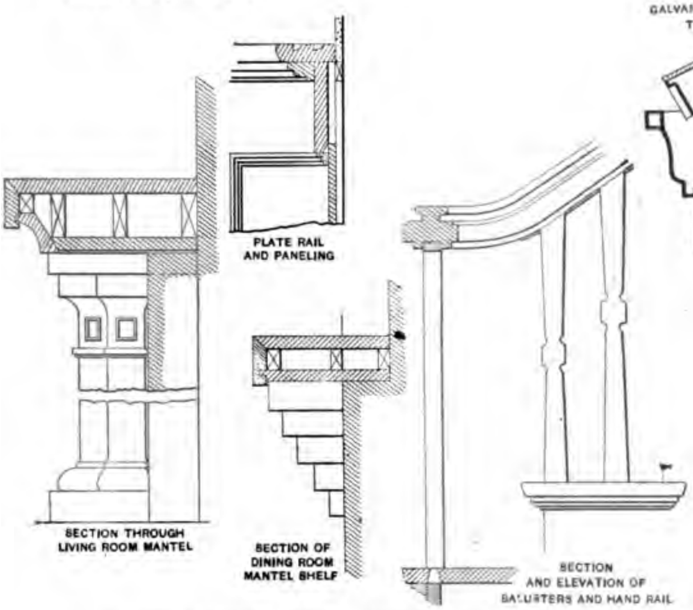
3 cu. yd. sand at $1.25 per yard	3.75	
100 lb. plaster of Paris at $1 per C	1.00	
Plasterer, 3¼ days at $5	16.25	
Helper, 2½ days at $3.50	8.75	
Cartage	1.00	
Cost per 100 yards	$48.29	
Cost per yard, 48 cents.		
Interior two-coat work, 894 yd. at 30 cents		268.20
Based on following data:		
Lath, labor and nails, as above	$10.18	
800 lb. lime at 68 cents per C	5.44	
6 lb. hair at 7 cents	.42	
2 yd. sand at $1.25	2.50	
Plasterer, 1½ days at $5	7.50	
Helper, 1 day at $3.50	3.50	
Cartage	1.00	
Cost per 100 yd	$30.54	
Cost per yard, 80 cents.		

CARPENTER WORK.

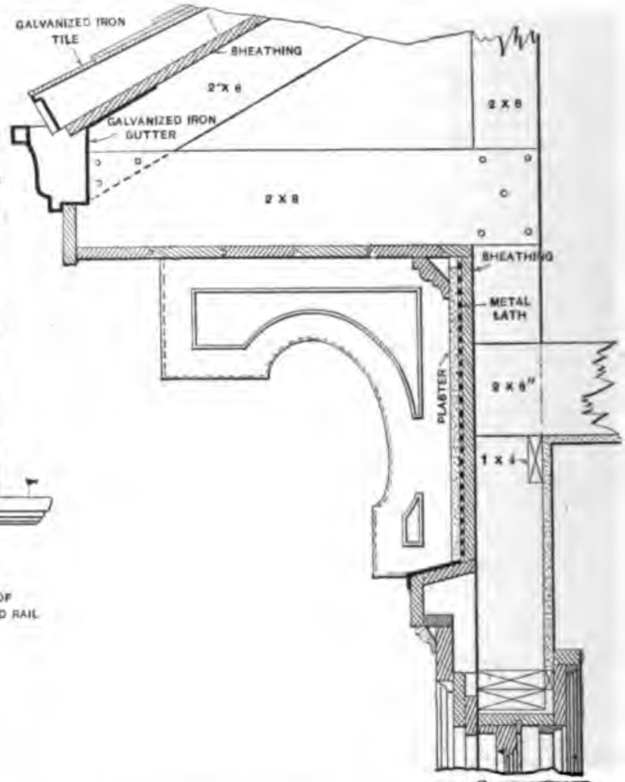
530 ft. redwood at $28	$14.84	
16,216 ft. Oregon pine at $22	356.75	
9,263 ft. Oregon pine at $23	213.00	
2,952 ft. Oregon pine at $24	70.86	
1,427 ft. Oregon pine at $40	57.08	
800 ft. T. and G. redwood at $38	30.40	
2,800 ft. No. 1 O. P. flooring at $38	106.40	
Labor, based on a scale of $3 to $4 per day	850.00	
Total		1,699.33

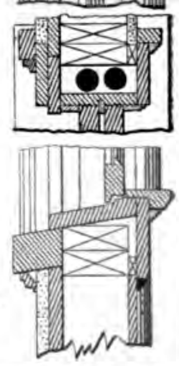
JOINERY.

74 brackets at $2	$148.00
50 window frames at $2.85	142.50
18 basement frames at 75 cents	13.00
6 basement frames at $1	6.00
29 pine door frames at 45 cents	13.05

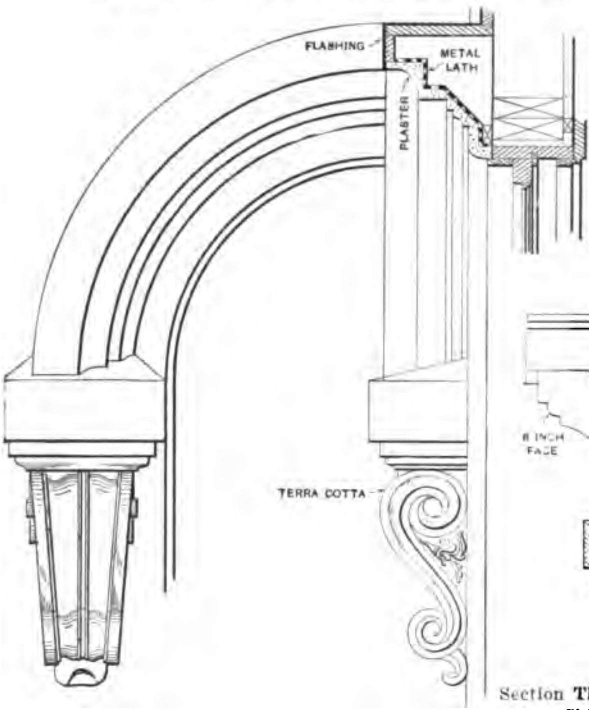


Various Interior Details.—Scale, ¾ In. to the Foot.

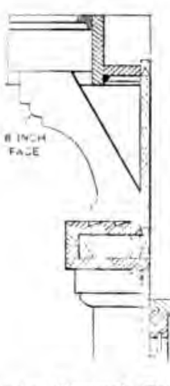




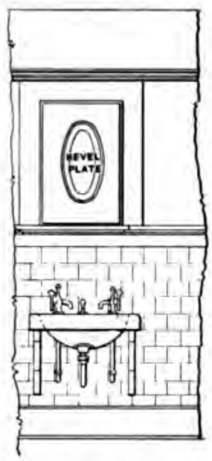
Section Through Cornice and Second-Story Windows.—Scale, ¾ In. to the Foot.



Details of First Story Front Window Heads. Scale, ¾ In. to the Foot.



Section Through Head of China Closet.



Detail of Bathroom Interior, Showing Wainscoting, Basin and Medicine Closet.—Scale, ¼ In. to the Foot.

Miscellaneous Constructive Details of Los Angeles Dwelling for Two Families.

PAINTING.

Exterior, two-coat work, roof, 422 yd.; cornices and belt courses, 170 yd.; porches, 52 yd.; total 644 yd. at 30 cents	$193.20	
Interior, three-coat natural finish, 288 yd. at 50 cents	144.00	
Interior, two-coat natural finish, 70 yd. at 30 cents	21.00	
Interior, three-coat enameled finish, 76 yd. at 50 cents	38.00	
Interior, hardwood floors, 145 yd. at 30 cents	43.50	
Pine floors, 210 yd. at 18 cents	37.80	
Total		477.50

13 oak door frames at $1.10	14.30
29 pine casings	17.00
13 oak casings	13.50
29 pine heads	8.40
13 oak heads	5.50
666 sq. ft. oak wainscoting	259.00
364 sq. ft. oak wainscoting	130.00
729 lin. ft. base	21.00
729 lin. ft. shoe	3.50
729 lin. ft. picture mold	11.00
casing for 34 windows	24.00
1,000 lin. ft. stop mold	10.00
450 lin. ft. oak stop mold	12.50
Front staircase	75.00
2 medicine closets	10.00

2 linen closets	20.00	
4 bookcases	40.00	
2 china closets	80.00	
2 kitchen closets	20.00	
2 sinks	30.00	
2 pantries	80.00	
2 coolers	60.00	
1 seat	10.00	
Beams (ceiling)	160.00	
2 mantels	60.00	
2 mantels	10.00	
8 brackets	8.00	
Rear stairway	45.00	
Hardwood floors	225.00	
Total		1,751.25

The above figures are inclusive of labor, based on same scale as framing.

SASH AND DOORS.

Sash and doors complete for building	418.00

and oakum, gasoline, band iron, pipe straps, etc.	94.44	
Labor, based on a journeyman's wage of $4 per day and helper at $2.50	104.00	
Total		520.00

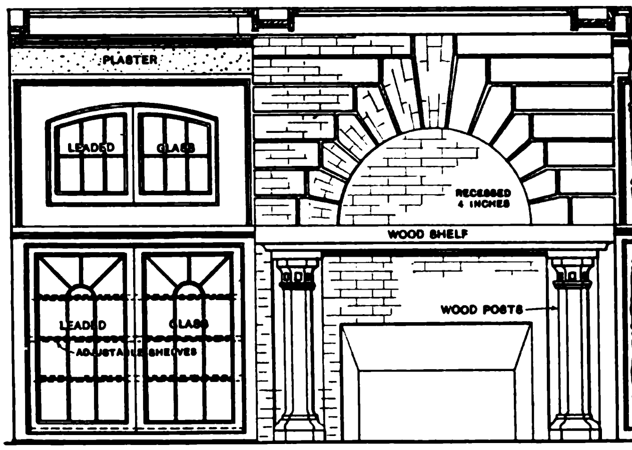
TINNING.

38 squares Meurer's galvanized iron tile at $18.	$684.00	
240 ft. galvanized iron gutter at 15 cents	36.00	
100 ft. conductor pipe at 10 cents	10.00	
320 lin. ft. 18-in. flashing at 8 cents	25.60	
200 lin. ft. 8-in. flashing at 4 cents	8.00	
Flashings for window heads, &c	5.00	
Total		768.60

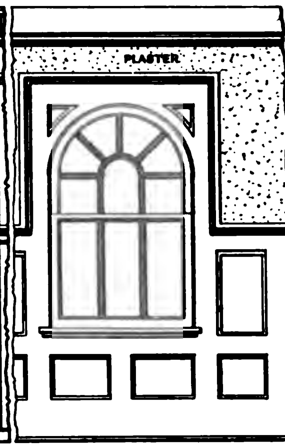
The above items are inclusive of labor, based on the following rates: Tinsmiths, $3.75 per day; helpers, $2.50 per day.

HEATING.

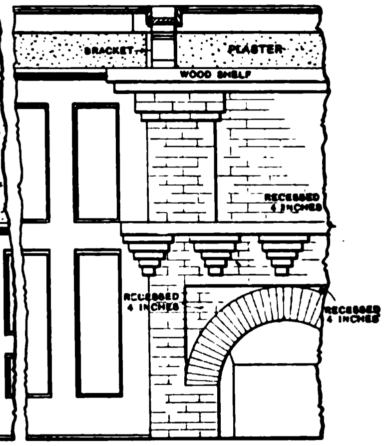
Two No. 4 Los Angeles warm air furnaces, complete,



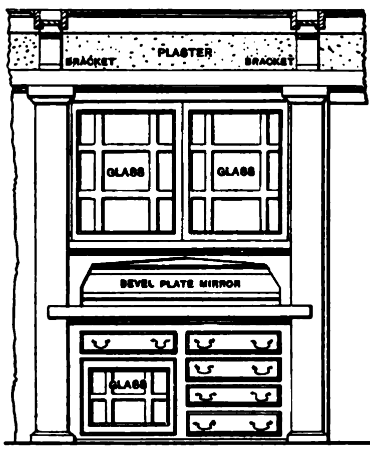
Elevation of Mantel and Bookcase in Living Room.



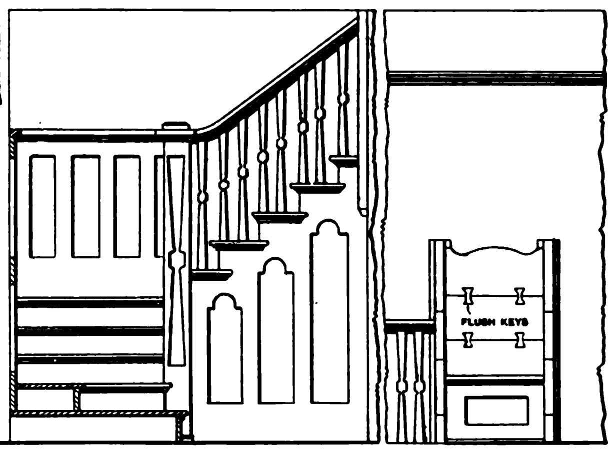
Living Room Window Trim and Wainscoting.

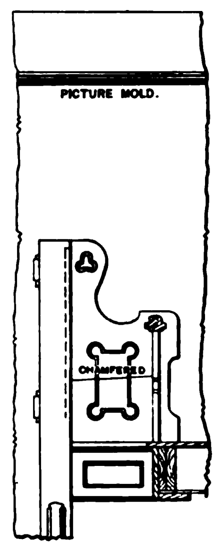


Partial Elevation of Mantel and Wainscoting in Dining Room.



Elevation of China Closet.





Details of Main Staircase and Seat on Second Floor.

Miscellaneous Constructive Details of Los Angeles Dwelling for Two Families.—Scale, ¼-in. to the Foot.

PLUMBING.

Water supply:

Permit	8.00	
Galvanized iron pipe for ¾-in. main supplies, ½-in. risers to supply all fixtures, including all elbows and fittings, two ¾-in. globe shut-offs and two ½-in. hose bibbs	8.77	
Two 30-gal. boilers and trimmings	11.40	
Total	$28.17	28.17

Fixtures:

Two sets of two 600-S Standard porcelain lined wash trays, with nickel plated trimmings, complete and lead trap to waste	62.88
Two 20 x 30 porcelain lined sinks, with nickel plated trimmings, complete	18.55
Two P-514 18 x 24" porcelain lined Standard wash basins, complete, less valves on supplies.	39.18
Two high wash-down closets, complete, with nickel plated trimmings and natural oak woodwork; two high siphon jet water closets, complete, with nickel plated trimmings and natural oak woodwork; four sets of complete trimmings for provision for said closets under floor	95.26
Two 5 ft. 6 in. 2¼ in. roll rim Standard porcelain lined bathtubs, with nickel plataed trimmings, complete, including trimmings under the floor	66.48
Tapping of water main	12.00

4-in. soil pipe for main waste lines from toilets; 2-in. waste lines from sinks, basins and wash trays; 2-in. and 1½-in. galvanized iron vent pipes, including fittings for same; 4-in. and 2-in. cast iron fittings for soil pipes; pig lead

with separate piping to each flat, six registers on each floor, installed complete and guaranteed to thoroughly heat the house with the outside temperature at 28 deg., pits and cold air ducts not included	249.10

HARDWARE.

Locks, butts and all trim hardware of best quality "Old Copper," nails, spikes, screws, window weights and all hardware necessary to complete the job	125.00

ELECTRIC WIRING.

All wiring installed complete, with switches, cut-outs, bells, buzzers, floor pushes and door opener, complete as specified	150.00

SUMMARY OF COST OF BUILDING.

Excavation	$166.38
Masonry	1,299.90
Carpentry	1,699.33
Joinery	2,169.25
Plastering	798.28
Hardware	125.00
Heating	249.10
Plumbing and gas fitting	520.00
Tinning	768.60
Painting	477.50
Electric work	150.00
Total cost	$8,423.34

The house here shown was designed by Architect D. W. Harris, 918 East Forty-seventh street, Los Angeles, Cal.

Carpentry and Building

WITH WHICH IS INCORPORATED
THE BUILDERS' EXCHANGE.

DAVID WILLIAMS COMPANY, - - PUBLISHER AND PROPRIETOR
14-16 PARK PLACE, NEW YORK.

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(Entered at the New York Post-Office as Second-Class Mail Matter.)

NOVEMBER, 1908.

The Season for Study.

Now is the time for young men and others to decide upon increasing their value in the world by acquiring information by a course of reading, study or practical training in some of the schools that are available in certain centers. In fact, it is necessary to make application to enter the classes in schools like the New York Trade School, in the pattern drawing class at the General Mechanics' Institute in New York, and in other similar courses of practical instruction open in Boston, Philadelphia, St. Louis and other cities. Older men who are good workmen and who feel the need and are ambitious to master the theory as well as the practice in their line will find a course in one of the correspondence schools of far greater value and entertainment than they imagine. It is now full time for those who have not already planned for self-improvement to make arrangements to enter some one of the various schools and engage in conscientious work of mental improvement, now that the busy fall season is over and there are long evenings available. Frequently some workman advances rapidly over his fellows and to their surprise. The secret is that he has been studying, and having the information, rules, custom and method of scientific men gathered, he impresses favorably those in authority, and, as a consequence, he is given important and profitable as well as responsible work to superintend. The old adage that knowledge is power is eminently correct, and those who wish the power to draw custom, to succeed in business and be a leader in any field must be persistent in the search for knowledge. If the long winter evenings that will be here before those who make no preparation for their use realize, are given over wholly to amusement or wasted, it will be found that more money will be spent in search of diversion than would more than pay for a course of school instruction, and also for all the standard text, reference and handbooks that will be required.

Value of Technical Books.

In whatever mechanical line a man engages there are books containing the information which men have gathered in experience and conference with experts in the same line. Such books are owned by ambitious men, and if they are not at first understood they should be studied and every opportunity embraced to converse with those who can explain the difficult parts and their application. There is no excuse except laziness or lack of interest for a full grown workman to fall short of the qualifications needed in these progressive times. The low wages paid to some men allows a higher wage to be paid to the man who oversees them. The wages of the overseer are only paid to the men who have the knowledge about what is to be done, and the best way to do it, and how to manage the work to the best advantage while keeping a record of all of the things that go into it, so that the cost can be known. There is great need for young men to study, read, converse and observe. A knowledge of accounting is as essential as a knowledge of the principles and practice to the man who has his eye on a place higher up. The season for study never passes and the successful graybeard will often be found reading something technical and comparing the ideas expressed with his own experience. Often he has surprised his old employees by a change of method and which is due to something new he has learned. When he retires his place will be filled by the man best equipped with knowledge to meet its demands. Such a place will be open for every young man who starts in now and keeps up the study in preparation to take it when it offers.

A Blow to Usurious Loans to Workmen.

The hardest blow that has been dealt to the practice of loaning money with assignment of wages as security is that embodied in a recently enacted Massachusetts law which provides that no assignment of wages shall be valid unless approved by the borrower's employer, and, if the borrower is married, by his wife as well. It is believed that this act will practically put a stop to an evil which has been serious. Workmen have placed themselves in the hands of usurers, rates of interest being so high that it has often been impossible to make any impression on the principal, which may increase indefinitely. Employers have been seriously annoyed by the practice, for in spite of posted announcements that an assignment shall be considered as satisfactory cause for dismissal, employes have persisted in taking the chance, expecting to meet the obligation before it becomes necessary for the lender to present the assignment to the employer. In Massachusetts this practice was given almost a quietus by compelling the recording of assignments in order to make them binding; but other States have not gone that far. The greatest protection of all lies in the necessary co-operation of the employer in order to make an assignment valid. If he sees that the loan is necessary he may permit it, with the consent of the wife of the borrower. But it is safe to say that such cases will be rare. Probably an advance in wages would be fully as likely an outcome of the employee's application at the office. The protection to the workman's family is also a very good thing, in that it may curb extravagance and extreme improvidence. Money lenders of the stamp who advertise extensively that they loan money without security will be seriously handicapped in their operations under the law. It is already strongly apparent that Massachusetts has been rid of the greater number of the class, and that the cities of adjacent States have increased their quota of usurers proportionately.

Pittsburgh's Tallest Skyscraper.

A structure which will be an architectural ornament to the city, and which, when completed, will be taller than any other office building in Pittsburgh, is the new skyscraper which is about being erected by the Henry W. Oliver Estate, and will be known as the Oliver Building. It will be 25 stories in hight and from the level of the street to the roof it will have an altitude of 358 ft. It will be of classic architecture, and the three lower stories will be of granite, while the upper 22 stories will be of terra cotta. Mahogany will be used throughout the building for decorative purposes, but otherwise the materials will be stone, tile and marble, and it will be as nearly fireproof as science and the modern building materials can make it. The plans prepared by Architects D. H. Burnham & Co. show that when completed the structure will contain 1150 offices, with three mammoth entrances, the main one being on Smithfield street and the others in Oliver and Sixth avenues. The power for the heating and electric light plants will be supplied from the central plant of the Oliver Estate in Strawberry Alley, a considerable distance away. It is interesting to note that in the construction of this building about 10,300 tons of steel will be used; that there will be 15 elevators, 14 of which will be for passengers and one for freight. The terms of the contract call for the completion of the building by the 1st of April, 1910.

New York's Revised Building Code.

The committee having charge of the revision of the Building Code for Greater New York, reference to which has already been made in these columns, submitted to the Board of Aldermen on October 6 its tentative recommendations regarding the hight of new buildings. It approved the plan to restrict the hight to 300 ft. unless the structures front on a park, square or plaza, in which case the total hight is not to exceed 350 ft. The recommendation of the Building Code Revision Commission regarding this feature reads as follows:

Limits of Height.—All buildings hereafter erected shall be limited in hight, except as herein otherwise provided, in general accordance with the width of streets on which they face, and shall not exceed 300 ft., except where the width of streets is less than 45 ft. the hight of buildings may be 135 ft. When buildings face upon a park, square, plaza or similar public place, the hight shall not exceed 350 ft. Provided that no fireproof buildings of classes E and F, except office buildings, observatories and grain elevators, hereafter erected or altered, shall exceed 150 ft. in hight.

Classes "E" and "F," referred to in the foregoing, are as follows:

Class E.—Office buildings, lofts, stores, warehouses, restaurants, markets, refrigerator plants, stables, factories, workshops, printing houses, slaughter houses, rendering plants, breweries, sugar refineries, observatories. All buildings of this class hereafter erected over 59 ft. in hight shall be of fireproof construction, except as otherwise provided in Section 25 of this code.

Class F.—Light and power plants, car barns, garages, smokehouses, laboratories, railroad freight depots, oil houses, oil refineries, grain elevators, foundries, coal pockets. All buildings of this class hereafter erected shall be of fireproof construction.

This regulation will not become a law until it is first approved by a majority vote of the Board of Estimate, and then passed by a majority of the Board of Aldermen. Not until the hight of buildings is finally determined will the commission be ready to report its other recommendations. Public hearings will be held and the matter thoroughly canvassed. Those who are opposed to high buildings have prepared data to show that skyscrapers are no longer necessary, but are a menace to the health and safety of the city.

Some of the buildings that could not have been erected under such a law as that outlined above are the following:

Building.	Hight. Feet.
Metropolitan Life	700
Singer Building	612
City Investing Building	434
West Street Building	404
Park Row Building	382
Times Building	362

The following buildings could not be erected under the proposed code because they do not face parks:

Building.	Hight. Feet.
Manhattan Life	348
American Tract	320
U. S. Express	306
Trust Company of America	318

Convention of American Institute of Architects.

The Board of Directors of the American Institute of Architects has decided to hold the next convention of the institute in Washington on December 15, 16 and 17, concluding with a dinner on the evening of the 17th. The topic to be considered at this convention is the creation of a department or bureau of the Federal Government, with a board of consulting artists, which would have control of buildings, landscape work, statuary, paintings and mural decoration, so as to harmonize and systematize work of this character under the jurisdiction of the Government. On the evening of December 15 a reception will be given in the Corcoran Art Gallery to view the work of Augustus Saint-Gaudens, the meeting to be a memorial tribute by the institute to his memory.

On the evening of December 16 speeches are expected showing the necessity of one department or bureau controlling the fine arts of the Government. On the evening of the 17th the banquet will be given as stated, when those familiar with the above subject are expected to treat of it in a less formal way.

The president of the institute has appointed as a Committee of Arrangements, William A. Boring, S. B. P. Trowbridge, Glenn Brown, William S. Eames and J. R. Marshall.

The president of the institute at the June meeting of the Board of Directors appointed Alfred Stone (since deceased), J. L. Mauran and Glenn Brown as a committee to select a name or names to present to the Board of Directors at its next meeting as the recipient of the Institute Gold Medal at the convention.

National Association of Builders' Exchanges.

The National Association of Builders' Exchanges will hold its next convention the first Tuesday in March, 1909, at the headquarters of the Building Trades Employers' Association in The Builders' Exchange, 29 to 35 West Thirty-second street, New York City.

Second Annual Cement Products Exhibition.

It has been decided to hold the second annual Cement Show in the Coliseum in Chicago, February 18 to 24, 1909. The date chosen, it is believed, will prove very satisfactory, coming, as it does, just prior to the opening of the cement season. Unusually elaborate and comprehensive preparations are being made to interest in the coming show, not only those directly connected with the cement trade, but the general public as well. The underlying idea of the exhibition is educational in its nature and not entirely for the purpose of bringing direct business to the exhibitors. It will be more in the way of an industrial demonstration calculated to create universal interest in cement and its innumerable uses.

Convention of Texas Association of Builders Exchanges.

The coming convention of the Texas Association of Builders' Exchanges will be held in Houston, Texas, Friday and Saturday, November 13 and 14. An interesting programme has been prepared and a local committee of builders and contractors has been appointed to arrange for the entertainment of visitors.

AT a meeting of the Board of Examiners of Architects of Illinois, held on September 11, the following New York architects were examined and given certificates entitling them to practice in Illinois: Charles A. Platt, 11 East Twenty-fourth street, New York city; Henry Davis Whitfield, 160 Fifth avenue, New York city, and Beverly Sedgwick King, 160 Fifth avenue, New York city.

CORRESPONDENCE.

Finding Profile of Raking Molding.

From J. G. F.—I would like to know whether you have heretofore published any illustrations on the subject of raked moldings at half pitch similar in profile to that shown in the inclosed sketch, and if so when. I should like to know the rules governing this problem, as I am frequently puzzled with it.

Answer.—We have in the past given more or less attention to the subject indicated, but as these volumes are now out of print we give a complete answer at this time. The sketch sent with the inquiry of our correspondent is that of a crown molding of ordinary profile, no plan or other view being given to show the adjacent arms of the miters which determine the desired result. The problem in connection with raking moldings which presents the greatest difficulty, however, is that in which an inclined molding is required to miter with a level return which is usually at right angles, but is sometimes at an oblique angle in the plan. We shall conclude, therefore, that this arrangement of parts is the cause of our correspondent's difficulty and proceed accordingly. The problem usually assumes the form shown in Fig. 1, which represents what is termed in classical architecture a pediment, the miter in question being that shown at A of the plan and B of the elevation.

Whenever an inclined molding is required to join with a level molding at the angle of a building, one of the moldings must undergo a change of profile to insure a perfect miter. Two cases may therefore arise; that is, either the profile of the inclined molding or that of the return may be changed. Since in either case that portion of the molding having the changed profile must be worked out by hand, it is desirable to rake that arm of the miter of which the least quantity is required. For instance, if a cornice which is being carried entirely around a building has a gable or pediment at one end only, the stock molding will be used for all except the inclined portion; but if on the contrary a portico, door hood or window cap is being built which does not form part of a continuous cornice or belt course, and which would therefore have only short returns at the sides, the stock molding may be used for the inclined portions, and the returns raked. This should be done not only as a matter of economy but for the sake of appearance, as a molding of raked profile, especially if the inclination of the gable is very great, has naturally a distorted appearance. The operations of obtaining the changed profile in either case, as accomplished upon the drawing board, are shown in Figs. 2 and 3, in which two different designs are employed.

In the case of the pediment, the pitch is usually much lower than in what is commonly called a gable, and the crown mold only, exclusive of its lower fillet, as indicated at *a* in Fig. 1, is included in the raking operation, the lower fillet and fascia being continued horizontally across the base or bed of the pediment, as shown at *b*. These last named members are also added to the pediment crown mold as indicated at *c*, but retain their normal profile, since they are required to miter only upon the top of the level cornice, as shown from *d* to *e*.

To obtain the correct profile of the raking or inclined crown molding, having first completed an elevation of the miter, as shown in Fig. 2, draw a line at right angles across the inclined molding, as shown by A B, to form the back or vertical line of the new profile continuing it above the elevation. Now, place a duplicate of the normal profile (shown at P as representing the return), with its vertical side against A B, as shown at P^1. Divide the curved portions of both these profiles into the same number of equal spaces numbering them correspondingly, as shown by the small figures. From the several points of division in the profile P carry lines parallel to the lines of the pediment across the space below profile P^1, and from the points of division in P^1 project lines parallel to B A to interesect the lines of corresponding number just drawn. A line traced through the points of intersection, as shown by 1′, 2′, &c., to 10′, will give the required profile, to which is added as above stated the normal profile of the lower fillet and fascia, 10 to 13 of profile P, as shown from 10′ to 13′.

In Fig. 3 is shown an elevation of a gable having a half pitch, in which a stock molding, whose profile may be referred to as being normal, is used, and in which that of the return or level cornice is changed or raked as it is usually termed. In constructing this view, first draw the lines of the inclined moldings, within which draw

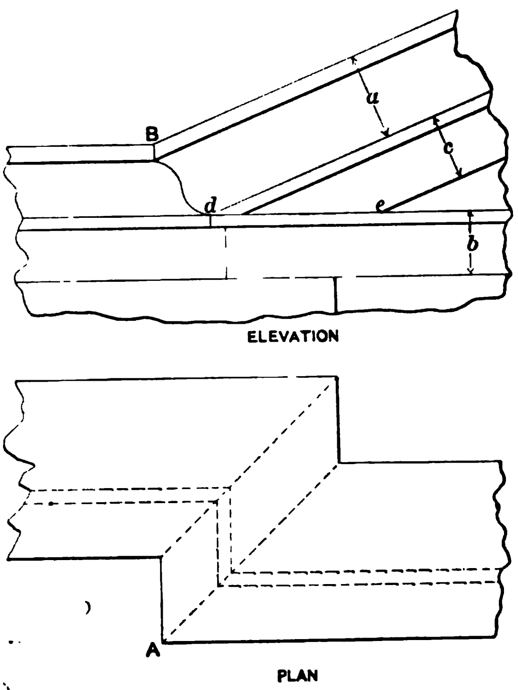


Fig. 1.—The Parts of a Pediment.

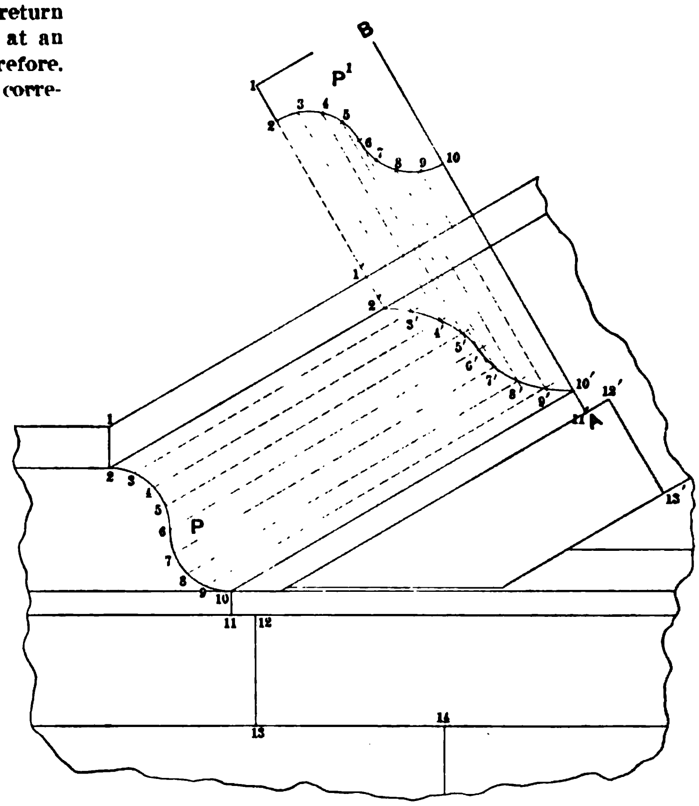


Fig. 2.—Raking the Profile of a Pediment Molding.

Finding Profile of Raking Molding.

also a normal section with its vertical line B C at right angles to A B, as shown at Q. Extend the lines of the molding beyond D, which may represent the projection of the fascia board of the return beyond E the side wall of the house. Extend the vertical line D to any convenient position above or below the return, and upon the same place a duplicate of the normal profile Q, as shown at Q¹. Divide both profiles, as before, into the same number of equal spaces, dropping lines from the points in Q¹ vertically to intersect lines of corresponding number brought down from Q parallel to A B. Lines traced through the points of intersection, as shown from A to D and designated as 2′, 3′, &c., will give the desired profile.

The result of this operation, as will be seen, is to incline the soffits—that is, in this case the surface 11′ 12′ and the planceer. This feature does not seem out of place in this design. If it should be desirable, however,

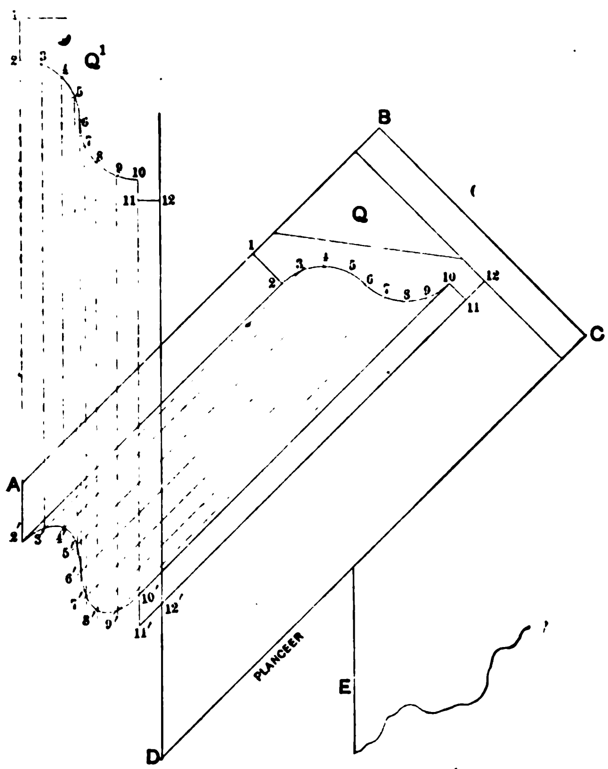


Fig. 3.—Raking the Profile of the Level Return When the Profile of the Pediment Is Normal.

Finding Profile of Raking Molding.

to retain the normal profile in the level or return moldings of a cornice having a gable at the front, the result would be the application of the methods shown in Fig. 2 to the design shown in Fig. 3. This will no doubt be understood without diagrammatic illustrations by supposing that lines are drawn at half pitch from every point (1 to 14, inclusive) of profile P of Fig. 2, thus eliminating the level portion previously referred to. Before completing the intersections described in connection with Fig. 2, it would of course be necessary to add that part of profile P shown from 10 to 14 to profile P¹. It will then be seen that, by the intersection of lines from points 11 and 12 of profile P with those from 11 and 12 from profile P¹, the line 11′ 12′ of the new profile would thus be thrown at an oblique angle with A B. This in itself would not be a very serious defect, but when the same operation is performed with points 13 and 14 of the two profiles, the line 13′ 14′, representing the profile of a wide planceer, would necessarily take the same angle of inclination. This means that the planceer under the gable cornice would appear as a beveled surface, a result scarcely to be desired. For this reason the pediment, which is of very ancient origin and was usually cut in stone, was so cleverly designed as to obviate the necessity of raking profiles having horizontal members of great width.

If on the contrary, the operations described in connection with Fig. 3 were applied to the design shown in Fig. 2, a very common occurrence, the result would be simply to produce at P a profile of the appearance and character of that shown in Fig. 3 from 10′ to A. In such a case it is to be supposed that the return thus raked would end at the back against a wall or plain surface instead of mitering with a continuation of level molding, which in that case must necessarily be of the same raked profile.

It is possible that the practical workman will prefer a method by which these results can be obtained without the use of drafting instruments. Such a method is not only possible, but quite practicable. To obtain the profile of the inclined or pediment mold shown in Fig. 2, let it be supposed that the fascia boards and the fillet of the level cornice below the pediment have already been cut and secured in position. First cut a piece of molding of normal profile to form the return P, cutting on its forward or right end an outside miter in the miter box in the usual manner, and fasten the same in position on the building as shown pictorially at A of Fig. 4. Next cut a short piece of wood, say a foot in length, of rectangular profile, whose thickness shall exactly equal the projection of the mold as shown by 1 B of profile P¹ Fig. 2, and whose width shall be equal to or even greater than the vertical width of the desired molding. Such a piece would have the general appearance of a short piece of studding dressed on all sides and may be called a blank. Cut a pitch board whose angle shall be that of the gable, and, having placed the same in the miter box with its vertex to the left, place the blank upon its upper edge and saw an outside miter; in other words, miter it to fit against the return piece A just as though it were the

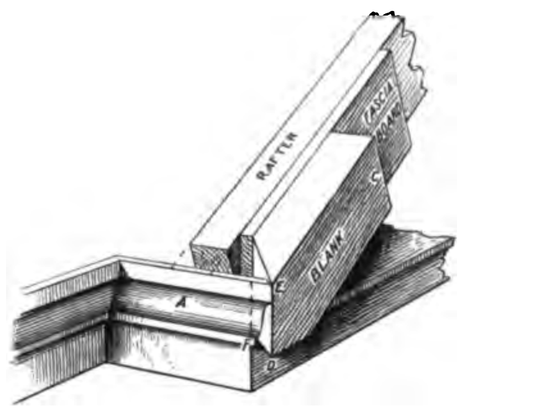


Fig. 4.—Practical Method of Obtaining Raked Profiles.

finished mold. Now place the blank in position upon the building as shown in Fig. 4. The mitered end of the blank thus coming against the mitered end of the molding A, the outline or profile of the mold from E to F may be transferred to the end of the blank by means of a scribing awl or pencil, after which the blank can be removed and worked down to form a short piece of molding of the outline thus obtained. If this last mentioned operation has been carefully and accurately done, the correct profile for the raking mold may then be transferred from the right hand or square end marked C in the engraving, and the result will be exactly the same as that obtained in Fig. 2.

The reader's attention may be called to the fact that after the blank has been mitered, the vertical hight of the normal profile, as shown by B 10 of profile P¹, of Fig. 2, should be set off on the near angle of the blank as shown by E D of Fig. 4, thus obtaining the point D on the blank, and the lower point of the blank be then cut off horizontally through the point D, all as shown in Fig. 4. This will allow the top of the blank to come exactly to the upper point of the miter on molding A at E, and the leveled lower surface of the blank to rest upon the top of the fillet of the level cornice below from point F, and for a short distance to the right. This last cut forms the miter on the fillet of the pediment crown mold to make it fit the level fillet as clearly shown at *d* of Fig. 1.

It will be easily seen that this method may be applied to gable moldings in which the full profile is involved in making the profile of either the inclined portion or of the level return. It is equally true that all of the methods above described may be applied to the moldings forming the heads of the brackets of a pediment when the sides of the brackets are vertically placed.

Designs Wanted for Double Houses.

From H. G. D., Freeland, Pa.—Will some one of the many readers of *Carpentry and Building* give me through its columns floor plans of a double dwelling house with all modern conveniences, say, three rooms down and three rooms upstairs, on each side, with hallways up and downstairs. The upstairs rooms are to be independent of each other, so that it will not be necessary to go through one room in order to get into any other. The pantry is also included on the first floor. The size of the house is to be 32 x 42, and my lot is 40 ft. wide by 150 ft. deep. I want the house to cost somewhere in the neighborhood of $2800 to $3000.

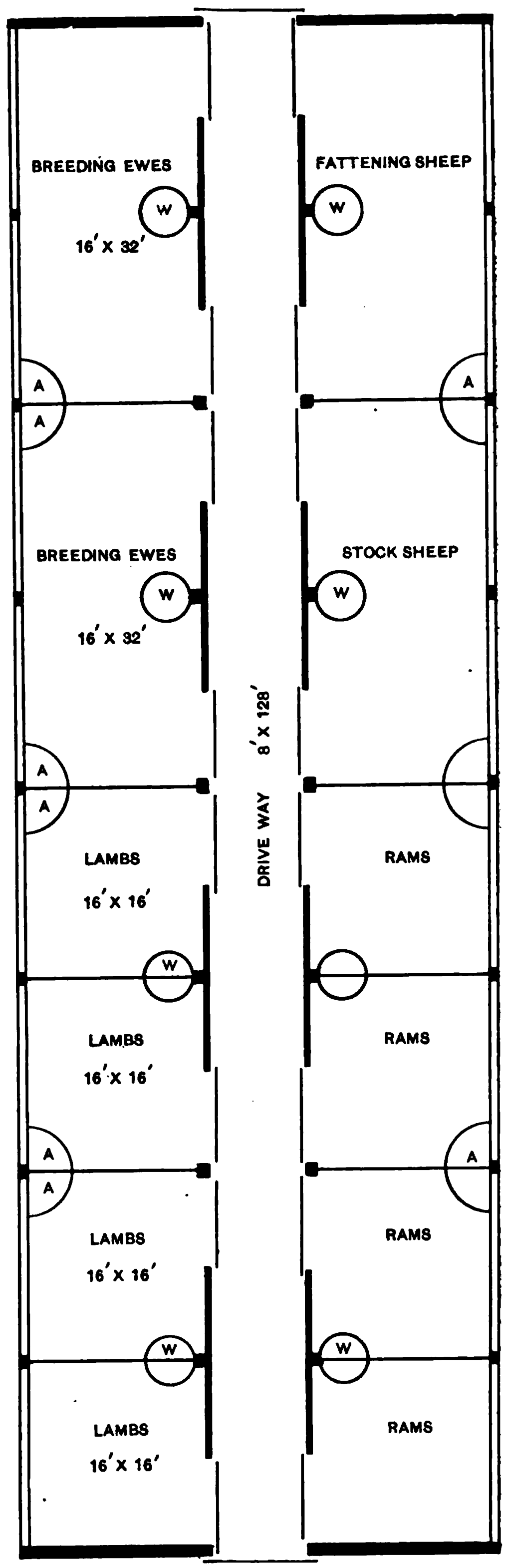
I have pretty carefully examined the double house in the October number, but the plan does not suit me in all respects. One thing, it is too wide for the lot which I have, and I must reserve 3 ft. or so for a walk on each side, so that the tenants can get to the rear of the house without going through the rooms on the first floor. Again, I notice the October house has the cellar partitioned off, which is quite an item of expense, and which is not required in this locality, for cellars, as a rule, are only places for tubs, preserves, &c. The people in this locality want a pantry with cupboard built-in and a sink; then a flour bin and no fireplaces. The people here are for the most part workingmen, and most or about all of the double houses built range in price from $2500 to $2600. Some of them have bath rooms and all sanitary plumbing. I should not mind if the price ran up to, say, $3200 or $3300, provided the plan is convenient for the lady of the house. I must say that the houses in this town are very inconvenient so far as arrangement goes, and I therefore ask through the columns of *Carpentry and Building* for the assistance of its architectural friends so that I may secure floor plans if nothing more. The elevations I can look after in a way, I think, which will make the exterior attractive.

Design for a Sheep Barn.

From John L. Shawver, Bellefontain, Ohio.—The correspondent, "J. E. S.," Bennington, Vt., whose letter appears in the September issue of the paper, desires a barn suitable for housing about 100 sheep, but he does not state the kind of sheep. Stock sheep must have more room than fattening sheep, and the coarse wooled sheep must have more room than is necessary for fine wooled sheep, so that I cannot very well assign the correct dimensions that would be required in his particular case. I send, however, the floor plan and the side elevation of a sheep barn planned last year for a large wool grower in Ohio. This barn is 40 x 128 ft., has eight pens 16 x 16 ft. and four pens 16 x 32 ft. It is really large enough for 200 or 300 sheep, but will probably afford suggestions for the correspondent making the inquiry. An examination of the plan will show the general arrangement of the pens and the purposes for which they are used. The partitions may be made permanent or portable, according to preference.

Each pen must be provided with water, and it should also have a hay chute to permit the hay to be dropped into the pen with as little labor as possible. Referring to the plan, A A A are the hay chutes and W W W are the water troughs or pans. The letters D D D, &c., on the side elevation represent the drop doors hinged at the top.

At least one of the pens in the breeding barn should be made snug and warm for the very young lambs, but after the lambs are a few days old they must have room in which to play and an abundance of fresh air. If a small "creep" door permits them to go out into the driveway it affords an ideal place for them to play, while the hinged or drop doors on both sides of the barn permit of an abundance of fresh air, without which the sheep will not thrive. The driveway, lengthwise of the barn, is to enable the owner to draw out the manure to the fields



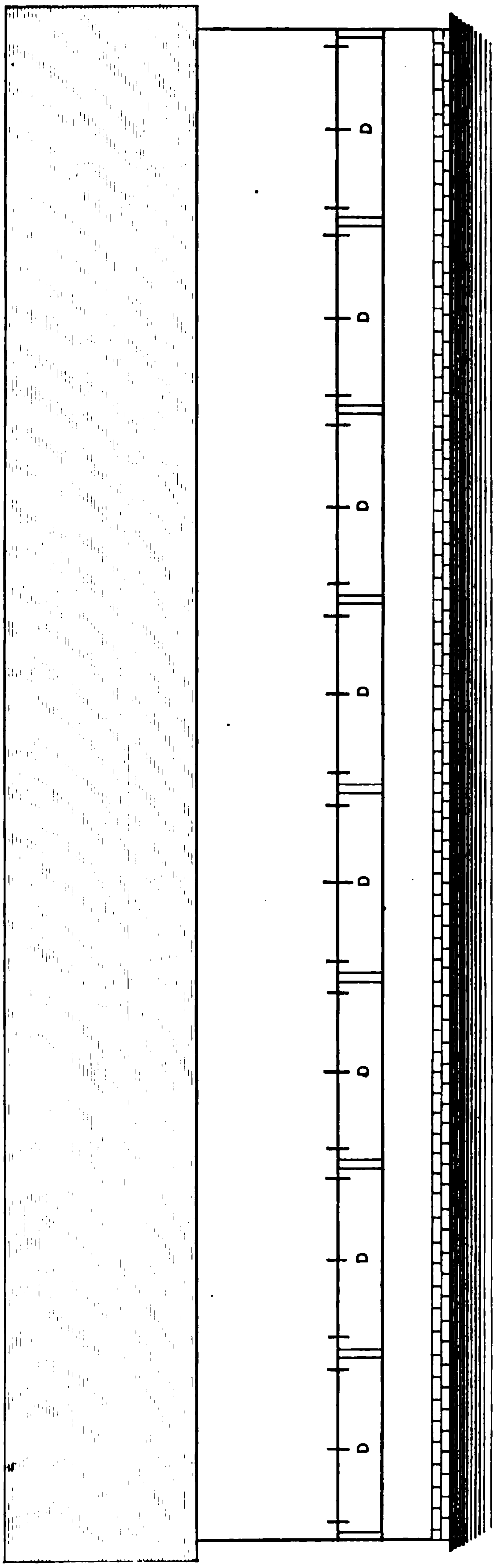
Main Floor Plan.—Scale, 1-16 In. to the Foot.

Design for a Sheep Barn.

on his manure spreader with a minimum amount of labor. This driveway may be utilized for an extra lot of sheep or for giving the lambs a run in which to play and always for the purpose of changing sheep from one pen to another.

Above the various sheep pens is a hay loft covering the entire area of the barn. The earth floor is 12 in. below the sills, so the manure will not rot them.

It may not be out of place to mention a fact well recognized by sheep men, but not always fully understood by the layman, and that is, that the size of a sheep barn must be governed by the kind of sheep to be stabled as well as the number. One of the most extensive feeders of sheep that I ever knew, a Mr. Watkins of Hillsdale, Mich., allowed only 6 sq. ft. of floor space for each fattening sheep, while some breeders are not content with less than 20 sq. ft. of floor space.



Design for a Sheep Barn.—Side Elevation.—Scale, 1-16 in. to the Foot.

I trust the above suggestions will be of value to the correspondent, but if he desires further information I shall be very glad to reply through the correspondence columns.

Wrinkles in Veneer Work.

From N. B. M., Fort Smith, Ark.—As an old subscriber to *Carpentry and Building*, I would very much appreciate instructions for taking wrinkles out of veneer work caused by getting wet. I particularly refer to coach head lining.

Note.—From the above statement of our correspondent's trouble, it is inferred that it is local or confined to certain upheavals caused by wetting. Should the veneer be of a burl variety, it will be more difficult to smooth down into place. The first thing, however, is to apply a little moisture to the brittle and loosened parts, which may be done by laying on for, say, half an hour a folded pack of cloth, which has first been wet and then well wrung out, placing over it a weight in order to exert upon it a little pressure. When the fractured parts have become pliable work in with a thin knife blade or stick some Le Page's glue, pressing it in and under by means of a toothbrush handle or other hard, smooth instrument. When this has been done have ready a piece of tin or zinc, and after removing by means of a wet cloth any unnecessary amount of glue on the surface, lay the metal over the part which has previously been wiped over with an oiled rag to prevent sticking. Place a heavy weight on the metal, or if possible use clamps or some driving up block pressure which will insure perfect contact. After a day the surface may be scraped carefully with a sharp scraper blade and fine sandpaper used when it is ready for refinishing.

Durability of Hewn vs. Sawn Timber.

From J. W. McConnell, Shamokin, Pa.—Will some reader of *Carpentry and Building* tell me through its columns if a hewn stick of timber will last longer and give better service than a sawn stick. If so, why? If a sawn stick will last longer and give better service than a hewn one, I shall be glad to have the reason stated, both sticks being exposed or inclosed in a building according to circumstances.

Work Bench for Use in Making Window Frames.

From C. J. G., Pittsfield, Mass.—I should like to see in the columns of your instructive trade journal a design and description of the best bench or table for use in squaring and nailing up window frames. By this, I mean a table on which the sill and jambs can be held perfectly square by means of wedges, screws, or some other device—not in the way of driving nails—and then nailed together, after which the blind stops and casings can be nailed on. If need be, a brace to hold the frame square until it is nailed in its place to the building, can be added. Some of the larger builders of frames can no doubt give information by which we can do this work accurately and quickly, and I am quite sure it will be helpful to many of the readers of *Carpentry and Building.*

Frost Proof Windows.

From J. N. G., Lansing, Mich.—I am fitting up a new storeroom and am desirous of making it so that I will not be troubled in the winter time with frost on the windows, and would be glad to have any instruction which will enable me to accomplish this purpose.

Answer.—The cause of frost on windows when understood helps in making the right provision to avoid it. The extreme cold on one side of the glass is transmitted to the other, when any moisture that may be in the atmosphere on the other side of the glass will condense and be frozen. Probably the best way to keep the show window clean and to avoid this moisture is to provide glass doors inside the store to shut the window space away from the store. This will prevent any moisture that is in the air in the store, from breath or other cause, from getting to the cold outside window glass. Then to preserve an even temperature in the window it is only necessary to make a dozen or so 1-in. holes in the bottom so that air from the outside can enter the window, and to provide an outlet at the top of the window so that the cold air from out of doors can circulate through it. It is a comparatively simple matter to provide baffle plates to prevent the dust which will be carried by the air from reaching the window. If the ventilation along the window glass is sufficient it may be possible to avoid the necessity of putting a sash back to the window.

Finding Lengths of Rafters with the Steel Square.

From Country Wood Butcher, Leland, Ill.—As "Afraid-to-Sign-His-Name" gives no width of building for which he desires lengths of rafters, I will simply give the lengths for 1 ft. run of the different pitches and the hip rafters for a 17-in. run, or, to be more exact, 16.97 in. Among the craft, however, we usually take the figure 17 as being sufficiently accurate for all practical purposes. If the correspondent has a building with a 12-ft. run he simply selects his pitch, which we will assume as one-third, giving a 12-in. run to 8 in. rise. He multiplies 14.42 in. by 12 for the length of the common rafter minus half the thickness of ridge pole, if any. He then multiplies 18.79 by 12 for the length of his hip rafter minus ridge pole, if any, and 14.42 in. by 2 for his first jack rafter, if spaced 2 ft. apart, and twice the length of the first jack for his second one, &c., minus half the thickness of the hip rafter for each different length.

LENGTHS OF COMMON RAFTERS.

Lengths below are for 1 ft. run only, and must be multiplied by the run, whatever that happens to be. Run and rise for plumb and level cut.

	Inches.
12-in. run to 8-in. rise	14.42
12-in. run to 9-in. rise	15
12-in. run to 10-in. rise	15.62
12-in. run to 11-in. rise	16.28
12-in. run to 12-in. rise	16.97

LENGTHS OF HIP RAFTERS.

Lengths below are for 17-in. run to correspond to 1 ft. run of common rafter, and must be multiplied by same run as common rafter. Run and rise for plumb and level cut; length and run for bevel or side cut; cut by length.

	Inches.
17-in. run to 8-in. rise	18.79
17-in. run to 9-in. rise	19.24
17-in. run to 10-in. rise	19.72
17-in. run to 11-in. rise	20.25
17-in. run to 12-in. rise	20.80

LENGTHS OF JACK RAFTERS.

Lengths below are for 1-ft. run only and are the same as for common rafter running same distance. Figures below must be multiplied by run. The run and rise give plumb and level cuts; run and length bevel or side cut; cut by length.

	Inches.
12-in. run to 8-in. rise	14.42
12-in. run to 9-in. rise	15
12-in. run to 10-in. rise	15.62
12-in. run to 11-in. rise	16.28
12-in. run to 12-in. rise	16.97

I give the lengths in inches and decimals thereof, as most steel squares have one inch divided into hundredths of an inch, and it is an easy matter with a pair of dividers to find out how many 8ths, 12ths or 16ths of an inch is contained in 42-100, 62-100, or, in fact, any hundredths of an inch.

I have been looking through books for rafter tables and I find mine would have to be worked on the same principle as the table on page 135 of "Hicks Builders Guide," where the readers will find a better and more lengthy explanation than I have given.

The rule I have tried to work is not the way I always obtain the lengths of rafters, as I generally obtain them with a common 3-ft. pocket rule right off the square when I know what the run is and when I have settled on the rise I am going to use per foot run. Assuming the roof rises 8 ft. and the run or half of the building is 12 ft., I measure the diagonal from 8 in. to 12 in. for the length of the common rafter and the diagonal of 8 in. and 17 in. for the length of the hip rafter. Assuming there are five pairs of jack rafters, I divide the length of common rafter by 6 and use one of the parts thus found for the length of the first pair of jack rafters, two parts for the second pair, &c.

What "Araid-to-Sign-His-Name" wants is probably a rule with many different runs, so it will not be necessary for him to do any figuring whatever. It can probably be done, but would be lengthy and complicated where there are a large number of different pitches.

Note.—We have a similar answer as regards lengths of common and hip rafters from "J. G. T.," Lansing, Mich. His figures for jacks, however, are double those of "Country Wood Butcher," as he uses 2 ft. instead of 1 ft. run.

From F. S. L., Silverdale.—I notice what the correspondent who seemed to be afraid to give his name asked in the August number in regard to finding the lengths of rafters, and I inclose a rafter table, which I hope will be what he wants:

RAFTER TABLE.

	Common rafters. Inches.	Hip rafters. Inches.	Spacing of jack rafters. Inches.
12 in. run, 8 in. rise...	14.42 or 14 5/12	18.78 or 18 9/12	2 5/12
12 in. run, 9 in. risc...	15	19.23 or 19 3/12	2½
12 in. run, 10 in. rise...	15.62 or 15 7/12	19.72 or 19 9/12	2 7/12
12 in. run, 11 in. rise...	16.27 or 16 3/12	20.24 or 20 3/12	2 8/12 1/24
12 in. run, 12 in. rise...	16.97 or 17	20.80 or 20 10/12	2 10/12

I am a young builder and also a close reader of *Carpentry and Building*. I find very much that is interesting and helpful in its columns, especially in the Correspondence Department.

From T. J. Pitts, Greenview, Ill.—I noticed the problem in the August issue of the paper propounded by the correspondent "Afraid-to-Sign-His-Name," Chillicothe, Ohio, and as an answer to it I submit the following: The width of the building not being stated, I will assume it to be 20 ft.

With pitch 8 to 12 the length of the common rafter is 12 ft. 1 3-16 in., the length of the hip 15 ft. 7 9-16 in., and the difference in length of the jack rafters spaced 2 ft. on centers is 2 ft. 5 1-16 in.

With pitch 9 to 12 the length of the common rafter is 12 ft. 6 in., the length of the hip 16 ft. ⅛ in., and the difference in length of the jack rafters spaced 2 ft. on centers is 2 ft. 6 in.

With pitch 10 to 12 the length of the common rafter is 13 ft. ¼ in., the length of the hip 16 ft. 4 15-16 in., and the difference in length of the jack rafters spaced 2 ft. on centers is 2 ft. 7 5-16 in.

With pitch 11 to 12 the length of the common rafter is 13 ft. 6 13-16 in., the length of the hip 16 ft. 10 5-16 in., and the difference in length of the jack rafters spaced 2 ft. on centers is 2 ft. 8⅝ in.

With pitch 12 to 12 the length of the common rafter is 14 ft. 1 11-16 in., the length of the hip 17 ft. 3⅞ in., and the difference in length of the jack rafters spaced 2 ft. on centers is 2 ft. 9 15-16 in.

The above lengths are within 1-32 in. of the exact lengths, and I trust the information above will be entirely satisfactory to the correspondent.

Development of Hand Railing by the Sectorian System.

From J. E. N., Leland, Ill.—I would like to have some of the readers show me how to get out a hand rail by the Sectorian System of hand railing invented by William Forbes. Some years ago, in his *Operative Builder*, Mr. Hodgson attempted to show it, but either left out all reference letters or made such a jumble of them that they were no guide at all. I think I have it worked out correctly, but am not altogether sure and would like to see it done by some smarter head, making use of reference letters, so that they would be a guide to a person and it would not be necessary to guess at it.

The first of the new buildings to form the home of the University of Pittsburgh on the 33-acre site recently purchased for the purpose, is the School of Mines building, the corner stone of which was laid on October 2, with appropriate and impressive ceremonies. The building occupies the corner of the campus, and will cost when completed in the neighborhood of $200,000. The architects of the building are Palmer & Hornbostel, and the contract is being executed by James L. Stuart. It is expected that the School of Mines will develop into one of the strongest departments in the University of Pittsburgh.

PLUMBING OF A TWO-FAMILY HOUSE.

BY W. B. GRAY.

IN arranging for the plumbing of a two-family house the following conditions were imposed by the owner: Each flat to control its own supply of gas to the gas ironing stove in the laundry; each flat to control its own supply of hot water to the laundry trays; each flat to have a reservoir in the kitchen with a gas heater and thermostat, and also be connected independently with a coil in the house heater; all principal lines to shut off and drain separately. Fig. 1 is a reproduction of a photograph of the work in one of the kitchens. Fig. 2 is a direct reproduction of a copy of the pipe diagram for one flat, as sketched for the journeyman before the work was roughed in. This diagram was planned to place hot and cold lines in pairs. The difference seen in carrying out the work was caused by the position of the range being changed by the owner and by difficulty in assembling the drips in the basement. The spirit of the original plan is manifest throughout, however, and the departures are less in position than might ordinarily be expected on such work, and there is no deviation from the principle. As shown by the charts and by the photograph, the gas and hot water service valves for the laundry are under the control of the occupants, the gas being carried to the mixer line of the stove, while a hot faucet for each flat is placed over each laundry tray.

There are some features in the job not called for by the specifications—for one example, the chart and numbered nickel-plated brass tags on all valves that might possibly be misused or not used at all. The chart states which are off and which on under normal service; what kind and size each stop is, and what line it is on. How easy, therefore, it is for the owner to explain by 'phone if something goes wrong; still easier if the installing plumber does the repairing. As main lines in the job are for corresponding service, the figures of the valve numbers were made the same for the flat lines, the one of 13 showing it to be first floor flat and the prefix 1 of 113 showing it to be drain of first flat, valve No. 13. Likewise, the prefix 2 of 213 shows it to be on second floor, and for the corresponding drain a nought was prefixed to number, making No. 0213. Some reflection will show this plan to be capable of conveying more information quickly than any scheme of consecutive numbering possible, and it is easily remembered.

The cross connection between the coil circulating lines was added for the purpose of relieving the coil of one flat in winter should it become vacant. Mixing and usage prevents the overheating of water in the flat not in use. Without the cross connection, if one flat was vacated in winter the coil would have to be removed from the house heater. If only one coil was placed in the house heater both flats would be out of business if the one coil should fail for any reason. The cocks in the circulating lines were added, so that either coil could be withdrawn or renewed without leaving water off in its flat during the interval, and should it become necessary to repair one of the coils, service in its flat may continue as usual by closing the lock cocks and lighting the gas heater in the kitchen. Cocks in heater connections are generally considered dangerous, but with them locked and the owner (who in this case is to be one of the occupants) thoroughly convenient with their whys and wherefores, no trouble is anticipated. A second cross connection above the lock cocks is contemplated. It will enable the hot service of both flats to go on in a more or less satisfactory manner should one of the house heater coils fail in cold weather. The single cross connection shown could not be placed above the lock cocks because it would then be impossible to relieve both coils if it became necessary to shut off and drain one of the flats for repairs to kitchen work.

The fixtures of the bathrooms are of the best and complete in every detail. The toilet room of the third floor given to servants' use is a plain, substantial job, treated as though it was an independent house.

The illustrations show the work and tell the story so well that the writer feels a study of them by the reader will be worth more than a long drawn out description of the work. Also, it ought to be apparent that a diagram of the kind shown worked out for the journeyman beforehand results in a better and quicker line of work than when he is left to flounder about and devise his own plan according to his own conception.

Extracts from the plumbing specifications are as follows:

One 40-gal. genuine Wolff extra heavy galvanized boiler on genuine A. & O. plain stand, with No. 1 ½-in. Lawson Natural Gas Water Heater, fitted with Natural

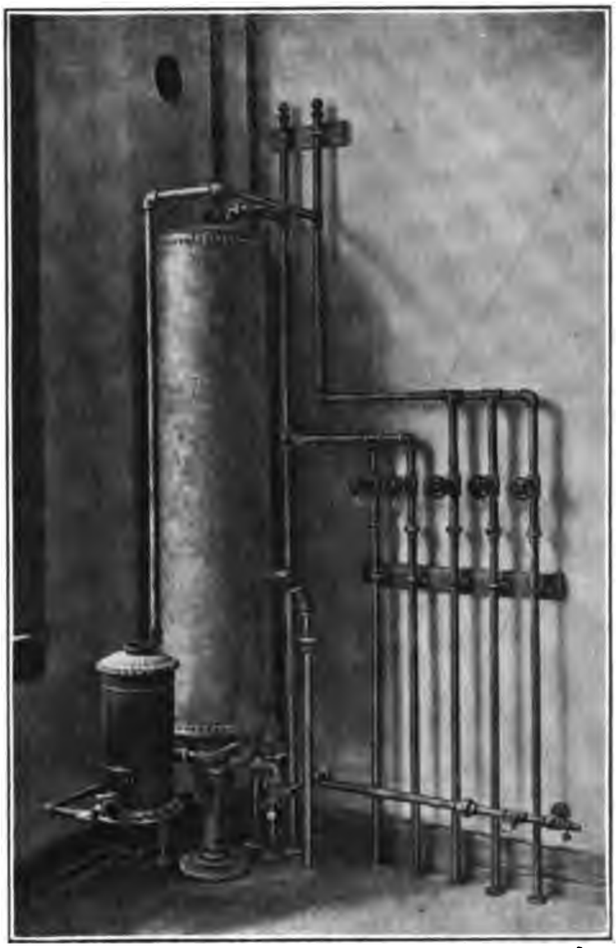


Fig. 1.—Piping in One of the Kitchens.

Plumbing of a Two-Family House.

Gas Thermostat—one outfit for each flat—unions to be used in the gas and water supply so that heater or boiler may be removed without disturbing other work.

Connect reservoir of each flat with stubs at exterior of house heater, so that water will circulate from supplementary heater to reservoirs independently, using 1-in. galvanized pipe with shutoff valve in kitchen of each flat with key air cock on heater side of valves, and provide ½-in. drain and valves from lowest point at heating boiler, and connect same to house heating boiler drain.

One three-burner hot plate flatiron heater for natural gas, to be furnished and connected, for common use in laundry to fuel gas with branched line, with key shield stop, accessible in each flat, so occupant of each flat may supply at will through his own meter or cut-off the supply, leaving the gas to be supplied by the other tenant.

One set of two trays, B-4315, as shown and described in A. & O. "B" catalogue, except the back to have an extra hole between each pair of faucet holes, and to be furnished with three faucets each, the middle one of each tray to be connected with ¾-in. branch from the hot water service from flat on first floor and the left faucet of each tray to be connected by a ¾-in. branch from hot water service of the second floor flat, with shut-off valve accessible to and in kitchen of each flat, 1½-in. pipe air chamber, 24 in. long, to be provided on tray supplies, independent of tray back. The cold faucets to be supplied from the general supply to the house, taken off in the basement, with separate stop in laundry.

The general lines of supply pipe in the job from property line to main stop, 1-in., elsewhere, ¾-in., galvanized wrought, with ½-in. vertical branches to water closets and ⅜-in. vertical branches to lavatory faucets. Separate lines for each flat to begin at branch in laundry, with stop and waste valve.

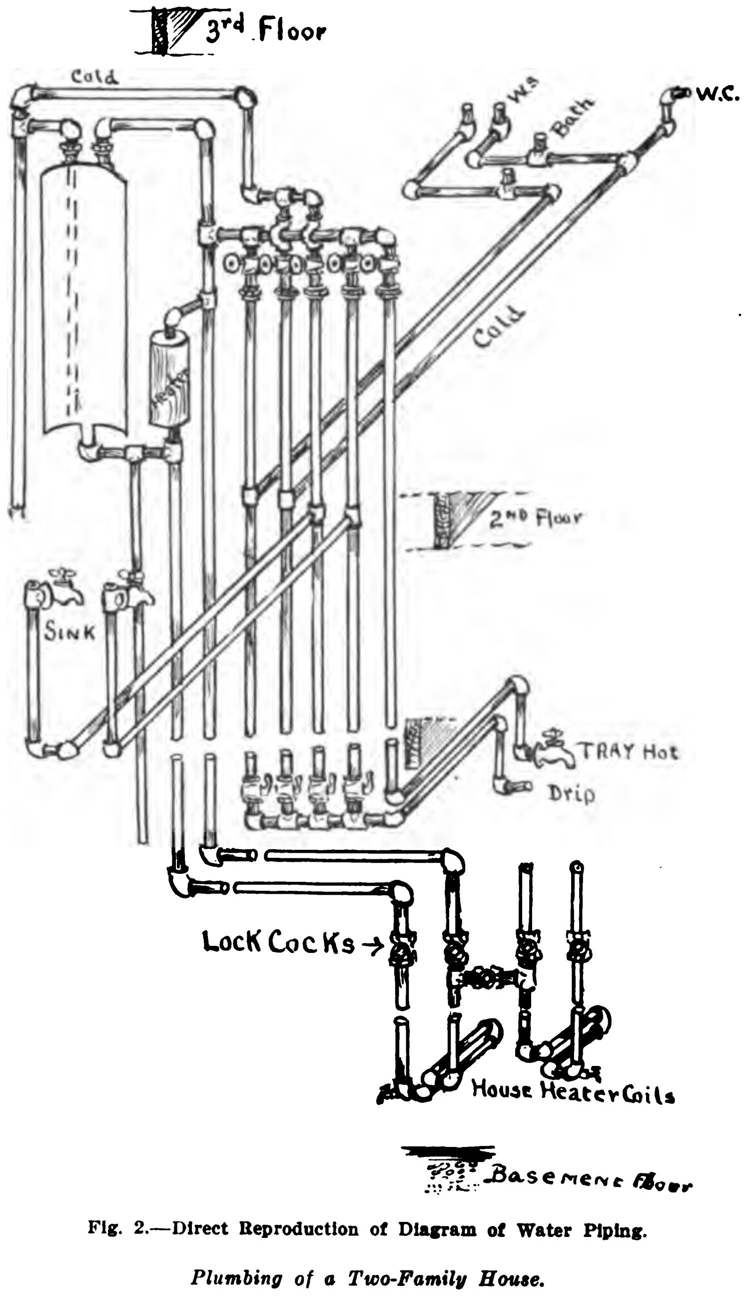


Fig. 2.—Direct Reproduction of Diagram of Water Piping.

Plumbing of a Two-Family House.

Galvanized solid ring hangers, at a distance insuring stable and pefmanent support for the supply pipe, will be provided—with screw or plate shanks, according as required by the character of the wall, and all supply pipes put up so that they will drain regularly, and every unavoidable trap in hot or cold service to have drain cock connected to waste pipe or soil pipe in an allowable manner, so that owner may shut off and thoroughly drain either flat independent of the other, or both as occupancy or vacancy of the building requires, for the safety of the plumbing, storage boiler to have drain and sediment cock connected to waste or soil line as described for other drain cocks, except size not less than ¾ in. Entire house supply system within house to be controlled by 1-in. stop and waste valve, accessible to laundry, and lines on house side of main stop to be branched by ¾ x ¾ x 1 in. bullhead tee. If any under floor supplies are necessary, and in places likely to freeze, such will be boxed with wood and packed in mineral wool.

The faucets used will be nickel plated brass of the full ¾-in. size on trays, regular ¾-in. and ½-in. elsewhere, A. & O. make, and the stop and stop and waste cocks where used will be of Standard Sanitary make, Bower-Barff finish.

There will be supplied a set of Chapman stops or stop and waste valves, as control the bathroom fixtures, so that the bathroom may be cut off independent of the closet, and the closet supply turned on or off without stopping the service of the bathroom. Bathroom stops must not control sink lines.

One ¾-in. fuel gas opening will be placed for gas stove in the kitchen of each flat, and one ½-in. opening in the bathroom of each flat with separate main lines for each flat to basement. Key shield valve set in floor with capped openings in each fireplace. The fuel gas job to be tested for natural gas. The stuffing boxes only of valves for the second floor flat will be placed above floor level, and extension rods with nickel plated floor plates will be used on first flat, placing pipe lines below joist. The key shields and stuffing boxes of all gas valves will be locked to the valve bonnets with hexagonal ferrules and all valves used will be genuine Wm. Powell make. On all gas fitting work the fittings will be galvanized malleable, wherever Crane or Western Tube Company show such to belong to the standard galvanized list.

Cost of a Small Greenhouse.

A small greenhouse, or conservatory, adds to a private dwelling a value greater than its cost. Even in town there are many situations which admit of the construction of a greenhouse annex, but the owner of a suburban estate or plot is restricted only by the amount of money he is able to put into it. A small greenhouse is possible almost in any situation having a Southern exposure, and it is the small house from which one derives the most personal enjoyment, when it provides a pleasant place of retreat from household cares. The three general types of greenhouses are discussed in a practical way for the house owner by H. J. Birch in a late issue of *Suburban Life*, and some estimates of cost are given. There are three general types of greenhouse, the even-span, three-quarter-span and lean-to. The even-span house has a pitch roof, with glass on each side. The angle of the pitch varies somewhat, but it is always about 7½ in. to every foot, or about 32 degrees.

The great advantage of an even-span house is that the plants receive the light on all sides. For the best results, such a house may extend north and south, yet many growers prefer them in the opposite direction. However, when the house extends east and west, more shade is cast in the early morning and late afternoon, than in a north and south house.

The lean-to, on the other hand, should extend east and west, having a Southern or Southeastern exposure, the glass being on the south side. It is an extremely handy house, for it can be built in small corners where it would be impossible to put an even-span house. The lean-to is usually built against some other structure, a wall of which forms the back wall of the greenhouse.

A three-quarter-span house is much like an even-span, except that it has only a little glass on one side, the balance of the roof being shingled or covered with some other material. It is necessary that this form of house extend east and west, the slope having only a little glass, being on the north side.

The cost of a greenhouse depends largely upon its construction. The cheapest form is made of hotbed sash which are 3 x 6 ft. The walls of such a house may be made of brick, cement, or even of boards, but, while the latter construction may be cheaper in the matter of first cost, it is much more expensive in the long run, because it needs renewing frequently. Such a house costs only $12 to $15 a running foot, and is all right for the person who can afford no better. I have grown good plants in such a house, but a house built on modern lines, with few sash bars and large lights of glass, gives much better satisfaction, as I have learned by experience. The extra cost of construction is more than overbalanced by the length of time such a house will last, and the larger crops of flowers.

I believe that one of the best greenhouses for the amateur to buy is one of the sectional frame houses, which are now on the market. A good house, 10 ft. wide and 25 ft. long, can be bought for $300, which price does not include the freight. The house comes complete—ventilating apparatus, glass, putty, glazing points, bolts, screws and all other little necessary items.

In addition to the cost of the structure, there are benches and a heating system to install, which will cost about $200 more. This extra amount will include the boiler, pipes and benches and all other necessary materials for putting a house in first-class shape.

The great advantage of buying a house of this sort over buying the stock from a lumber yard and putting it together yourself lies in the fact that all the parts fit perfectly before they leave the factory, so that when the house is put together you have something ornamental as well as useful. I have seen many houses built, both by greenhouse builders and by local carpenters, and although the local carpenters employed were the best in the community, and good mechanics, they never could put up a house as good as one built by the man who makes greenhouse building a specialty. Of course, in addition to the first cost of the structure, there will be the cost of putting the sectional house together, but there will really be very little work. The amateur can easily do it himself in his odd time, or he can have a local mechanic put it together. He can't help doing a good job, for, as I have already said, the parts are made to fit; it is a matter of bolting them together.

In ordering such a house, it will be necessary to give the dealer the following information: The temperature which you wish to maintain at night, and the lowest temperature you have in your locality during the winter. Should the greenhouse be some distance from the house and you wish to have the boiler in the cellar, there will be a small additional cost for pipe. If at any great distance, it will be better to have the heater in the potting shed or workroom of the greenhouse. Never attempt to have the heater inside of the greenhouse itself; the escaping gas will injure the plants.

Another advantage of these sectional houses is that they can be added to at any time just as you can add to a sectional bookcase, and if you are an enthusiast—as most amateurs usually become—you will soon find that you are crowded for space. Additional sections 8 ft. long can be had for about $65.

For people who desire a somewhat more elaborate house, with stone or cement foundations and the most modern form of construction, there is the even-span house, 11 x 25 ft., which can be built for about $1000. Larger houses will cost in proportion.

Do not think for a moment that looking after the greenhouse is going to be a heavy care. If you feel that way about it you had better not have one. I know commuters who have small houses in which they spend a great deal of their time when at home, and more enthusiastic gardeners you never saw. They get more real fun out of it than any person whoever rode a stamp, coin, china or antique-furniture-collecting hobby.

Relative to Henry Flat Building Plumbing

IN BASEMENT

STOP & WASTES

No. 1—Cold to Laundry.
No. 2—Cold to 3rd Floor Toilet.
No. 3—Hot to 3rd Floor Toilet.
No. 4—Main Cold, 1st Flat.
No. 5—Main Cold, 2nd Flat.

STOPS

No. 6—Supply to Heating System.
No. 7—Drain to Heating System.

Drains to Branch Lines

1st Floor Flat.	2nd Floor Flat.
No. 113—Drain to No. 13.	No. 0213—Drain to No. 213.
No. 114—Drain to No. 14.	No. 0214—Drain to No. 214.
No. 115 Drain to No. 15.	No. 0215—Drain to No. 215.
No. 116—Drain to No. 16.	No. 0216—Drain to No. 216.

Stops for Emergency Use:
A and B—Stops (don't touch ordinarily). Close when 1st Flat Coil is to be removed from House Heater.
C and D—Stops (don't touch ordinarily). Close when 2nd Flat Coil is to be removed from House Heater.
E—Stop (don't touch ordinarily). Open when one flat is vacant and water on to it.

IN FLAT KITCHENS

Stops in 1st Floor Flat

To Stop, Close:	To also Drain, Open:
No. 13—Bath Room, Cold	Faucets and No. 113
No. 14—Sink, Cold	Faucet and No. 114
No. 15—Sink, Hot	Faucet and No. 115
No. 16—Bath Room, Hot	Faucets and No. 116
No. 17—Laundry, Hot	Faucet.
No. 18—Laundry Gas Stove.	
No. 19—Kitchen Gas Heater and Thermostat.	

Stops in 2nd Floor Flat

To Stop, Close:	To also Drain, Open:
No. 213—Bath Room, Cold	Faucets and No. 0213.
No. 214—Sink, Cold	Faucet and No. 0214.
No. 215—Sink, Hot	Faucet and No. 0215.
No. 216—Bath Room, Hot	Faucets and No. 0216.
No. 217—Laundry, Hot	Faucet.
No. 218—Laundry Gas Stove.	
No. 219—Kitchen Gas Heater and Thermostat.	

When the job is in normal service, Nos. 6, 7, 113, 114, 115, 116, 0213, 0214, 0215, 0216 and E are always off.

No. 17, 217, 18 and 218 are kept off or on according to service required in Laundry.

All other numbered Valves and Cocks are left on for normal service. Some fixtures (not mentioned above) have individual stops at the fixtures.

Nos. 1, 4, 5, 13, 14, 15, 16, 17, 213, 214, 215, 216, 217 are ¾-inch Chapman gate valves.

Nos. 18, 19, 218, 219 are Key gas valves. A, B, C, and D are 1-inch Socket Head Stop Cocks. E is 1-inch gate valve. Nos. 113, 114, 115, 116, 0213, 0214, 0215, 0216 are ½-inch L. H. Pet Cocks. Nos. 2 and 3 are ½-inch L. H. S. & W. Cocks. Nos. 6 and 7 are ¾-inch L. H. Stop Cocks.

Radiator Key **Gas Valve Key** **Lock Cock Key**

Fig. 3.—Chart for Operation of Water and Gas Supplies.—Three Keys Are Hung from Hooks on a Board Under the Chart, as Indicated.

Plumbing of a Two-Family House.

Staining Bricks Red.

In answering a correspondent of that journal who asks the proportion of copperas required in a stain for brickwork which is to be made of Venetian red, stale beer and copperas, the job being a large one in which is included old as well as new brick, the *Painters' Magazine* in a recent issue says: We have never used stale beer or stale ale in brick stain, but believe it to be superior to glue water and alum as a binder. The copperas is introduced for the same purpose as is the alum in glue water—that is, as an astringent and drier and fixative or mordant. Green copperas (iron sulphate) is heated in an unglazed earthen pot until it falls into a dry white powder.

Make up the stain by wetting up the Venetian red or whatever other mineral color you require to produce the right color, then add your stale beer or ale and to each gallon of the stain add at least 4 ounces of the calcined copperas, which first work into a smooth, creamy paste with a portion of the stain. On account of the difficulty of making the stain cover well on the old brick, you will have to use a strong Venetian red. Try your stain first on a few of the bricks before going ahead.

A VERY interesting example of concrete block residence has recently been completed by Frank Powers at Westbury, Long Island, N. Y. The blocks were made of a mixture consisting of 1 part cement and 4 parts sand, with a certain percentage of hydrated lime for the purpose of rendering the blocks waterproof. The footings were 12 x 24 in., and the concrete blocks for the cellar walls 10 x 16 in. When the blocks were all laid they were given three coats of cement applied with a brush, the last application containing 25 per cent. of hydrated lime.

WHAT BUILDERS ARE DOING.

FOR the second time this year the monthly figures of building operations covering the leading cities of the country indicate a slight increase as compared with the corresponding period of a year ago. This is largely due to the fact that in many of the smaller places there exists a decided degree of activity, and the feeling is quite confident that the improvement is likely to be steady, although possibly somewhat slow. The figures for 67 cities for September indicate a gain, as compared with September last year, of about 6 per cent., although the number of individual operations as compared with last year make a much better showing. This clearly indicates a tendency toward more dwelling houses and minor business structures, and is explained in part at least by the increasing amount of work that is being done in the suburban and rural districts.

Atlanta, Ga.

The building that is now in progress is about equally divided between structures intended for business and dwelling purposes, but there is nothing especially noticeable to mention in the way of important undertakings. Prices of building materials are a trifle higher just now than they were at this time last year, but it must be remembered that a year ago conditions were decidedly unsettled and the country was trembling on the verge of a money panic, the like of which has probably never been seen. That recuperation has been rapid may be judged from the fact that the permits issued from the office of Inspector of Buildings Ed. R. Hays for September were valued at $436,019, while in the same month a year ago their value was $256,188.

For the months of July, August and September of the current year, constituting the third quarter, the value of the building improvements projected was $1,340,181, while in the corresponding quarter of 1907 the valuation was $934,324, thus showing a gain in 1908 over the previous year of $406,857.

Birmingham, Ala.

The estimated cost of building improvements authorized during the month of September is placed at $243,245, as compared with $102,210 for the same month last year. Thus far the current year building improvements have been projected, involving an estimated outlay of $1,624,565, while for the same period last year the estimated cost was $1,605,199.

The members of the Building Material Men's Exchange of Jefferson County held their first semiannual banquet at the Hotel Hillman on the evening of Tuesday, September 29. This organization was effected several months ago, and the membership is made up of representatives of various branches of the building material line from the retail dealer in materials to the wholesale brick and lumber concern.

The president is H. H. Snell of the Lathrop Lumber Company, the first vice-president is W. A. Currie of the Moore & Handley Hardware Company, the second vice-president is L. L. Stephenson of the Jefferson Brick Supply Company, the treasurer is J. H. Eddy of the Kaul Lumber Company and the secretary is Thomas S. Forbes.

Bridgeport, Conn.

The Bridgeport Local Assembly Interstate Builders', Contractors' and Dealers' Association held its sixth annual meeting on the evening of October 5. The reports of the officers showed the association to be in a prosperous condition, and peace and harmony existing between employers and employees.

The following officers were elected to serve for the ensuing year: President, Stephen A. Meeker; vice-president, T. Stewart; treasurer, W. H. R. Du Bois; secretary, L. D. Stone; sergeant-at-arms, Percival Laister.

Buffalo, N. Y.

There has been considerable activity the latter part of the present season in house construction, prospective builders, apparently appreciating the fact that the cost of materials is about as low as it is likely to be for some time to come. Generally speaking, prices of all classes of construction have been about 10 per cent. lower than last year. The scale of labor has not changed, but the men have been compelled to deliver a better day's work, and contractors have been content with a smaller margin of profit. There has been but little doing in the line of heavy construction, although just now there are 4 or 5 big jobs on which bids have been received and the work may go forward. Notwithstanding the prices of common brick, building stone, sand cement, structural iron and lumber are on the average somewhat lower than a year ago, contractors still run up against the same propositions in connection with big buildings, namely, owners think the work too high, and send the plans back to the architects for revision.

The number of operations projected in September shows a heavy shrinkage when compared with the same month a year ago, although the amount of capital involved is practically the same, thus indicating a more substantial class of work under way. According to the figures furnished by Deputy Building Commissioner, Henry Rumrill, Jr., 185 permits were issued in September by the Department of Public Works calling for an estimated outlay of $644,000, while in September last year, 297 permits were issued involving an outlay of $688,000. The value of the work projected has shown a slight shrinkage during each of the last three months, but the total for the third quarter aggregates $2,099,000, for which 778 permits were issued. In the corresponding quarter last year 781 permits were issued for new buildings, alterations, additions, &c., involving an outlay of $2,306,000. The only important operation projected during the last three months is that of the new sheep sheds for the New York Central Railroad estimated to cost $150,000. The other work consists largely of frame dwellings.

Chicago, Ill.

Building activities in Chicago, as represented by permits issued in September, show a moderate decrease in value of improvements as compared with the corresponding period of last year, but in number of buildings and frontage a distinct gain is recorded. In September, 1908, there were 950 buildings projected, with 25,279 ft. frontage, and estimated to cost $5,147,350, which compares with 798 buildings with 21,048 ft. frontage and costing $5,523,605, in September last year. The gain in the first two items in favor of the present year is 152 buildings and 4231 ft. frontage, while the decrease in cost amounts to $376,255.

A comparative showing of the results for the third quarters of 1907 and 1908 is favorable throughout for the present year. In the third quarter of last year permits were taken out for 2824 buildings having 68,756 ft. frontage, valued at $15,392,380, while in the same period this year the permits issued amounted to 2824 buildings with 76,841 ft. frontage, and total cost of $16,220,790. It is evident from these figures that there has been much more doing in small structures, such as dwellings, small apartments and business buildings of moderate size, than in undertakings of larger individual importance. This movement has been fostered to a large extent by the cheaper prices of material, the steadiness and ample supply of labor and the general tendency of small investors to turn to real estate investments for security.

Lumber is on an average about 15 per cent. lower than at the beginning of the year, though within the last two months it has reacted somewhat from the low point reached early in the season. Brick is selling at $5, and though the volume of business is larger than at this time last year, makers claim that the margin of profits is very narrow. Demand for cement has continued to grow and prices, which are now about 40 per cent. lower than before the panic, have stiffened up slightly within the last 30 days.

The construction of small buildings, which use more or less cement, is going on without interruption, but it is the belief of manufacturers that not much is to be expected in the way of large work until after election. While the nominal price of structural steel has been but slightly reduced, it is observed that, in the competitive bids offered by fabricators, some very low prices appear.

During the last quarter work has been begun on several new structures of noteworthy size, the principal among which are the La Salle Hotel and the new City Hall, the demolition of the old building being now in progress. Contracts have recently been let for several other buildings of important size, upon which work is soon to be commenced, so that before the end of the year it is expected that there will be marked improvement in the amount of building work under way.

Cincinnati, Ohio.

As a general thing, architects are fairly busy and look with confidence to the future. A number of large building improvements projected late in 1907, and held up during the first half of the current year are now being pushed forward to completion. One of the large builders who suspended his operations in dwelling and apartment house construction last fall decided a few months later, because of a large increase in inquiry, to resume work, and is now putting up a large number of substantial dwelling and apartment houses in Norwood, Evanston and other Cincinnati suburbs.

In September the Building Department issued 601 permits for improvements, involving an estimated outlay of $456,245, while in September last year 757 permits were issued for improvements, costing $401,931.

For the months of July, August and September of the current year 1641 permits were issued, involving an estimated outlay of $1,832,165. In the same quarter last year 2183 permits were issued for improvements, costing $1,986,521. From this it must be inferred that a more substantial character of building is being erected just at the present time than was the case in the corresponding period last year, the greater number of permits at that time having been due to the increase in the erection of dwelling houses.

As building materials are from 10 to 15 per cent. lower at the present time than they were a year ago builders generally would not be surprised at an early advance in certain lines.

Cleveland, Ohio.

Building activity is holding up fairly well in the city, but while no new large building projects have been started during the month, and no large undertakings are expected to be commenced during the balance of the season, considerable small work is developing. Work of this nature is being stimulated by the lower prices of material that are prevailing, and the close bidding by contractors. During September there were 630 permits issued by the city building inspector's office, for structures calling for an estimated outlay of $1,332,122, as compared with 674 permits issued during August for buildings to cost $921,701.

Up to the first of October, 5390 permits were issued during the year for buildings to cost $7,193,426. It is estimated that the total for the year will amount to about $9,000,000, as compared with $15,888,407 during last year, which was an abnormal year. This year's permits will nearly equal in amount those of 1905, and will largely exceed any year previous to that.

Denver, Colo.

A most gratifying degree of activity prevails in building circles, and the record of operations for which permits were issued in September is far ahead of that of the same month last year, more particularly as regards the amount of capital involved. The number of undertakings is not much greater than that last year, but the work projected is of a more pretentious and expensive character. According to the figures compiled in the office of Building Inspector Robert Willison, 285 permits were taken out in September, involving an estimated outlay of $1,006,625. In September last year 231 permits were taken out for improvements costing only $472,230. This gives an increase over a year ago of 54 in the number of permits issued and $534,395 in the value of the cost of the improvements.

Of the 285 permits issued last month 164 were for brick residences to cost $420,250, and 10 were for business buildings to cost $149,000. A permit was also taken out for a $140,000 pavilion, a $70,000 warehouse, and a $30,000 brewery.

From January 1 up to and including September 30, there were 2390 permits issued for building improvements to cost $7,563,320, while in the corresponding period of 1907 there were 2014 permits taken out for new buildings, involving an outlay of $5,121,599. The month of October starts out well, the permits the first day calling for an estimated expenditure of $148,000.

Detroit, Mich.

Builders were both surprised and gratified when total figures of cost of building operations for the month of September were given out at the fire marshal's office, for they exceeded the corresponding month in 1907. The figures for last month amounted to $922,200, for 278 new buildings, and $270,950, for 51 additions, making a total of $1,193,150. In September, 1907, the cost was $958,450, for 404 new buildings, and $233,050, for 62 additions, making a total of $1,191,500.

Additions and alterations have been a feature of all building operations in Detroit this year. It can be seen from the above figures that the value of new buildings in September, 1907, was greater than this year, but September of this year more than made up the deficit with the cost of additions. It is generally figured, also, that building operations in Detroit for 1908 will fall below both 1907 and 1906, and possibly below 1905. The total for the nine months of the present year is $7,472,450, while the total for the entire year of 1905 was $10,462,100.

The building permit list for the first 10 days in October, this year, is a healthy one and points to a better month than last year. Among larger permits already taken out are the following: Belle Isle Casino, $63,000; Gratiot Avenue Methodist Episcopal Church, $30,000; Campbell Avenue Methodist Episcopal Church, $35,000; Everitt-Metzger-Flanders Auto Company factory, $30,000.

It may be of interest to note that more than the usual amount of building work is reported out in the State of Michigan generally. Building operations in Grand Rapids, second city of the State, are being rushed and will be much larger than a year ago.

Hartford, Conn.

The past month makes a most gratifying showing so far as building is concerned, and at the present rate of increase over the previous months the year will close with a total which will compare favorably with its immediate predecessors. One factor in swelling the total value of new improvements was the permit for the State Library and Supreme Court Building, which is estimated to cost in round numbers $1,000,000.

The report of Building Inspector Fred. J. Bliss for September of the current year shows 58 permits to have been issued for improvements involving an estimated cost of $1,377,765, which figures compare with 68 permits in August calling for an outlay of $67,185, and with 60 permits in July for improvements valued at $91,780. This makes a total for the third quarter of the year of 186 permits for buildings valued at $1,536,730.

In September last year 86 permits were issued for improvements estimated to cost $1,570,120, while in the month before 76 permits were taken out for improvements costing $445,695, and in July of last year 66 permits were taken out for improvements valued at $219,780.

From these figures it will be seen that in both years September made a tremendous gain as compared with August, especially in 1908.

Indianapolis, Ind

While the amount of new work projected in the building line in the month of September was somewhat greater than that of the same month a year ago, yet the shrinkage from August, 1908, is very marked, and it was even less than in July. The record for the quarter, however, is far ahead of last year, and the feeling seems to be that improvement, though slow, is likely to be steady from this time forward. The report of Thomas A. Winterwood, Inspector of Buildings, shows that in September the value of the building improvements for which permits were issued from his office was $513,236, these figures comparing with $453,659 in September last year.

The figures for July, August and September involve a total of 1208 permits for improvements, involving an estimated outlay of $1,843,922, while in the third quarter of last year 1156 permits were issued for new work, estimated to cost $1,502,901—an appreciable increase in favor of the current year.

Los Angeles, Cal.

Though the situation here shows but little change, there was during September a still further falling off from the high standard of building set during July. According to the figures of the Building Inspector, there were during September 656 permits issued, with a total estimated valuation of $849,703, as compared with 676 permits, with a valuation of $954,271 for August and 571 permits, with a valuation of $1,352,290 for July. There was also a falling off as compared with the month of September, 1907, when the building record showed 737 permits, with a total valuation of $1,116,901.

For the nine months of the year ending September 30 the showing is as follows: For 1908 5458 permits, with a total valuation of $7,463,120, and for 1907 5906 permits, with a valuation of $11,033,165, or a falling off of 348 in the number of permits and $3,370,045 in the estimated valuation of the work for the nine months.

Builders report that there is apparently little or no easing up in the planning of residences and other frame buildings, the low price of labor and materials apparently proving a considerable incentive to people of small means. On the other hand, the falling off in the demand for offices and the tendency for office rentals to drop appear to have more than offset the lower cost of materials and labor as far as the construction of large structures is concerned. The average cost of new construction has dropped from over $1500 a year ago to less than $1300 now.

Memphis, Tenn.

The outlook for building operations is very flattering and architects and builders expect an active season. The permits which are being issued from the office of Building Commissioner Dan. C. Newton seem to strengthen the optimistic feeling, and new work is going forward upon a most gratifying scale. Prices of building materials are maintained at about the same level as a year ago and there are those who appear to be convinced that the cost of building, especially where lumber is largely involved, will not be very much less in the future than it is at present.

During September the Building Commissioner issued 252 permits for improvements valued at $303,685, this being a slight increase over August, but considerably under the total for July. In September last year 226 permits were issued for buildings estimated to cost $280,276, which also was a slight gain over August of that year.

For the third quarter of the current year there were 710 permits issued for new buildings, alterations, repairs, &c., aggregating an outlay of $986,280, while in July, August and September last year 669 permits were issued involving an estimated outlay of $941,251.

Milwaukee, Wis.

The city continues to make a steady and healthy growth as regards its building operations, and while some business buildings are being put up, probably 75 per cent. of the new work covers dwellings of one sort and another. While the value of the improvements for which permits were issued have shown a gradual shrinkage since July, yet the record for September is far ahead of the same month last year.

According to the figures compiled in the office of Inspector of Buildings Edward V. Koch, 374 permits were issued in

September, covering building operations estimated to cost $910,315, these comparing with $931,299 in August and $1,103,839 in July. Going back to September last year, it is found that 291 permits were issued for improvements estimated to cost $580,434. This figure, however, was very much less than in August that year, when the value of the improvements projected was $932,535, and in July it was $993,400.

Taking the figures for the third quarter of 1908, it is seen that 1220 permits were issued for building operations costing $2,945,453, these comparing with 1059 permits for buildings costing $2,506,369 in the corresponding three months of last year.

Minneapolis, Minn.

While building materials are showing a slight decline in prices as compared with a year ago, it appears to be having no appreciable effect upon the volume of operations and the work at present in progress is normal in its distribution between building construction intended for dwelling and business purposes. In September permits were issued for 539 buildings to cost $861,200, as compared with 411 buildings to cost $753,770 in the same month in 1907.

During the third quarter of the current year there were issued, according to the figures compiled in the office of Inspector of Buildings James G. Houghton, 1625 permits for building improvements, the estimated cost of which was $3,089,035. This is a slight improvement over the same three months last year, when 1480 permits were issued, involving an estimated outlay of $3,000,260. The only notable undertaking during the third quarter of the current year was a 12-story fireproof hotel of brick and reinforced concrete construction, estimated to cost $450,000.

Nashville, Tenn.

The leading building contractors and others identified with allied interests have formed the Nashville Builders' Exchange, and the first meeting was held on Saturday afternoon, September 19, with 52 charter members present. The organization was perfected by the election of the following officers for the ensuing year:

President, H W. Buttorff.
First Vice-President, T. L. Herbert, Sr.
Second Vice-President, R. T. Creighton.
Treasurer, John Oman, Jr.
Acting Secretary and Assistant Treasurer, Haynes McFadden.

A Board of Directors has been elected and committees appointed on Membership, Rooms, Arbitration, Legislation and Entertainment.

The aims and purposes of the organization, among others are:

"To promote among its members integrity and good faith in their dealings with their brother contractors, with architects and with the general public.

"To foster the business interests of members in every fair and legal manner possible.

"To maintain uniformity in commercial practices in this particular branch of the city's business.

"To disseminate valuable business information to its members.

"To adjust fairly and amicably differences existing between members or between a member and any outsider.

"To advance in every way possible the business interests of Nashville.

"To educate the public to the fact that applications for membership to this Exchange are so carefully scrutinized that a membership card is a fair assurance of skill and reliability on the part of its possessor.

"To make such rules and regulations as will guarantee a standard, sensible set of contracts and specification for the benefit of architect, agent, owner and contractor."

The members and promoters of the organization are much encouraged over the outlook, and by the interest which is being manifested by the building fraternity.

The amount of building in progress in the city at the present time is up to the standard, and there is more modern fireproof construction under way than was the case a year ago. With regard to prices, it may be stated that while some materials have declined, the majority have been sustained, although it is said that residences can be constructed fully 10 per cent. cheaper than was the case 18 months ago.

Newark, N. J.

Notwithstanding the fact that prices of building materials have declined probably on an average of 10 per cent., operations are rather slow and the outlook for the immediate future is not altogether encouraging. The volume of new work projected in September, however, shows a slight gain over the same month a year ago, although the total for the third quarter of the year is considerably behind the figures for the same period of 1907. According to the figures compiled in the office of Superintendent of Buildings William P. O'Rourke, the value of the improvements for which permits were issued in September was $710,459, while in the same month a year ago the value was $626,085.

For the third quarter of the current year the value of the improvements for which permits were issued was $2,125,982, whereas in the same quarter last year the value was $2,894,977. During the past three months the principal operation of importance was the building of the Essex Troop Armory, costing $84,000.

New York City.

The building situation has shown comparatively little change during the month that has passed, but there is a volume of work in progress which compares very favorably with this season last year. Contrary to some of the more recent months, no permits were filed in September for notable building operations, and the total was made up of what might be described as routine work. In the Borough of Manhattan only 48 permits were issued, involving an estimated expenditure for new buildings of $4,490,000, whereas in September last year 52 permits were taken out calling for an outlay of $3,852,500. In the Bronx the new work projected in September called for an outlay of $1,890,000, compared with $1,233,000 in September last year.

For the nine months of the current year the total estimated cost of the building improvements for which permits were issued in the boroughs of Manhattan and the Bronx was $71,576,000, these figures comparing with $83,105,880 in the corresponding nine months of last year. These figures, however, do not include alterations, for which $9,552,000 was involved in the nine months of the current year and $15,764,540 in the corresponding nine months of last year.

In Brooklyn there was a slight gain in September over a year ago, permits having been issued for 815 new buildings estimated to cost $4,829,740, as against 540 new buildings costing $4,067,400 in September last year. For the nine months of the current year the estimated cost of building improvements was $25,270,300, compared with $54,644,000 in the nine months of last year. The estimated cost of alterations in the two periods was $4,543,000 and $5,348,500, respectively.

Oakland, Cal.

Construction in Oakland and in the surrounding towns continues to show slight increase over preceding months. During September the number of permits issued was 369 for buildings valued at $496,875, as compared with 305 permits valued at $444,532 for the month preceding. This is for the comparatively small section within the incorporated limits of the city, no records having been returned for Berkeley, Alameda, or the other suburban towns. Oakland builders show that for the area of the town the building activity is perhaps greater than any other city on the Pacific Coast, except San Francisco. Construction is now averaging about $40,000 per square mile per month in Oakland, as compared with about $15,000 per square mile per month in Los Angeles. As in other cities of the Coast, the trend of the construction work is toward the smaller class of residences.

Omaha, Neb.

Comparatively few permits have been issued this year for large buildings, although structures that were contemplated during the earlier months are now being figured by contractors, and it is probable that a number will yet be included in the operations for 1908. The greater percentage of the operations, however, cover buildings for dwelling purposes. Prices of materials are practically the same as last year, what changes there are being very few.

The report of C. H. Withnell, Building Inspector, for the month of September, shows 158 permits to have been issued for improvements costing $473,800, the latter figure comparing with $485,725 in August and $576,040 in July. The total permits for the three months constituting the third quarter of the year was 487, involving an estimated outlay of $1,535,565.

In September last year 134 permits were issued, calling for an estimated outlay of $396,155, and for the three months of July, August and September, 433 permits were issued, involving an estimated outlay of $1,397,645.

Pittsburgh, Pa.

Building operations continue of an ordinary but diversified nature, although special mention might be made of the Soldiers' Memorial Hall and the School of Mines, the latter being the first structure for the University of Pittsburgh on its new site. There has been little, if any, change in the cost of building materials, yet in some instances figures are, perhaps, a shade lower than some months ago. September is about on a par with the same month in 1907, although the cost per building is less.

Superintendent S. A. Dies of the Bureau of Building Inspection reports 410 permits having been issued in September, covering operations estimated to cost $1,180,177, while in September last year 316 permits were issued by the bureau calling for an estimated outlay of $1,134,632. The value of the improvements last month was $300,000 less than in August, although showing a considerable increase as compared with July.

For the third quarter of the year the bureau issued 1188 permits for building improvements estimated to cost $3,431,456, these figures comparing with 921 permits for improvements costing $4,123,080 in the corresponding months of last year.

Portland, Ore.

During the last few months the construction of business blocks has been actively going on, and the prospects are that this class of work will continue for some little time. In the last month or two permits have been taken out for a 10-story building for Meier & Frank, to cover an area 100 x 130 ft., and to cost $400,000; a 9-story hotel building, 100 x 100 ft., to cost $230,000; a 6-story structure for the Crane Company, 100 x 20 ft. in size, to cost $150,000; a 10-story structure for Gay Lombard, to cost $160,000; a 6-story building for C. K. Henry, 100 x 100 ft., to cost $150,000; a 5-story Homeopathic Hospital, to cost $60,000, and a 6-story building for Blumauer-Frank, to cost $110,000.

According to the figures compiled in the office of Inspector of Buildings G. E. Dobson, there were issued in September 445 permits, involving an estimated outlay of $972,-355, while in September last year 362 permits were taken out calling for an outlay of $943,300. The permits issued last month cover, among others, 232 dwellings to cost $468,-800, and five buildings, class A, B. C, to cost $183,100. There were also four reinforced concrete buildings costing $53,600. Of the grand total, $119,285 represented the cost of repairs for which permits were issued.

Taking the figures for the third quarter of the current year, it is found that 1316 permits were issued for improvements costing $2,783,116, whereas in the months of July, August and September last year 1125 permits were taken out for buildings costing $2,587,031. The figures for September this year are $200,000 ahead of August, but are $66,000 less than the value of the new buildings projected in July.

Philadelphia, Pa.

It is interesting to note that building operations in this city during the month of September show a substantial gain over those of the previous month, but we are still about $500,000 behind the total for the same month last year. It must be remembered, however, that we were still feeling the effects of the tremendous building boom of 1907 at that time, and therefore comparisons under conditions existing then and at the present time can hardly be taken seriously. From present indications it looks as if there would be a further increase in the volume of business undertaken during the next month or two. The situation is materially aided by the amount of municipal work, placed and being estimated upon. Work of the latter character begun last month totals nearly $250,000, while during October contracts will be let by the city for more than twice that amount of work, and almost as much is now being estimated upon, proposals for which will not be opened until some time in November. Work on the William Penn High School for Girls, costing over $500,000, will be started this month, and the Board of Education has announced that it will let contracts, probably early in November, for five school buildings, the aggregate cost of which will be close to $1,000,000.

From data compiled by the Bureau of Building Inspection, it is to be noted that only twice in the past 10 years has the total for the month of September exceeded that of the month past, and that was in 1905 and 1907. Permits issued during the month numbered 1056 for 1548 operations, at an estimated cost of $2,545,520, showing an increase in the value of work undertaken when compared to the previous month amounting to $521,190.

We are, however, still far behind the record as far as comparisons with the same nine months last year are concerned, the figures being $21,249,840 for 10,582 operations this year against $32,911,660 for 13,629 operations in 1907, showing a deficit at this time of over $11,500,000 in cost. It is not expected that this shortage can be made up during the remainder of the year, but there is undoubtedly a better feeling prevailing in the building trades, and a steady growth in the volume of new work is expected.

Considerable activity developed during the past month in dwelling houses, which class of work has been steadily falling off for some months past. Two-story dwelling houses again went over the million dollar mark, 529 operations being started at an estimated cost of $1,097,960, a gain of over $250,000 over that of the previous month. Three-story dwelling houses about held their own, while considerable work was done in apartment houses, and plans are now in course of preparation for several more of the latter. Manufacturing plants, workshops and warehouses have not been very important factors in the building trades recently, the general condition of business having a tendency to curtail work in that direction.

Generally speaking, the tone of the trade is stronger, labor is better employed, although there is still a large force of idle mechanics. Builders' supplies and materials are in good supply, and it is believed that the month of October will show a further gain in the right direction.

Salt Lake City, Utah.

There is a fair amount of building in progress throughout the city, including a number of rather pretentious structures. Among these may be mentioned an office building to cost $150,000, a hotel, involving an estimated outlay of $75,000, and a schoolhouse to cost a similar amount. There is also under way a depot for the Oregon Short Line Railway Company, which will probably cost in the neighborhood of $250,000. Prices of building material and of labor are considerably under the high point of last year, and this has resulted in a considerable increase in building activity. Some porton of the increase in building this year in the face of the depression all over the country is due to the great influx of labor from other Western cities not enjoying the prosperity of Salt Lake City.

The report of Inspector of Buildings A. B. Hirth for September shows 117 permits to have been issued, which number was within 23 of the record, and covering operations estimated to cost $317,015. Of this total $260,550 were for brick buildings, $41,275 for frame and $15,190 for alterations and additions.

The quarter ending September 30 was very satisfactory in many respects when compared with the corresponding period last year. The number of permits issued during July, August and September, 1908, was 330, and the estimated cost of the building improvements $1,140,000. The latter figure compares with $519,000 for the third quarter of 1907.

San Francisco, Cal.

During the past few weeks building operations in San Francisco have shown a decided improvement, though builders did not realize until figures for September were available just how large the improvement was. These figures, however, show that for the past month the total building permits had increased from $2,450,000 in August to $3,799,543 for September.

The large increase is due directly to the decision of the larger savings banks of the city to resume the lending of money on real estate for building purposes, this having been practically suspended since the panic of last fall. Loans for building purposes are now running above $500,000 per week. With the present improvement the building activity for this year has passed that of last year for the same season, though the year as a whole still falls some $17,000,000 behind the same nine months of the previous year.

The character of the work at present undertaken differs considerably from the prevailing type of a year ago. Now the bulk of the work consists of frame flats, frame dwellings and the smaller class of frame hotels. The brick and steel construction prevails only within the fire limits, and here the buildings average much lower than in the first two years after the big fire. For the first time since the disaster the construction of private dwellings is becoming an important feature of the situation.

The fact that lumber has gone down in price more in proportion than other building materials, and the further fact that carpenters' wages, while nominally maintained at the old standard, are actually rebated to such an extent that they are much lower than a few months ago, have led to a tendency toward frame construction, that is causing much dissatisfaction with the present fire limits of the city as established just after the fire. At the time the new building law was adopted the feeling was to avoid a recurrence of the disaster, and the fire limits were greatly extended. Now property holders on the hill sections north of Market street claim that their property is not fitted for business purposes; that the individual lots are too small to justify the construction of brick buildings, and that the building law in effect prevents them from building at all. The trouble is that the city charter provides that when once property has been placed in the fire limits it shall not thereafter be taken out. It is now proposed to get around this provision by creating a new class of buildings, which, though in reality frame structures, may be erected in certain parts of the fire limits. The Board of Supervisors is planning to appoint a committee to revise the building laws with the idea of remedying this and other difficulties that have arisen.

Though the past month was not notable for the expensive class of buildings planned or begun, there were a number of structures started or for which permits were secured, ranging in the neighborhood of $100,000 each. Among these were: The four-story brick, steel and stone University Club building, to be built at California and Powell streets at a cost of $100,000; the Gump Building, on Post street, near Stockton, to cost about $70,000; the four-story brick Pacific Realty Building, to cost $78,000; the five-story brick and steel Crocker Estate Building, on Post, near Kearny, to cost $85,000; the four-story stone Youths' Directors' Building, on Church street, to cost $100,000, and several others. A considerable amount of municipal construction work is also under way, and several large buildings on which work was suspended on account of the financial stringency nearly a year ago have begun to move forward once more.

Seattle, Wash.

One of the notable features of the present building situation is the large percentage of small residence work, the plans now being filed showing great activity in this line, although a decided improvement is to be noted in connection with buildings intended for business purposes, there being nearly $1,000,000 worth of work now in the office of the Superintendent of Buildings, pending the issuance of permits. According to Superintendent Francis W. Grant, the value of the permits issued in September for frame dwellings aggregated a value of $825,343. The total number of permits issued during the month was 1498 involving an estimated outlay of $1,104,631, as compared with 1244 permits calling for an outlay of $1,206,874 in September last year. These figures show that while the valuation was less last month the number of permits issued was considerably in excess of September a year ago.

For the months of July, August and September of the current year 3891 permits were issued by the Department calling for an estimated outlay of $3,930,499. These figures compare with 3314 permits for building improvements estimated to cost $3,608,118 in the third quarter of last year.

Prices of building materials are very much lower than last year, but at the present time they show no decided tendency either way. The prospects of building during the remainder of the year are exceedingly promising, all architects reporting a large amount of work on hand.

St. Louis, Mo.

Prices of building materials show a decline of about 10 per cent. from a year ago, but the lower range of figures seems to have no appreciable effect on the volume of building operations. The work under way and in contemplation consists, for the most part, of dwellings of various kinds. The amount of work in progress is not quite up to what it was a year ago at this time, although it is a trifle better than in August.

According to Commissioner of Public Buildings James A. Smith, permits were issued in September calling for an estimated outlay of $1,483,016, while in September last year the value was $1,966,956. In July of the present year the value of the improvements reached a total of $2,781,528, and for the third quarter of the current year the total is $5,680,-228. The corresponding three months of 1907 showed a total valuation of buildings for which permits were issued of $6,596,326.

During the third quarter of this year the only notable permit issued was that for the La Salle Building, at Broadway and Olive streets, to be 13 stories high, and estimated to cost $200,000.

Supplementing what appeared in our last issue relative to the Building Industries Association, it may be stated that the organization is now installed in its own quarters in the Locust street wing on the seventh floor of the Century Building, where it has 6000 sq. ft. of floor space, with the option of 4000 ft. additional. The west end of the Locust street wing lighted by large windows on three sides affords ample light for the space to be occupied for exhibition purposes. It is divided into 53 spaces for exhibits or desk room, the idea being to give exhibitors the preference and then sublet any remaining spaces to those who desire desk room.

The constitution which has been adopted was carefully framed by men whose sole interest was in seeing that every element of the building industry was adequately protected. The experience of the successful associations of the United States was drawn upon in the formation of the constitution with the result that the best features of many are now embodied in it. It was to this end that the membership of the association was divided into groups, each group to be represented on the Board of Directors.

The various committees already appointed include the following:

Committee on Acquaintance and New Members.—S. M. Lederer, chairman; R. M. Gillespie, E. F. Lasar, W. M. Sutherland, F. W. Choisel, Fred B. Adam, T. K. Peters, E. J. Hanley, D. H. Kremer, John M. Powers, C. W. S. Cobb, Jerome F. P. Casey, George A. Riddle, John M. Sellers, C. A. Sincair, Robert B. McConnell, Leo. G. Hadley, Alfred M. Lane, J. J. McClymont, Patrick Rowan, Harry S. Wells, Samuel C. McCormack, John A. Lynch, J. G. Hewitt, H. G. Rolfes, Ralph Simpkins, Morris Skrainka and James Gordon.

Committee on By-Laws.—James W. Black, chairman: James L. Westlake, Henry W. Kiel, Henry Ratermann, Fred Boeke, Henry F. Gruetzmacher, Sr., and F. E. Newbery.

Committee on Architects' Plans and Contracts.—C. L. Gray, chairman; O. G. Selden, H. W. Lohmann and James H. Bright (to be enlarged).

Committee on Membership.—William R. Bright, chairman; Henry W. Kiel and Fred B. Adam.

Committee on Rooms.—F. W. Choisel, chairman; Fred B. Adam and E. F. Lasar.

Committee on Incorporation.—W. H. Swift, chairman; F. W. Choisel and E. J. Hanley.

Committee on Finance.—F. W. Choisel, chairman: O. G. Selden and Hugo F. Urbauer.

Committee on Entertainment.—E. F. Lasar, chairman; Harry W. O'Connell and Joseph F. Tumalty.

There are, however, several committees yet to be named, including those on Legislation, Arbitration, Labor, Public Buildings and Permanent Exhibit, the latter embracing the present members of the Committee on Rooms.

Tacoma, Wash.

While the volume of building in the city in September showed a heavy shrinkage from the total of August, yet it was in considerably in excess of what was being done in the same month a year ago. The work has been largely augmented by business blocks, apartments and hotels, and activity has been stimulated somewhat by the low prices of materials and labor, although materials just at the moment show a slight increase in cost.

According to the figures of Building Inspector T. L. Hebblethwaite, the value of the improvements for which permits were issued in September was $528,393, these figures comparing with $754,754 in August and with $300,455 in September last year. For the three months constituting the third quarter of the current year the value of the building improvements was $1,634,208, while in the same quarter last year their value was $1,222,648. In no corresponding three months in the history of the city was the value of the building improvements equal to those of the third quarter of the current year.

Toledo, Ohio.

The greater portion of the building which has been done in the past three months has been confined to dwellings of a rather inexpensive character—cottages for the most part—although some work was done in the business section. The number of operations for the third quarter of the year was practically the same as in the similar period of 1907, but the estimated value of current improvements is something like $100,000 less. In September there were 105 permits issued by the Department of Building Inspection, of which John W. Lee is the head, covering building improvements valued at $204,955, while in September last year 108 permits were taken out for buildings valued at $325,135.

For the third quarter of the current year 328 permits were issued, calling for an expenditure of $723,721, these figures comparing with 337 permits in the third quarter of last year, covering improvements valued at $826,560.

Washington, D. C.

Activity in building circles is gradually increasing and the amount of work projected in September showed a gratifying gain over the preceding month. The value of the improvements for which permits were issued from the office of Inspector of Buildings Snowden Ashford in September was $1,300,122, an increase over the previous month of $154,186. The 421 building permits issued covered 47 brick dwellings costing $356,800, also 11 apartment houses involving an outlay of $220,500, and one office building to cost $266,000. There was a $200,000 school house and a $15,000 hotel.

The report of building operations in the District of Columbia for the fiscal year ending June 30 was made public September 26 by Inspector Ashford. During this period permits were taken out for the erection of 8532 buildings estimated to cost $8,711,577. In the preceding fiscal year 9862 permits were issued calling for an estimated outlay of $12,714,472. In neither case do the figures include Government work.

Licensing of architects and builders is one of the important recommendations made by the Inspector, he suggesting that a Board or Committee be appointed to pass on the qualification of those claiming to be architects or builders, and limiting the scope of their operations to their established reputations or evident qualifications. The inspector advises the Commissioners against the practice that has sprung up in recent years in some of the District Departments of making their own estimates for the cost of buildings to be erected. He maintains that the estimate should be made and then turned over to the Building Department. The inspector would also change the law relating to the hight of buildings, recommending that Congress be petitioned to allow a hight of 93 ft. for fireproof buildings on residence streets or reduce the hight of combustible buildings to 50 ft. At present the law allows a hight of 80 ft. for fireproof buildings and a hight of 60 ft. for cumbustible buildings.

Notes.

The value of the building permits issued for the month of September in Sacramento, Cal., reached a total of $163,-378, as against $114,953 in September of last year. The value of permits for the nine months of the current year is $1,231,507, while for the entire 12 months of last year the value of the permits was $1,006,606.

September was not a particularly active month in the building line in Erie, Pa., as the total invested in new buildings and repairs amounted to only $87,910, as against $182,-336 for the same month of 1907. More money was invested in additions and repairs than a year ago, but present indications point to a busy October. Two business blocks will be erected, the cost of which will approximate $75,000, and several other improvements are under advisement.

Building Inspector George H. Stevenson reports that for the month of September there were issued in Trenton, N. J., 64 permits, calling for 98 new structures, valued at $129,838. Of the new buildings for which permits were issued 55 were dwellings.

Laying Out Window or Door Frame for Circular Tower.

A PIECE of work which often embodies some rather interesting features is the laying out of a window frame for a circular tower, this involving, as it does, a circular arch in a circular wall, or, as it is commonly designated, "circle on circle." While the method has been explained at intervals in the past, a correspondent in northern New York forwards his plan of doing the work, which may not be without interest to many of the younger element in the trade. He says:

Referring to the accompanying diagrams, Fig. 1 represents the ground plan and O the center from which the circular wall is struck. Draw the perpendicular B O and on each side of it set off half the width of the window. Then draw from O through J and L as shown. Set off on the right and left the width and thickness of the jambs. Draw L-H and make Y K parallel with it. through 4 at the point T. Now draw C B square with C O and join T P. We then have the angle C P T, a part of which when bent coincides with the circular wall.

Returning now to the center V, draw from it a curve through B′, and complete the mold as shown. In order to produce the mold for the circular head we find the inside mold by drawing from H square with H L of Fig. 1 the line H J. Let H J equal J H on the right and from J parallel with H L draw the line J-S. Now with J as center and H L as a radius, describe the quarter circle S T and set off the width to equal the thickness of the jambs. After this has been done, draw the inside curve. Here we have 3 or 4 in. of straight wood on the mold below the spring line.

To obtain the outside mold, take K as a center and set off the width as shown. Here we have the same

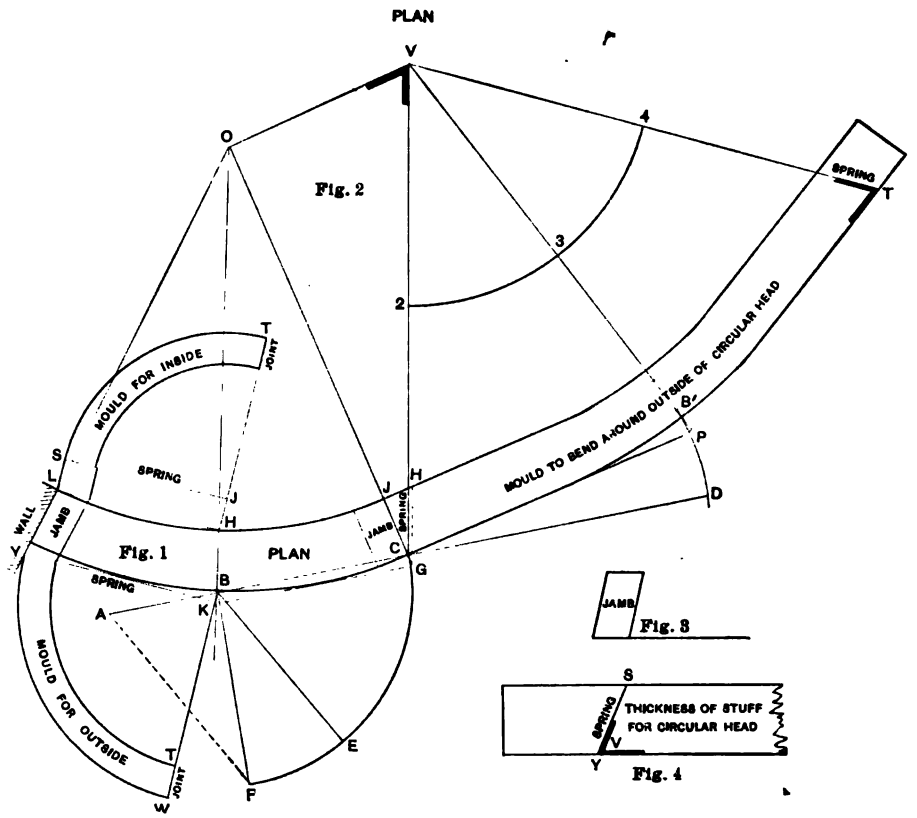


Fig. 1.—Plan with Various Molds.
Fig. 2.—Development of the Mold to Bend Around the Outside of the Circular Head.

Fig. 3.—Application of Straight Part of Bevel Shown at the Left in Fig. 1.
Fig. 4.—Application of Bevel V in Fig. 2.

Laying Out Window or Door Frame, for Circular Tower.

Then draw an indefinite line through B C to the right and left, and from B as a center with B C as a radius describe a quarter circle as C F. With the same radius and C as center intersect at E. Join E B and from B draw square with B C the line B F. Now from F draw parallel with F B the line A F. Then A C is half the stretchout of the semi-circular head, its face forming a curve which agrees wih that of the circular wall. This curve is produced by having a mold or thin pattern, as shown in Fig. 2, which is obtained from O square with O G. Let O V equal B C of the plan. Join V C, and with C as center and A on the left as radius, describe the segment of the circle indicated from D on the right. This done, set a trammel at O C for radius, and from V as center intersect the arc from D at B′.

In order to construct a door or window frame with semicircular head standing in a circular wall with jambs radiating to the center and the crown of arch level, proceed as follows:

From V extend the line V B′ to P. Again from V with any radius describe an arc cutting the line V B at the point 3. Make 3 4 equal to 2 3. Set the trammel to the radius V C and with V as center intersect the line drawn length of straight on this mold below the spring as on that for the inside.

We are now ready to apply the outside mold to the plank, which mark and cut square through leaving the stuff full. Work the straight part of the bevel shown on the left of Fig. 1 and its application in Fig. 3. Next take the bevel V in the angle above, apply it as shown in Fig. 4 and work Y S. The piece being thus prepared, let its square ends stand on the jamb to the left of Fig. 1, also let the lower end of both molds stand on L-H and Y K. The mold being in this position shows the spring line made by the bevel B. Then W T, shown on the center joint, are opposite and level. Now mark the stuff and work it according to the direction given by the mold. Both pieces parallel in this manner are connected with a couple of dowels and hand rail screws.

The semicircle being formed, take the bending mold on the right and apply it, letting the spring lines and those made by the bevel V agree. Mark as the mold directs, which will give a line by which to work the curved surface on the face of the head, so that when in position it and the circular wall will range. Here it may be thought that two bending molds are necessary, one for the inside and one for the outside, in order to give a still better guide for marking a curved space on the head. This, however, would necessitate nearly double the amount of drawing to what has already been given, and the object can be obtained equally as well with one bending mold.

We will next consider the method of producing the veneer for a circular head of frame which stands in a circular wall the stiles radiating to a center. The plan shows that the cylinder to be used for bending is cone shaped. Here it seems that the staves or keys of veneer must be tapered and not parallel, and the veneer may be prepared for either staves or keys. If the latter, the boards should be grooved previous to forming their curved edges.

The method of finding the stretchout and curves is so obvious that it can be explained in few words. The plan, Fig. 6, shows that the chord line is drawn from outside the pulley stile cutting the perpendicular line B-T

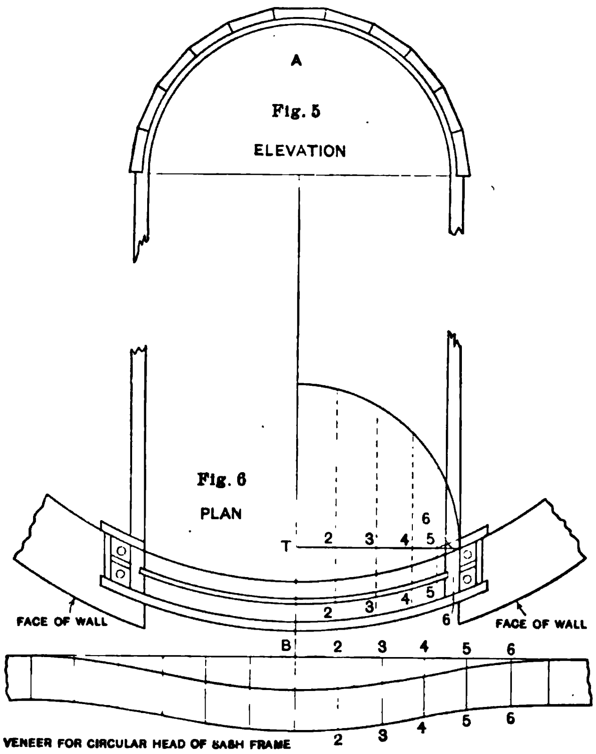


Fig. 5.—Elevation of Circular Head.
Fig. 6.—Finding Stretchout and Curves for Producing the Veneer for the Circular Head.

Laying Out Window or Door Frame for Circular Tower

forming a right angle and giving T as center and 6 as radius with which to describe the quarter circle shown. This quarter circle may be divided into any number of equal parts, as for example 6. From each division drop a perpendicular cutting through the chord line and plan, thus establishing the points 2 2, 3 3, 4 4, 5 5, &c. Joint the edge of the board for the veneer. Square with the plan extend the line T B indefinitely, and on each side of it set off 6 parts equal to those in the quarter circle. Transfer the distances between the chord and the outer circle of the plan to the square line on each side of B as shown by 2 2, 3 3, 4 4, 5 5, &c., and through the points thus obtained trace the inside and outside curves by applying a thin flexible lath. Work true to the line in dressing. This being done the veneer is ready for bending on the cylinder prepared for it.

The reader will understand that the pulley stiles and circular heads may be made from one piece of board, thereby avoiding a joint which is desirable whenever it can be done as it is in this case by having the cylinder upright when bending the veneer. See to it that the blocking or keys are neatly fitted and glued and allowed to stand until dry. Have a brace screwed on the back edge of the pulley stile and in like manner one at the spring. Square the work by rod, and when correct screw on two diagonal braces. Everything now being secure, cut the stiles to their proper length and connect them with the sill.

Apprentices in the Building Trades.

At the closing session of the recent convention of the United Brotherhood of Carpenters and Joiners of America, held in Salt Lake City, the report of the special committee having in charge the consideration of the apprenticeship system was adopted. The plan outlined by the committee was substantially as follows:

Contractors who are doing the work requiring the services of carpenters will be permitted to hire a boy who wishes to become a carpenter, and set him to work at the rudiments of the trade and with the regular journeymen for a period of two weeks. If at the end of that time the young fellow, who must be more than 17 years of age, shows any sort of capability or aptitude for the trade he will be indentured for a period of four years and started on the way to be a journeyman carpenter.

The young apprentice will be paid a salary established by the rules of the brotherhood, the amount being not less than $320 for the first year and being increased $100 each year of the apprenticeship, except the last year, when he will be paid $650. The boy will be permitted to work for only nine months of the year, and will be laid off for three months, during January, February and March, as these months comprise the dull season of the year. It is also provided that the boy cannot work longer than nine months at his new trade, after which his union card will be taken from him, and at the end of three months the lad must show a certificate from some first-class training school, where he has been doing work for at least three months, before the card will be restored to him, and he is given permission to continue his studies in a practical way.

The object is to compel the apprentice to devote a proper amount of his time to actual study in order to fit himself for the business of life and to become in fact a first-class carpenter. At the end of the four years of his apprenticeship the lad will be expected to be a thorough journeyman carpenter and entitled to receive the standard wage established by the brotherhood.

If, however, the employer insists that the new man is not capable of earning the regular wage, the young man will be permitted to work for another employer in order to show what he can do, and if at the end of a certain length of time, the limit to be set by a board appointed by the employers and carpenters, it is then decided that the young man has not learned his trade, and in the judgment of the board the fault is due to the first employer, the difference in the wage paid by the second employer and the standard wage for the period that the boy worked for the latter will be paid by the first employer. The object of this is purely protectionary, it is said, so that the employers of carpenter's apprentices may give them every opportunity to learn the trade.

Circular Rooms Bad for the Mind.

That circular rooms are distinctly bad for the mind is argued by the Chicago *Journal*. It says that experts in mental diseases who have made a study of conditions at the Minot Ledge Light attribute the unusual prevalence of insanity among the keepers of this lighthouse to its peculiar form of structure. There is no point, they say, on which the eye may rest, so it travels round and round in a maddening whirl. They, therefore, suggest that some means be devised for filling the curves and producing corners and angles. In support of their theory they cite instances of men who have lost their mental balance during long confinement in circular prisons, but have quickly regained it on being transferred to an ordinary room of corners and angles. Baron Trenck spent much of his time in prison making marks and corners to break the circularity of his surroundings and keep his reason from slipping away on the whirling and encircling walls. Casanova, an Italian engineer, who was imprisoned in a round tower, gives much the same testimony.

A Septic Tank Sewage System.

At intervals in the recent past there have appeared in these columns more or less reference to the disposal of sewage by means of septic tanks, the article in the Correspondence columns in the October number being the latest contribution to the subject. This coming to the notice of R. A. Griffin, Menlo, Iowa, has resulted in his sending us a clipping descriptive of a septic tank sewage system which is being used with great success in his section of the country. The system employed is said to have been of accidental discovery, and to have first been put in successful practice at the Western Hospital for the Insane at Watertown, Ill. The clipping enclosed is in the nature of an article contributed by L. B. Kuhn to a recent issue of *The Furrow*, and from it we present the following particulars with the accompanying illustration:

The system consists of two oblong tanks of 70,000 gallons capacity each, placed side by side, one tank emptying into the other through a pipe. For all practical purposes, however, one tank with a weir box at one end is exactly as good as two tanks, as it has been found that the water as it emerges from the first tank is just as pure as after it has passed through the second tank. The object of this weir box is to check the overflow and prevent any agitation of the sewage in the tank.

The tanks in this system are located about a quarter of a mile from the buildings. They might be located 40 ft. or four miles away, according to convenience, as the result would be the same.

The sewage tank, as shown in the illustration, consists of a brick box with 8-in. walls and floor, lined within and without with cement. Concrete would make a better tank. The roof is made airtight with a heavy coating of pitch, and all crevices are tightly sealed with the same material. The sewer inlet is about 2 ft. below the surface of the sewage in the tank. A short distance from the opposite end of the tank a cross wall is built, having a narrow opening extending across the tank on a level with the inlet. This opening has little if any greater capacity than the inlet. Such an opening causes less current in discharging than would a circular opening.

In the end wall is a row of curved tile so placed that the outlets are 2 ft. above the sewer inlet and the opening in the cross wall. The cross wall forms a weir, or dam, which retards the outflow from the main tank, and of course there can be no discharge until the contents of the tank and weir box reach the level of the curved tile outlets. Thus both inlet and outlet are submerged about 2 ft. below the surface of the sewage in the tank.

The filter box is filled with sand and gravel, and has an outlet at the bottom through which the water finally discharges.

The operation of this system is exceedingly simple. The sewage entering the tank remains until it fills the tank and the weir box to a level with the overflow from the curved tile outlets. In 24 hours or a little over, after entering the tank, a scum will have formed on the surface, 1 in. or more in thickness, consisting of a solid mass of filth bacteria, which prey upon the poisonous matter and the solids contained in the sewage, constantly fighting among themselves and destroying each other like the Kilkenny cats, which devoured each other until nothing was left but the tail, the tail in this case being represented by the 2 per cent. of poisonous matter left in the water as it escapes, and which is at once eliminated upon exposure to the atmosphere.

Light and air are fatal to these bacteria, hence the necessity of keeping them in a dark, air tight place that they may accomplish their work. For this reason the tank must be air tight. Again, to do their work effectively they must be left in perfect quiet, hence the inlet and outlet are submerged below the surface in order that from inflow and outflow as little current as possible may be caused, and this quiet is further assured by means of the weir box.

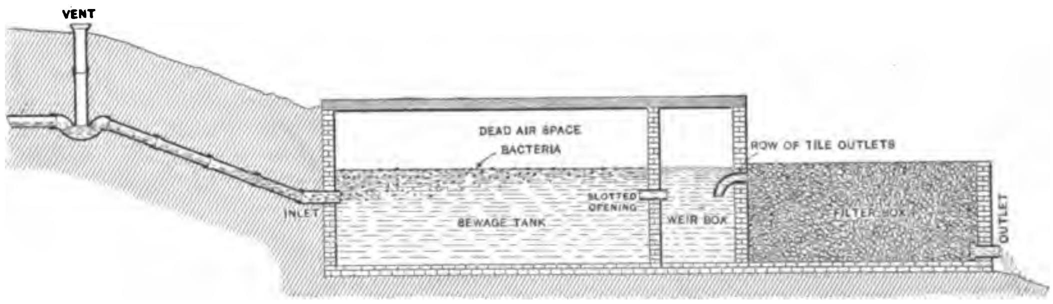
Upon emerging from the tiles the water is clear, and by chemical analysis is found to contain but 2 per cent. of bacteria, that would be in the slightest degree injurious to the human system. This water is allowed to filter through the sand and gravel, its exposure in this manner to the air destroying all remaining bacteria.

A system of this kind will not freeze in winter, as the gases arising from the sewage in the tank generate enough heat to counteract the cold and prevent freezing. The water as it emerges will be found much warmer than the air in cold weather.

In cases where the sewage discharge is scanty and intermittent there might be danger of the water freezing in the filter box during a long cold spell, and then it would be advisable to erect a small tight building, well protected from frost, over the whole outfit, including both tank and filter, but when the sewer is in constant use this would be unnecessary.

The secret, if secret it may be called, of the whole system is the dark air tight tank, the submerged inlet and submerged outlet, and that is all there is to it. The bacteria will do their work if let alone. If stirred up they refuse to perform as desired. When properly working the tank might be opened, the bottom scraped and not a handful of solid matter could be found.

The tank should be large enough to hold all the sewage that is ever likely to run into it within a period of 24 to 36 hours. For a private residence this would rarely need to be larger than 3 ft. wide, 6 ft. deep and 8 to 10 ft. long.



A Septic Tank Sewage System.—Showing Section of Tank and Filter Box.

Ventilation of Schoolhouses.

Among the interesting papers read before the Congress of the Royal Sanitary Institute, at Cardiff, Wales, in July last, was one by R. G. Kirkby, an associate member of the Royal Institute of British Architects, on the "Ventilation of Schools." Although dealing with the subject from an English standpoint, the suggestions presented are of such obvious interest to architects generally that we present the following extracts:

From my observations and the recent tests made by experts to ascertain the state of the air in the classrooms I am led to believe that many, if not most, of our modern schools are inefficiently ventilated, and a radical change will have to be made to make them efficient.

Dr. George Reid, county medical officer of health, Staffordshire, recently made some tests to ascertain the quality of air in schools built on the central hall type and those of the pavilion system now being erected in Staffordshire and Derbyshire. The tests showed the air to be very much purer in the pavilion schools than those of the central hall type, and even better than the plenum ventilated schools of that district.

The standard of purity in the central hall schools was very far short of that generally recognized. From the complaints made in the central hall schools it would appear that from a ventilation point of view it is not the most serviceable building, and even from an administration point of view many head teachers have led me to believe that little importance can be placed on the idea of having the head teacher's desk in sight of all the classrooms.

It is to be regretted that this type of building has been so extensively erected before its efficiency has been proved. No doubt the rules of the Board of Education in recommending it in their "Principles to be observed in planning and putting up new buildings," has led many architects and others to adopt it in order to get their plans approved, there being no other course apparently open to them. The arbitrary manner in which the Board of Education has dealt with those who suggested improvements in the planning and ventilation of schools is much to be regretted, and the opposition which the pavilion system met with from this body does not reflect much credit upon it.

By ventilation we do not mean putting into a building certain appliances, either mechanical or otherwise, but by passing through a building sufficient fresh air to maintain it in a state of purity to the general comfort of the occupants. The different systems of ventilating schools may be described as follows:

Natural Systems.

(*a*) By means of fresh air inlets in walls, and in ventilating radiators and stoves fitted with ventilation flaps. Foul air outlet openings in ceilings connected by means of tubes to so-called roof extractors either on the ridge or concealed. This system, which appears to be largely adopted, will be known to most of us by its failures and want of system, and thereby want of ventilation.

(*b*) The open air system, such as may be found in Germany and at "The Cloisters," Letchworth, where really no ventilation in the ordinary sense takes place. While this building has many advantages from a hygienic point of view, yet I do not think the idea could be adopted for the average school of, say, 300 to 500 scholars without enormous cost, but at the same time its possibilities should not be overlooked. The result of this scheme is that sufficiently warm and completely fresh air is supplied to each student without the danger of it becoming vitiated.

(*c*) Another system, somewhat on the lines of the first one as regards inlets, and having the foul air outlets in the ceilings connected to a roof turret by ducts formed of wood framing and plaster. The turret is fitted with an inner framing, the openings of which are covered with silk cloth flaps, which remain closed on the side of the wind and easily open with the current of air passing through the ducts. An outer framing is fitted in the usual way with louvred openings to protect the inner from the weather. The system has proved successful but is capable of improvement.

(*d*) In some cases an iron flue from the heating chamber is placed in an upcast shaft, which draws the vitiated air from the classroom by means of ducts with outlets at ceiling and floor levels. The fresh air is warmed by being passed over the heating apparatus, and is delivered at about 8 ft. from the floor level. This system is more elaborate and pretentious than most natural systems, but has met with some measure of success.

(*e*) In the counties of Staffordshire and Derbyshire a new type of school on the pavilion system has been built to insure the cross ventilation into the open air of all classrooms, which appears to be the most natural and successful way of dealing with this question. The tests in these schools, taken by Dr. Reid, show the air inside to be practically as pure as that outside. This system of ventilation is by means of hoppers and sash windows on both sides of the room. No appliances of any kind are used, but ventilating radiators are introduced on both sides of the rooms. On the coldest days in winter some of the hoppers are kept open with no discomfort to the scholars. The fresh air inlets provide six or eight times the area usually required by the Board of Education. It has been necessary to slightly increase the heating surface on account of the larger quantity of fresh air admitted. In these schools a system of thorough cross ventilation is obtained, and so a natural system of ventilation exists. All sorts of difficulties were raised by the Board of Education when the plans for these schools were submitted, and it was only after a deputation had waited on the board that permission was obtained to put up the buildings, which have undoubtedly proved far in advance of those built on the principles recommended by the board. Although several of His Majesty's inspectors have visited these schools privately, yet, I understand, no official approval of them has been given.

Mechanical Systems.

A number of schools have been ventilated on various mechanical systems, but I think the initial cost and cost of upkeep is too prohibitive for schools excepting in special cases, and could only be used with advantage in large towns where the air is laden with dust and dirt. On this account, and owing to the limited space, I have not dealt with the mechanical systems.

There may be some excuse for keeping windows closed where the air is laden with soot and dust and the air requires moistening, but even then buildings should have their windows made to open. It does not seem natural to teach children to keep windows closed, as the ideas learned at school are carried into the home, and they should rather be taught to keep windows open and obtain as much fresh air as possible.

Among the buildings of this class which I visited was one recently erected in London for higher educational purposes. Outlets were placed near the ceilings, connected by ducts to a large extracting fan on the roof; and although the fan could be heard working in the rooms below, yet no upward movement of air was noticed, although I tested it in several ways and in a number of rooms. I entered the rooms immediately after an examination had been held, and found it quite a relief to pass out into the open air once more.

The question often arises as to whether schools can be properly ventilated so as to maintain a recognized standard of purity without incurring great expense. The Staffordshire and Denbighshire show us that this can be done, for the amount of added impurity in the schools only averaged 0.23 CO_2 per 1000 cu. ft.

My object is not to attempt to calculate the velocity of air passing through certain sized openings, or to say whether the CO_2 to be found in classrooms is greater at the ceiling or floor level. While I have gathered statistics on these and other interesting points, I have purposely omitted them, and hope rather to show that there is something radically wrong with the ventilation of many of our new schools, and to appeal for an inquiry to ascertain the best means of making them efficient.

Novel Method of Concrete Construction.

Since the use of concrete upon such a liberal scale in connection with building construction, various have been the methods evolved of executing work in which it constituted the dominating material. One of the latest developments and probably the most sensational since the Edison idea is the scheme of molding the walls of a building flat on the ground one at a time and then tilting them into position and tying them at the corners. A practical demonstration of the theory was recently undertaken at Camp Perry, Ohio, where the State constructed a two-story mess hall for the State troops which practice on the rifle range each year.

The theory of the inventor of the idea is that a more artistic finish can be given to the wall if it is built flat on the ground face up, as it is more accessible for treatment, and again, the saving in time and labor is a factor, as the material has to be raised only a few feet. Another point emphasized is that all false work is done away with and the wall is in reality cast all at once.

The principal feature of the equipment used at Camp Perry was a series of specially constructed jacks for raising the completed wall. In starting the building, says a recent issue of *Concrete*, a platform of 2-in. lumber was laid across steel beams about 4 ft. apart, these beams being supported by jacks. The platform was not more than 3 ft. from the ground and lay inside the proposed building. Four inch boards were set up on the four sides to complete the form, and on the platform were placed the window frames and the reinforced concrete cornice which was cast in 6 ft. sections 3 ft. wide. In this particular instance special ornamental window caps were required, and these were cast separately and placed in their proper position on the platform. Concrete consisting of one part cement, one and one-half to two parts sand and four parts crushed stone, was then poured on to the platform in a very wet condition. After about 2 in. of concrete had been laid, ¼-in. twisted steel rods were placed in both directions 6 in. apart and the balance of the concrete poured on. The wall was made 4 in. thick and very little tamping was necessary. For a facing a rich cement mixture of one part Sandusky white Portland cement to one and a half parts white sand was placed on last.

Forty-eight hours after pouring a 5 hp. engine was connected with the shaft under the platform operating the jack screws and slowly the wall was tilted into position. When 4 hr. later the slow moving screws had raised the wall to a vertical position, every line was found to be plumb, the platform supports having been so accurately placed that the foot of the wall swung to its position on the foundation at precisely the right line. Five or six wood props tacked to the window frames held the wall in position and the platform was taken away from the rear side and swung about for the construction of the next wall at right angles to the first. This operation was repeated until all the walls were up.

The reinforcing rods were allowed to protrude at the edges of the wall, and when all the walls were in position these rods interlocked at the corners of the structure and ere twisted together. An 8-in. board was then placed inside the corner and concrete was poured in, making on the outside corner a neat joint and binding firmly together the two walls.

The walls of the building are 26 ft. high, 4 ft. thick, and have 10 in. pilasters and 6 in. sills. The columns are 8 x 8 in. in cross section and 10 ft. 8 in. in length, reinforced at the corners with four ¾-in. steel rods. The girders are 8 x 12 in. in cross section, 15 ft. in length and reinforced with 16 ¼-in. twisted rods.

Upon the girders were placed the floor slabs 3 ft. wide and 2½ in. thick. Those of the first floor are reinforced with ¼ in. twisted bars both ways, 6 in. apart, while the second floor slabs have similar reinforcement 4 in. apart.

The slabs were molded on the ground in a way which may be said to be both novel and interesting. On a bed of sand, four pieces of 2 x 3 in. stuff constituted the frame of the form. The pieces or sticks had holes to receive the steel rods that protruded about 6 in. on all sides of the finished slab. The concrete was poured in very wet and tamped but little. The proportions used were the same as used in the walls, but this could be made less rich if the work was not rushed. Ten minutes after the first slab was molded a sheet of heavy paper was spread upon it; a new form was placed on top and a second slab molded on top of the first. If several piles are started it will be readily seen that there need be no loss of time, for as soon as the last slab of the second tier has been completed the workmen can return to the first pile and start a third tier of slabs. When the slabs are completed they are left to cure and it is unnecessary to handle them again until they are placed in the floor.

In placing in the floor the reinforcing bars of the slabs interweave at all sides. A board is placed under each joint and concrete poured in forming a perfect bond. In this, as in all similar cases on the work, the old concrete was thoroughly wet before the cement mortar for the joint was applied. With the joint each slab is 42 in. wide. After the slabs were laid they were wet on top and a top coat of concrete spread over the entire floor, bringing the thickness up to 6 in.

The work at Camp Perry is being done by the R. H. Aiken Engineering Company, and the system of reinforced concrete construction has been patented by Col. Robert H. Aiken of Winthrop Harbor, Ill. The company is also building near the mess hall 800 ft. of 6 in. wall 10 ft. high, to be used for the new rifle butts, and it is being raised in 130 ft. sections.

Duty on Steel Window Frames.

A decision of considerable importance to the building trade of the country was recently handed down in the shape of a customs decision to the effect that steel window frames with sashes and gun metal handles, stays, &c., are dutiable at 45 per cent. as "manufactured articles wholly metal, not specially provided for." The importer E. M. Ackerson, New York City, set up the claim that the merchandise should be admitted as "structural shapes or building forms," and as such were dutiable at the rate of five-tenths of 1 cent per pound. The invoice described the articles as "steel channels of structural shapes and forms, punched and fitted together for use."

The general appraiser in overruling the importer's protest, says that although invoiced and described in the fashion named the exhibits and the testimony offered show that these articles as imported are complete steel window sashes with steel slides fitted with gun metal stays and gun metal handles or hinges all fastened together. In fact, he says it is conceded that these steel window cases have been manufactured, fitted, painted and advanced to that form to fit their special places in the masonry of the Singer Building, and the contention of the importer for a lower rate of duty is overruled.

Meeting of Architectural Institute of Canada.

The first annual meeting of the Architectural Institute of Canada was held in the Cargenie Library Building, Ottawa, the last three days of September. At the sessions no papers were read, as the meeting was confined almost entirely to business matters. There were, however, trips to various points of interest in and about the city, and a banquet was held on the evening of the second day.

The officers elected for the ensuing year were:

President, A. F. Dunlop of Montreal.

Vice-Presidents, Maurice Perrault, Montreal; S. Hooper, Winnipeg; F. S. Baker, Toronto.

Treasurer, J. W. H. Watts, Ottawa.

Secretary, Alcide Chausse, Montreal.

Following the president's address, the secretary read the report of the Council, which was adopted, the report giving a resumé of the events leading to the formation of the Institute. The report of the Publication Committee, which was included in the Council's report, stated that the "Quarterly Bulletin" had been found to be the best means of communication between the members and recommended that its publication be continued.

After the treasurer's report had been received, showing a balance on the right side of the account, the by-laws were ratified clause by clause, after which the Code of Ethics was discussed and adopted.

The members then took up the schedule of usual and proper minimum charges, and after some debate a resolution was adopted to the effect that the Council make the schedule correspond as far as possible with that of the Ontario Association of Architects.

The final session of the meeting was devoted to a consideration of the regulations for architectural competitions, and after some debate they were adopted. The regulations are practically the same as those of the Royal Institute of British Architects and other English Institutes. A provision was added to the draft regulations providing that all competitors should be entitled to receive a copy of the assessor's report upon their drawings.

A system of standard symbols for electric wiring plans providing a code for use in specifications and plans, which has been adopted by the National Electrical Contractors'

Association of the United States and the American Institute of Architects, was then discussed.

A resolution was adopted to the effect "that application be made to the R. I. B. A. looking to affiliation with the Architectural Institute of Canada; also that the Canadian Institute be requested to write formally to the various Canadian Associations looking to affiliation with the Canadian Institute."

A motion was carried electing as Fellows all members of the Institute who have had 10 years' practice and exempting them from the payment of any fees.

It was suggested by Vice-President F. S. Baker of Toronto that the Council be recommended to consider "the selection of one architect each year as a medalist on account of important work done; the establishing of a traveling scholarship and of studentships without prizes; the laying down of a model for study clubs for students throughout the country; the publication of the proceedings of the Institute instead of a bulletin as at present, in a more formal manner, and the issuing of diplomas to indicate the class of each member."

Before adjournment it was decided by a close vote to hold the next meeting of the Institute in the city of Toronto.

Death of James Swan.

James Swan, treasurer of the James Swan Company, manufacturer of fine edge tools for woodworkers, Seymour, Conn., died at his home in that city September 23 from a complication of ailments. He was born December 18, 1831, in Dumfries, Scotland. In 1853 he came to America, locating in what is now Derby, Conn., and shortly after accepted a position with the Farrel Machine Shops in Ansonia, of which he was superintendent from 1858 to 1865. In the latter year he accepted the superintendency of the Auger Bit Shops of the Douglas Mfg. Company in Seymour, and in 1877 purchased the entire plant, turning out chisels, gouges, drawing knives, screw drivers, augers and bits, boring machines, hollow augers, &c. Mr. Swan was president of the company until four years ago, when, on account of advancing age, B. A. Hawley of the Russell & Erwin Mfg. Company became president, Mr. Swan, however, remaining as treasurer and in control of the business.

A Stable of Concrete Construction.

The adaptability of concrete for the construction of attractive structures of various kinds is shown in a stable recently erected for Robert E. Griffith at Haverford, Pa., in accordance with drawings prepared by Architect Randolph Parry of Philadelphia, Pa.

The stable is of a very solid character, comparing from that standpoint very favorably with the best examples of brick and stone. In designing the structure the practical and convenient features were given the first consideration. Artistic effects were a secondary matter, yet the results are entirely pleasing from an architectural standpoint. The same methods of construction here employed could, with equally good results, have been applied to a dwelling.

The building is 26 x 37 ft. on the ground, with a 14-ft. shed, or overhang. The outer and partition walls are of concrete 6 in. thick, the former being 11 ft. 6 in. high. They were all carried up together as a unit, the forms employed consisting of only two boards, inside and out, a method of decidedly quick construction. The foundations are 24 in. deep, consisting of a 12-in. concrete wall carried to ground level.

The concrete employed was one part cement, two and a half parts Jersey gravel and five parts crushed rock, ¾ in. in size. This mixture was employed for the foundation walls and columns.

A box stall, three single stalls, carriage and harness rooms, occupy the entire first floor. Concrete water and mixing troughs and a concrete hay chute are also located on the first floor. The second floor, in addition to ample storage space for hay and feed, contains the groom's room. The entire ground floor, together with that under the shed, are of concrete laid off in 6-in. squares. The concrete stall floors are covered with planks.

By employing the two-board system of form work a saving, estimated at 90 per cent., was made in the matter of lumber. All the lumber so employed was afterward used in the carpenter work, thus preventing all waste. The roof and second floor are constructed of wood. The wall was plastered with a mixture of equal parts of cement and sand, an even surface being insured by working the plaster over with a float.

As completed, this building presents a decidedly attractive appearance, the proportions being pleasing. Its cost was considerably less than if constructed of brick or stone and, in the opinion of the builder, even less than if lumber had been employed.

A New Sliding Rule.

A trigometric slide rule for solving the problems in plain trigonometry has been designed by an electrical engineer in Chicago by the name of M. J. Eichhorn. We understand that it is not intended to take the place of various forms of Manheim rules, which it resembles in all respects except graduations, but because of the latter it is the simplest and quickest means of obtaining the solutions of triangles where greater accuracy than three or four places is not necessary.

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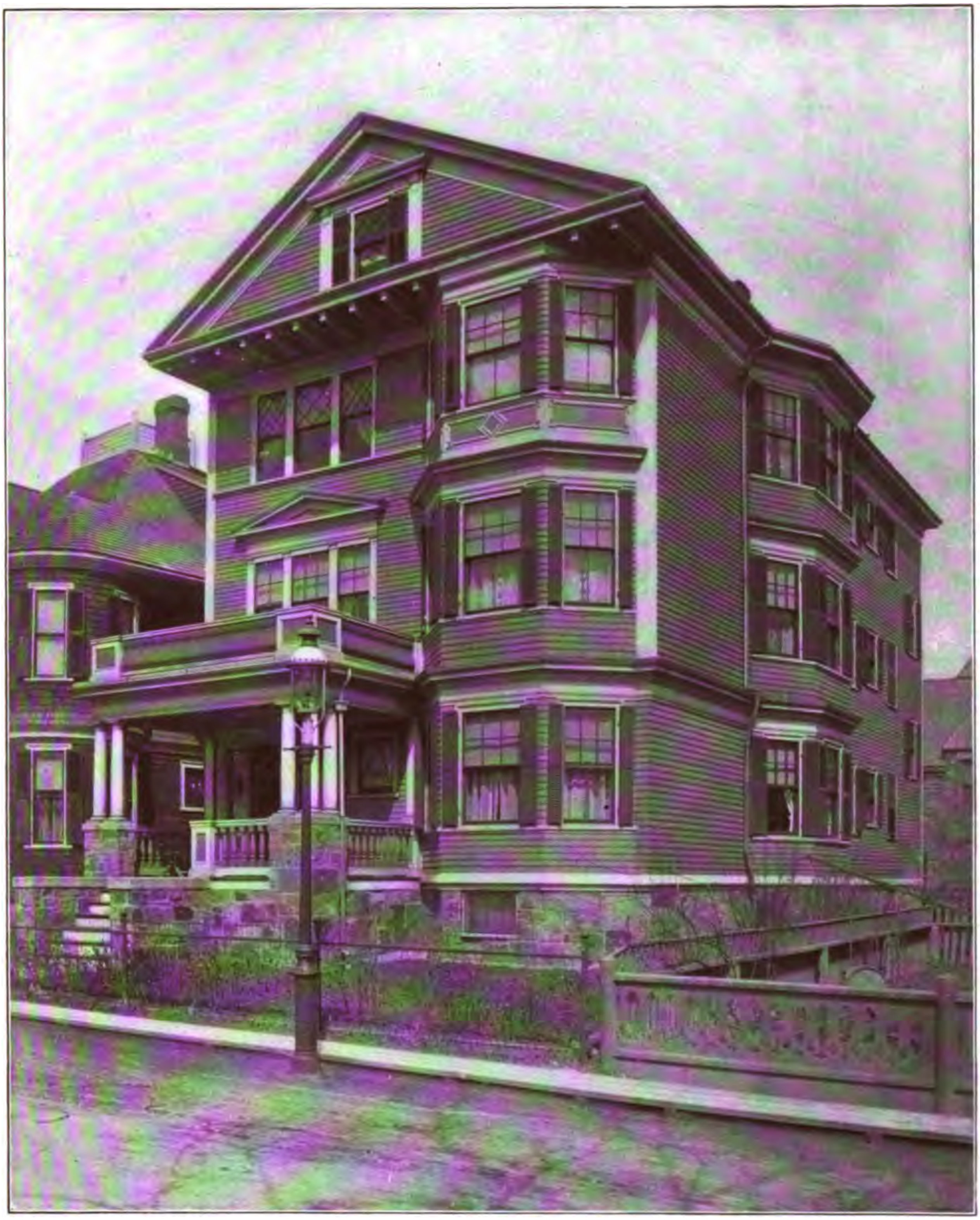


THREE-FAMILY APARTMENT HOUSE ERECTED FOR MR. J. W. WEBB, IN ROXBURY, MASS.

ARTHUR W. JOSLIN, ARCHITECT

Supplement Carpentry and Building, November, 1908

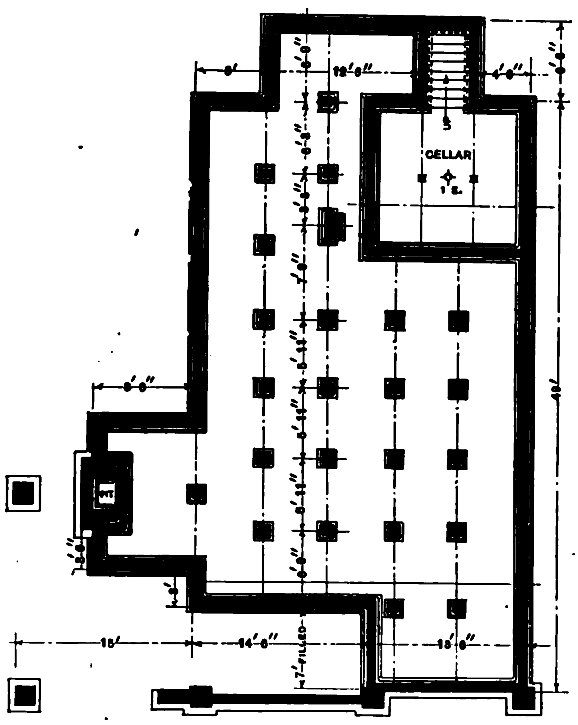
Carpentry and Building

NEW YORK, DECEMBER, 1908.

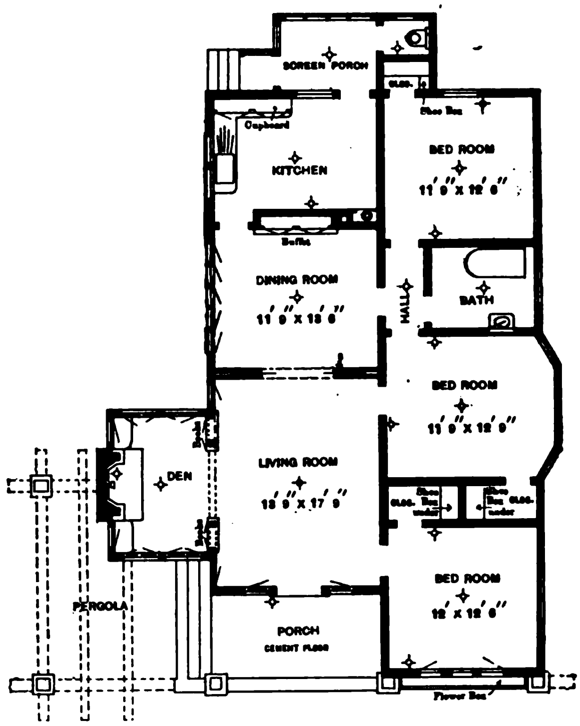
A Bungalow in South Pasadena, Cal.

THE popular idea of cozy homeliness as represented by the cottage type of dwelling at the present day is unquestionably the bungalow of attractive exterior and comparatively inexpensive construction. It is to be found in practically every section of the country, especially on the Pacific slope, where climatic conditions are favorable to this form of habitation. As a general thing the rooms, or at least the greater portion of them, are finish. It will be observed from an inspection of the plan that there are a living room, a den with capacious fireplace, a dining room, a kitchen, three sleeping rooms and a bathroom. Notable features of the exterior treatment are the shingled surfaces, the rough stone under-

Front Elevation and Section.—Scale, ⅛ In. to the Foot.



Foundation.



Main Floor.

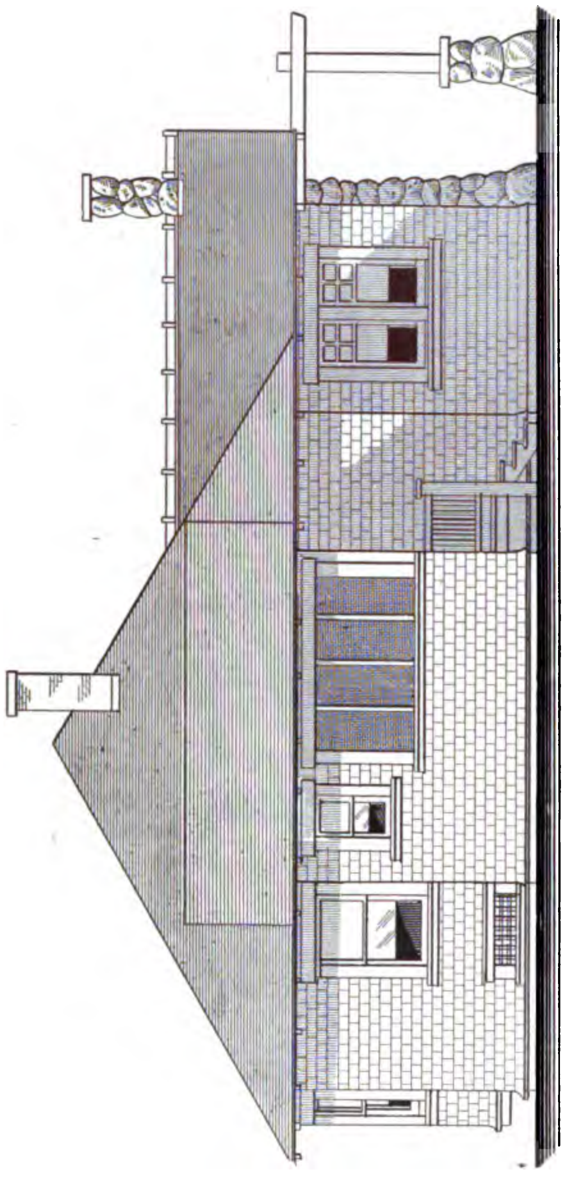
Scale, 1-16 In. to the Foot.

A Bungalow in South Pasadena, Cal.—Henry L. Wilson, Architect, Los Angeles, Cal.

on the main floor, although in some cases there is an attic which is utilized for a few additional sleeping rooms or for storage purposes. The bungalow which we illustrate herewith and which forms the basis of our half tone supplemental plate is an attractive example of this type of dwelling, the plans clearly showing the arrangement of rooms all on one floor, while the miscellaneous details indicate the general construction and interior pinning and rustic chimney with the pergola covering the approach to the front porch.

According to the specifications of the architect the porch walls, columns, piers and all exposed surfaces of the chimney are of selected light colored boulders laid up in colored cement mortar. The mortar for pointing the exposed stone and faced brick work is composed of one part Portland cement and three parts clean sharp sand.

In the construction of the frame Oregon pine is largely employed, the mud sills, however, being of 2 x 6 in. redwood. The floor beams are 4 x 4 in.; the floor joists 2 x 6 in. placed 20 in. on centers; the ceiling joists and rafters are 2 x 4 in., the former being placed 16 in. on centers and the latter 32 in .on centers. The ridge pole is 1 x 6 in.; the collar ties 2 x 3 in.; the outside plates 2 x 4 in.; the inside plates 2 x 3 in.; the outside and bearing studs 2 x 4 in. and the inside studs 2 x 3 in., all studding being placed 16 in. on centers. The under pins on the outer walls are 2 x 4 in. placed 20 in. on centers, while the under pins on the piers are 4 x 4 in. The shingle lath used on the roof are 1 x 3 in. and surfaced one side, placed 7 in. on centers, except in that part of the roof which projects beyond the building, where the rafters are covered with ⅞ x 6 in. V. and C. V. tongued



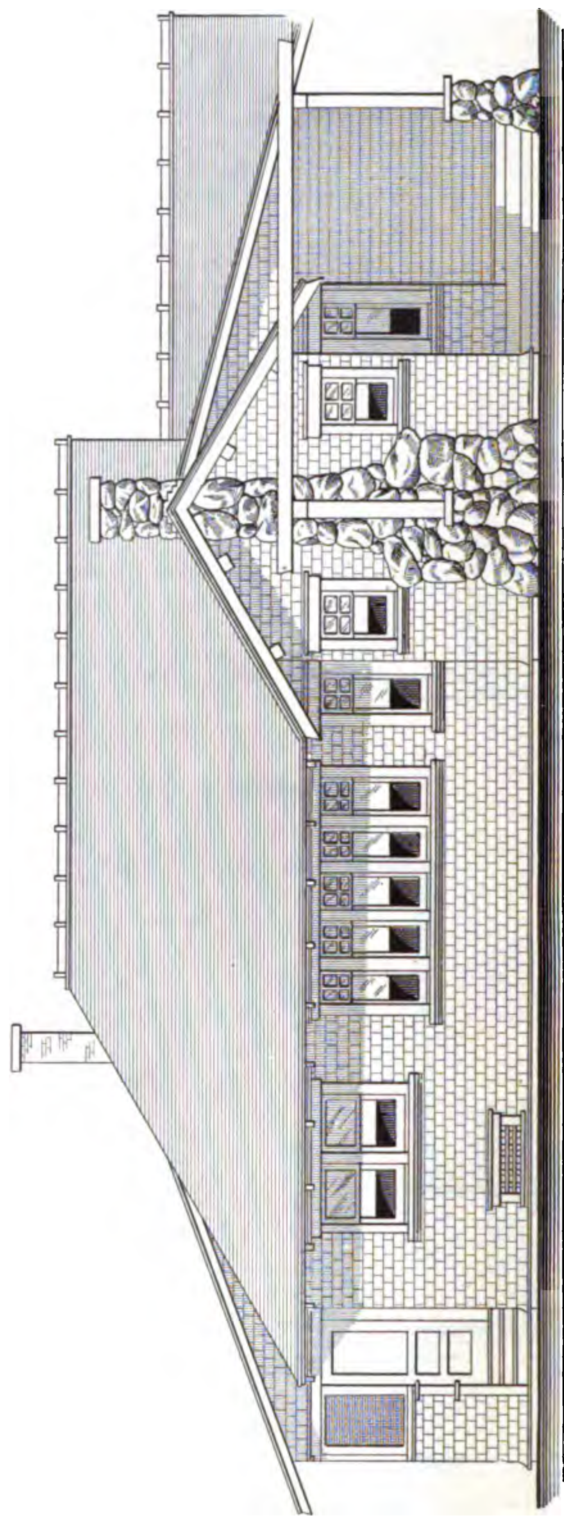
Rear Elevation.—Scale, ⅛ In. to the Foot.

and grooved Oregon pine ceiling. The roof is covered with No. 1 redwood shingles set 4½ in. to the weather. The eaves of the roof project 3 ft. as do also the gables, the latter being finished with 3 x 6 in. barge boards with the ends cut as shown on the elevations. The barges are supported by 4 x 4 in. Oregon pine purlins running back to the second rafter. Under the edge of the shingles in the gables is run a ⅞ x 1½ in. strip to cover the sheathing.

The walls of the bungalow are covered with 1 x 3 in. shingle lath surfaced one side, which carry cedar shingles laid 6 in. to the weather. The porch posts, beams, purlins, &c., are constructed of rough material as shown. The studs at all corners and angles of the frame are doubled and all doors and windows have double headers. There are double floor joists running lengthwise under the partitions and block joists running crosswise. All openings 5 ft. and over are trussed. The under pins on piers rest on 2 x 8 x 8 in. redwood blocks braced from the beam above with 2 x 3 in. bracing. Joists in all spans of 12 ft. or over are thoroughly cross bridged.

All exterior trim except where otherwise specified is of surfaced redwood neatly jointed. The casings are ⅞ x 5 in., the head casings having a 1½ x 2½ in. cap as shown. The sills, 2 x 8 in., project up under the casings and have a 2-in. bed mold under. All outside doors have rabbeted frames.

The porch floors are of ⅞ x 4 in. tongued and grooved



A Bungalow in South Pasadena, Cal.—Side (Left) Elevation.—Scale, ⅛ In. to the Foot.

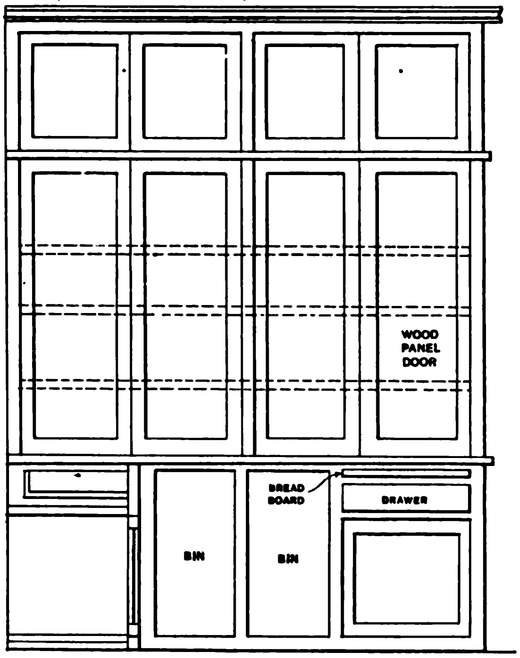
Oregon pine laid with white lead joints and blind nailed to every joist. The ceilings of the porches are of ⅞ x 6 in. V. and center V. tongued and grooved Oregon pine.

The flashing around all chimneys, window casings, &c., is of Taylor's I. C. Old Style tin. The rear porch is screened as indicated with 14-mesh galvanized wire screen fastened in place with ⅝-in. half round stops. There are also screens back of all lattice, ventilators and in cold air vents. All double hung and hinged windows are protected by 14-mesh galvanized wire screens, while the double hung windows have half screens with ⅝-in.

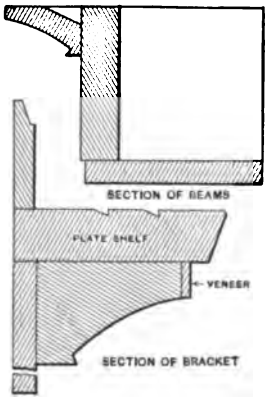
R. W. frames set on stops to slide up and down. Hinged windows have hinged screens with R. W. frames full length.

All finish is of selected slash grain Oregon pine, hand smoothed, scraped and sandpapered. The doors, except for the entrance, are 1½ in. five-panel colonial type, while the door between the dining room and kitchen is double acting. The front entrance door is 2¼ in. veneered

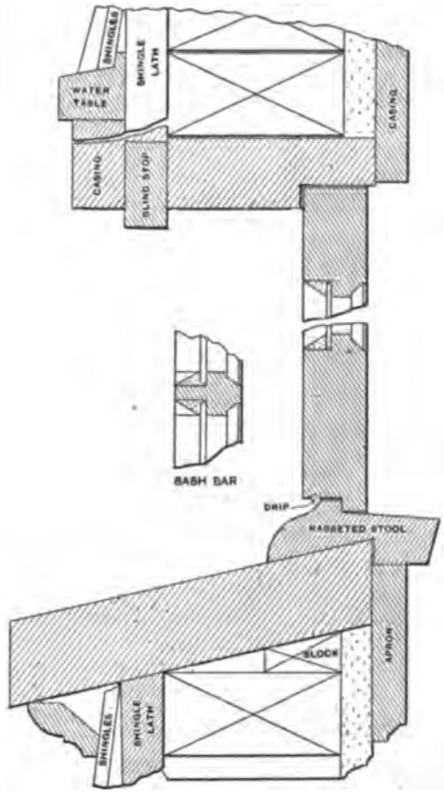
The floors, except where otherwise specified, are of ⅞ x 4 in. tongued and grooved Oregon pine blind nailed to every joist. The den has a sub-floor of ⅞-in. tongued and grooved Oregon pine, on which is placed a layer of two-ply giant building paper, this in turn being covered with a ⅜ x 2 in. clear white oak floor well driven and fastened with wire nails every 8 in. The seats are of ⅞-in. material paneled, with 1⅛ in. tops, sunken hinges



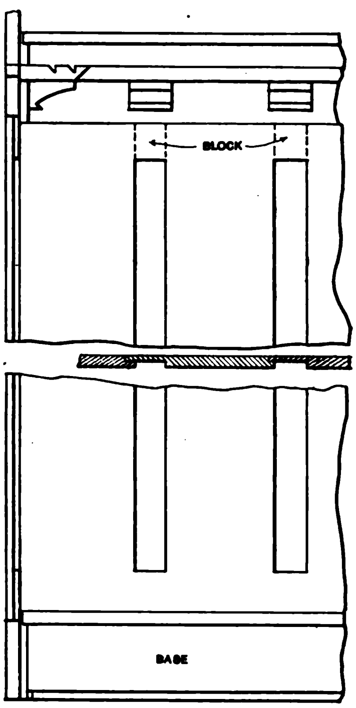
Elevation of Kitchen Cupboard.—Scale, ⅜ In. to the Foot.



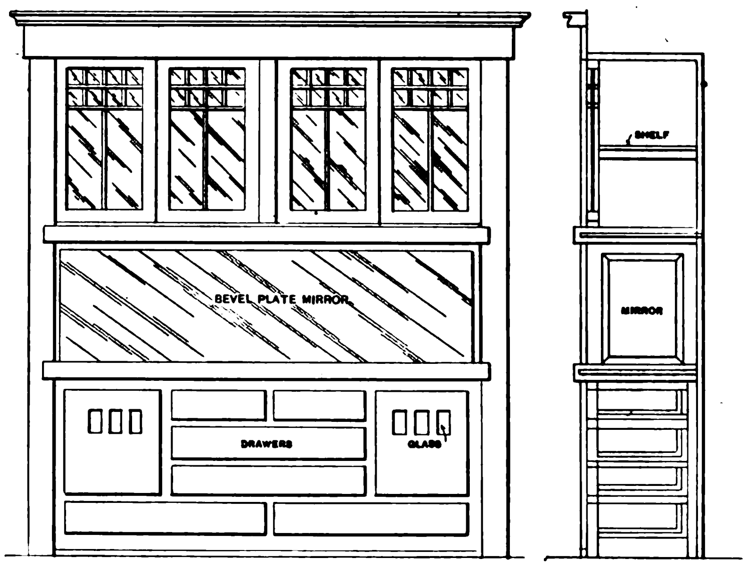
Details of Inside Finish.—Scale, 3 In. to the Foot.



Details of Frame for Swing Windows.—Scale, 8 In. to the Foot.



Detail of Wainscoting.—Scale, ¾ In. to the Foot.



Elevation and Section of Dining Room Buffet.—Scale, ⅜ In. to the Foot.

Miscellaneous Constructive Details of Bungalow in South Pasadena, Cal.

quarter sawed white oak outside and slash grain Oregon pine inside. All outside doors have rabbeted jambs and inside doors ⅞ in. jambs.

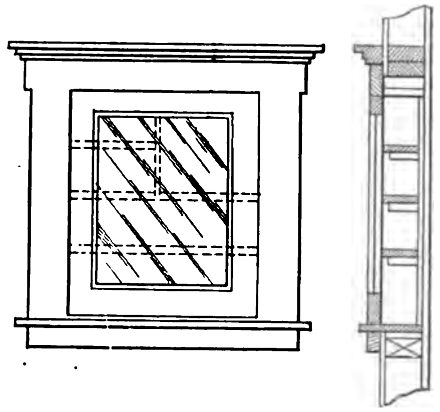
The inside trim is as per details presented herewith. The wainscoting in the dining room and living room is 4 ft. 6 in. high with grooved plate shelf supported by brackets. The wainscoting is of ⅞ x 12 in. rabbeted boards with wood strips, the exact width and thickness of groove fitted in the openings under the skirting board and base. The beams are built where shown with mold in angle of the walls and ceiling, all as indicated in the details.

and lifts. The ends of the seats are made of two thicknesses of ⅞-in. boards glued together.

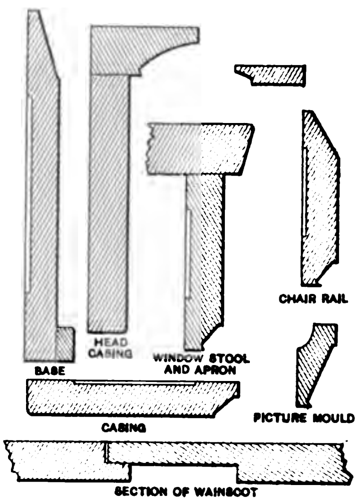
The bookcases in the den are lined with ⅞ x 4 in. tongued and grooved Oregon pine ceiling. They are fitted with ¾-in. shelves and glass doors. The medicine cabinet in the bathroom has a 1⅛-in. door with 16 x 20 in. plate mirror, and is fitted with ½-in. shelves. It is lined with ½ x 4 in. V. tongued and grooved Oregon pine ceiling.

The built-in buffet in the dining room is provided with glass doors, built-up counter shelf, drawers and cupboards. The doors have plate glass panels and over the countershelf is a plate glass mirror with wood backing. The space back of the doors is lined with ⅞ x 4 in. Oregon pine ceiling. The cooling closet is built with removable wire screen shelves.

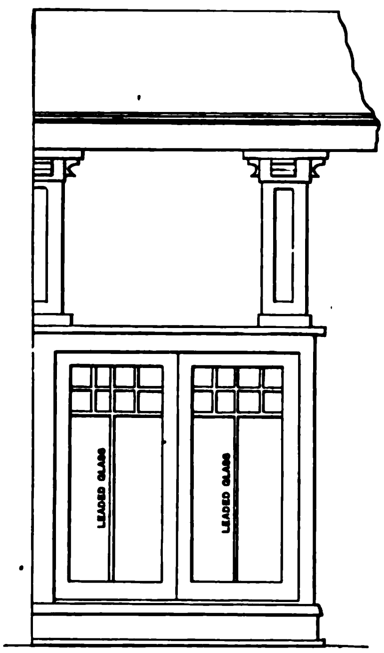
The plumbing fixtures consist of one 5½ ft. porcelain enameled cast iron bathtub with 3-in. roll rim supplied with Fuller combination cocks, a porcelain enameled lavatory, and a washdown closet with quarter sawed golden oak low down copper tank and D. C. seat. In the kitchen is a 20 x 30 in. cast iron enameled sink and a 30-gal. high pressure galvanized iron hot water boiler. The laundry trays or tubs are of cast iron. All fixtures have cut off on both hot and cold water supply pipes.



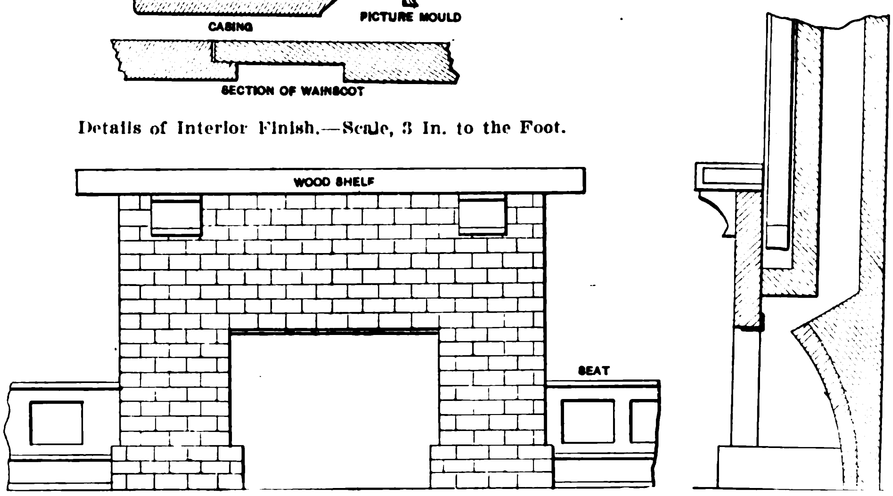
Elevation and Section of Medicine Closet in Bathroom.—Scale, ½ In. to the Foot.



Details of Interior Finish.—Scale, 3 In. to the Foot.



Elevation of One of the Bookcases in Buttress Between Living Room and Den.—Scale, ⅜ In. to the Foot.



Elevation and Section of Fireplace and Seats in "Den."—Scale, ⅜ In. to the Foot.

Miscellaneous Constructive Details of Bungalow at South Pasadena, Cal.

All pipes and open plumbing is nickel plated and all connections between lead and iron pipes are made with brass ferrules and wiped joints. The water pipes connecting with the main service pipe are ¾-in., with ½-in. branches to lavatory and toilet. Other runs are ¾-in. Sill cocks are placed at the front and rear of the building.

The bungalow is piped for fuel gas and lights, all the work being done in accordance with the rules and regulations of the local gas company. The electric wiring is done in compliance with the latest rules of the National Board of Fire Underwriters. Regulation iron outlet boxes are used for receptacles and switches and all wires are sufficiently large so that at full load they will not exceed 2 per cent. of loss. All switches are of the Perkins flush push type. The front entrance lights are controlled by a switch inside of the front door and all bracket lights are controlled at the fixtures. Gang switches are usued where two or more switches come together. The various circuits are run from the screened porch at which point is placed a fusible knife switch to control all lights. Front and back door bells are arranged to ring in the kitchen. All switches match the finish of the hardware.

The walls and ceilings are covered with hard wall plaster applied to Oregon pine lath and spaced ⅜ of an inch apart. The first coat was mixed 18 shovels clean sharp sand to one sack of fibered hard wall plaster, the walls being well rodded and floated to an even surface for a sand finish consisting of equal parts best quality lime putty and clean sharp grit sand made seven days before using. The bathroom and kitchen are wainscoted 4 ft. 6 in. high with smooth Alpine plaster ruled off into 3 x 6 in. blocks to represent tile. All corners are protected by metal corner beads nailed to the studs before plastering.

All interior woodwork except in the kitchen and bathroom has one coat of pure linseed oil stain, one coat of pure white shellac and one coat of Johnson's wax, well rubbed on. The kitchen has one coat of white shellac and one coat of varnish. The woodwork in the bathroom, Alpine wainscot and the outside of the bathtub has two coats of white lead and turpentine and two coats of Neal's white enamel rubbed between coats, leaving a dull gloss. The hardwood floors were treated to one coat of mineral wood filler and one coat of white shellac, followed by one coat of Johnson's wax well rubbed in. All plastered walls and ceilings are tinted in colors. The living and dining rooms have rich colors, while the other rooms have light colors.

The shingles on the exterior walls of the bungalow were treated to two coats of boiled linseed oil and then left natural color, while the shingles on the roof received two coats of creosote stain. All other rough exterior woodwork and weather boarding received one coat of oil stain applied so as to cover all parts and be of uniform color. All exposed tin, porch floors and sides, screens and all surfaced material received three coats of linseed oil paint in colors, while the ceiling of porches and pulley stiles were treated to two coats of pure linseed oil stain.

A cesspool 5 ft. inside diameter and 15 ft. deep is located at a point 10 ft. from the rear of the building.

The bungalow here illustrated was built for Thomas D. Nestor, 625 Fremont avenue, South Pasadena, Cal., in accordance with drawings prepared by Architect Henry L. Wilson, 426 to 428 Copp Building, Los Angeles, Cal. It was erected at a cost of $2250.

TIMELY SUGGESTIONS FOR THE PROGRESSIVE CARPENTER.

BY J. CROW TAYLOR.

THERE are carpenters and carpenters. Some are good, some indifferent, some bad, some good to-day and just as good next year—that is, as good compared to what they were, but not so good as other carpenters will be next year, because they do not make progress. To keep up with the procession in carpentry, like any other business, a man must improve, must take on new skill, fresh ideas or something of the kind to show that he is alive and wide awake, otherwise in the course of events he finds others ahead of him and he is frequently unable to explain why it is. There is an element of skill that is essential in carpenter work, to acquire which requires a certain amount of time and practice, but some carpenters, too many perhaps, make the mistake of thinking this skill, deftness with tools and agility of body are all that are necessary to get along in the work. One may get along with it, too, but to get along and make real progress there are other things just as important as the acquiring of this skill. One must, for example, keep informed on various changes time is likely to bring to various parts of the building trade, and not only be prepared to meet the changes, but also to take part in bringing about the desirable ones.

Roofing as an Example.

Let us take roofing, for example. Time brings more changes in this that affect the carpenter than many in the trade seem to appreciate, otherwise they would be more active and their influence would have been felt more than it has. The shingle roof is one in which the carpenter is interested, but it did not deprive him of any of his work when the general change was made from the old clapboard roof to the shingle roof, even though it did make some changes in it. But in changing from shingles to metal roofing, as has been done much in the city carpentry and in smaller towns, too, where there is more danger of fire from the outside than in the isolated country dwellings, the carpenter has lost an interesting and valuable part of his work. Some carpenters probably didn't lose it because they equipped themselves for putting on metal roofing, and thus while changing from carpenters to roofers for the time being managed to preserve the work for themselves. Many others, especially in the cities, have let the roofing branch of the trade go entirely to other people who make a specialty of metal roofing.

Now here is an interesting question. Could the carpenters in some measure have prevented this, or can they do anything yet to reclaim a certain percentage of the roofing work that is now going to others? As a partial answer to this question there is a story or theory in metal roofing that any carpenter may find worth experimenting with. This theory is that metal roofing put on in large units or sheets and soldered or crimped together, so that each unbroken roof surface is practically one sheet, is prolific of leaks through the simple cause of expansion and contraction due to variations in temperature. If the metal is put on in smaller units, in the form of shingles, for example, this expansion and contraction is easily taken care of between the joints of the smaller units, and as a consequence there are very few leaks in such a roof as compared to those of roofs made of large sheets. If the roofing is put on in shingle form it remains a carpenter's job of practically the same class as putting on wooden shingles. So it is naturally to the carpenter's interest to experiment with this theory, and if he can demonstrate the truth of it, it should enable him to shape the destiny of roofing so that he can get more of it to do that has been going to others.

The more extensive use of brick in building, the advent of concrete and various other kinds of what is termed the hard building material, probably creates now and then a little apprehension in the minds of progressive carpenters as to the future, and especially as to the advisability of training young men up in this calling. There is really no need for apprehension, however, for there is actually more carpenter work doing now than there was ten or even five years ago, and one may judge from the Government figures on the building trade that the value of lumber going into buildings, even those that are made exclusively of lumber, is in excess of all other building material, even including the steel and stone entering into the big skyscrapers and other business buildings. It is but natural, however, to assume that in the course of time lumber, and consequently carpenter work, will show a decrease as compared to other building material in the walls of most buildings, but as the population of the country increases there will be more of what is termed interior finish to do.

This means that in time there may not be enough work for the saw and hatchet man or the "wood butcher," so to speak, but for the skilled workman who delights in doing nice work skillfully rather than rough work ruggedly there will be plenty to do in the future and more of the kind of work that he can take a pride in.

One of the pronounced changes that has come in interior work in the last few years—that is, has become prominent and general the last few years—is the laying of hardwood floors. There have been hardwood floors made for many years, but the use of them has spread wonderfully the last four or five years, and in some cases the carpenter, through not having kept in step with the times and prepared himself for this work, has lost it to others. One of the most prominent manufacturers of what is termed parquetry flooring from hardwood, said that when they first put their product on the market they had more trouble with it through incompetent laying than from any other cause, and finally to overcome this trouble and to get their product before the people in the best light, they made it a point to avoid the carpenters and place it only through men who made a study of it and took hardwood flooring as a special line. It would be difficult to ascertain how many carpenters, or, rather, how much carpenter work was lost because of this. And that it is a fact that these specialists in flooring do exist in goodly numbers, you have but to make inquiry in any city of magnitude to find the evidence for yourself in the shape of people running quite an extensive business in nothing but hardwood floors.

Specialists in the Trade.

Probably it is better so; better in the larger cities that the trade be divided up and each different branch handled by specialists. That is an open question that it is not the purpose here to argue, but aside from the cities there are smaller towns and country districts. The carpenter who is equipped to lay a hardwood floor as it should be laid can materially increase the volume of his own work and also add to his standing and reputation as a builder. In short, this hardwood flooring question is one that should have special attention, because it is a growing factor, and if you don't take a hand in helping it grow it will simply grow without you and you will lose a certain amount of trade that by rights should belong to you and for the loss of which you can blame no one but yourself.

What, you may ask, are the mysterious points surrounding the laying of hardwood flooring which make it so difficult that in many instances the average carpenter has not been trusted with and has been avoided rather than sought? There is really no mystery about it. It is simply a matter of details and close attention to things that the average carpenter may have considered as immaterial in the laying of flooring. For one thing hardwood flooring, especially where it is cut up into small units or squares, must be kept and laid as free from moisture as possible. The manufacturers kiln dry it until after testing and baking there is no further evidence of moisture in it. Then they keep it in heated warehouses, where the temperature varies but little throughout the year. To follow out this idea of close attention to prevent moisture such flooring should not be laid during wet weather unless the carpenter has some dry house or place where he can keep it heated enough to dry out all the moisture that it might absorb from the air. This may look like it is drawing it pretty fine, but is just what it takes to insure close joints in the floor after it has been laid and remains so in a heated room for some time.

When a hardwood floor is made by a carpenter from strips which are cut and paved into whatever design is wanted, one mistake that is frequently made is in the end jointing. The side joints are usually made by the flooring man, but the carpenter from long habit is inclined to bevel his stock under a little in cutting for end joints so as to insure a close fit. This is probably one of the most common mistakes in floor laying; in fact, one might go into it at length and prove that it is a mistake in any kind of joinery. But we are talking of hardwood floors now, and here is how it is a mistake to saw under or bevel in cutting end joints in hardwood flooring. All hardwood flooring is finished off after it is put down. In the process of finishing off some strips may not be cut down much, but some are dressed down 1-16 in. any way, and naturally if a joint has been beveled or cut under when the face is cut down the joint immediately begins to open up, and it opens up in proportion to the amount it has been beveled and the amount that it has been cut down. The thing to do, therefore, in jointing hardwood flooring where it is in thin strips or standard thickness is to use a fine saw and cut perfectly square. Then when you get a good joint you can feel safe about the joint, even if 1-16 in. is taken off the top in smoothing down. So you see instead of being a matter of mystery the proper laying of hardwood flooring is a matter of simple intelligence and close attention to small details. There are many other little points that might be cited for further illustrating this fact, but enough has already been said to start those who are interested in the subject thinking along right lines.

New Type of Reinforced Concrete Joists.

An apartment house is in process of construction in Detroit in which will be used a newly devised system of concrete construction, which is described in a recent issue of *Concrete*, and from which we extract the following particulars: The system consists of reinforced concrete joists, of an exaggerated I-shape, 12 in. wide and 8 in. deep, with heavy flanges. They are made of a 1, 2, 4 mix, the concrete being placed between two mold boards. These are made of inch stuff, 8 in. wide, in the center of which are secured lengths of timber cut from 6 x 6 in. stuff, the edges being beveled to form the flange. The first joists are made on the ground, with inch boards for pallets, and on to the pallets about an inch of wet concrete is poured, flowing into the spaces formed by the angles between the flange molds and the boards at the sides. On top of the concrete is placed the reinforcement, which may be of any standard type carrying shear members. Wet concrete is shoveled in in the ordinary manner and smoothed off at the top with a shovel. Little or no tamping is required to make the concrete solid, and when the two side boards and flange molds are withdrawn the joists have a uniform finish and appearance. The molds are oiled every other time they are used, with the result that they are easily withdrawn. In practice, the joists are made five tiers high, as high as it is convenient to shovel concrete, each tier being separated in the ordinary manner, by cross pieces.

Inside of 10 days the joists have cured sufficiently to be placed in the building. They are set side by side, the tops forming the foundation for a granolithic or concrete floor and the bottoms the base for one putty coat of plaster for a finish.

If a wooden floor is desired, it is an easy matter to cast a wooden nailing strip, dovetailed in shape, into the top of the joist as it is being prepared.

When the joists are all set in the floor, it will be seen that there is an ample air space, formed by the heavy flanges, and these spaces allow for placing water pipes, electric wires, speaking tubes and other necessary accessories.

The construction is heavy, running about 50 lb. to the foot, but it is absolutely fireproof, says J. W. Vaughan, who devised the scheme. The joists develop ample strength very early, bearing a weight to 150 lb. to the square foot without deflection, and failing only under absolutely excessive weights.

In the joists for the present building the Gabriel system of reinforcement is being used, but it would of course be practicable to use other systems, if preferred. While the joists in the present case are being made on the ground, it is planned to establish factories for their stock manufacture, and the Currie Cement Construction Company of Detroit, Mich., will shortly begin their manufacture on a commercial scale.

When these joists are used the necessity for centering is avoided, and hollow tile find no use in floor construction. The apartment house is being built by Mr. Vaughan for himself, and it contains many unique features, the chief of which is the use of the new type of joist.

Unusual Features of a Reinforced Concrete Factory Building.

As indicating the size to which it is possible to build an unobstructed concrete floor, it may be stated that in connection with a factory building recently erected in Long Island City, N. Y., there are floor panels 35 x 180 ft. in area and a 5-in. floor slab including the finish, or an area of over 6000 sq. ft, without column obstruction. Another point in connection with this building is that while covering an area of 175 x 180 ft. the time occupied in the construction of the floors averaged less than a week for each, or an average of a net area of practically 25,000 sq. ft. in about five days. The concrete was run in almost a liquid state, so that every square inch of the reinforcing steel was covered with the Portland cement mortar, work proceeding on several floors at the same time. The shoring supporting the steel beams independently of the concrete was removed after the lapse of a week, although the central prop on the long spans remained from three to four weeks.

The girders are 20 ft. in length, the concrete over them being 3 in. thick, while over the 35-ft. span beams the covering is 2 in. and over the columns 4 in. The beams are 21 in. deep from the top of the finished floor to the bottom of the reinforcement, and the girders 29 in. deep between the same points.

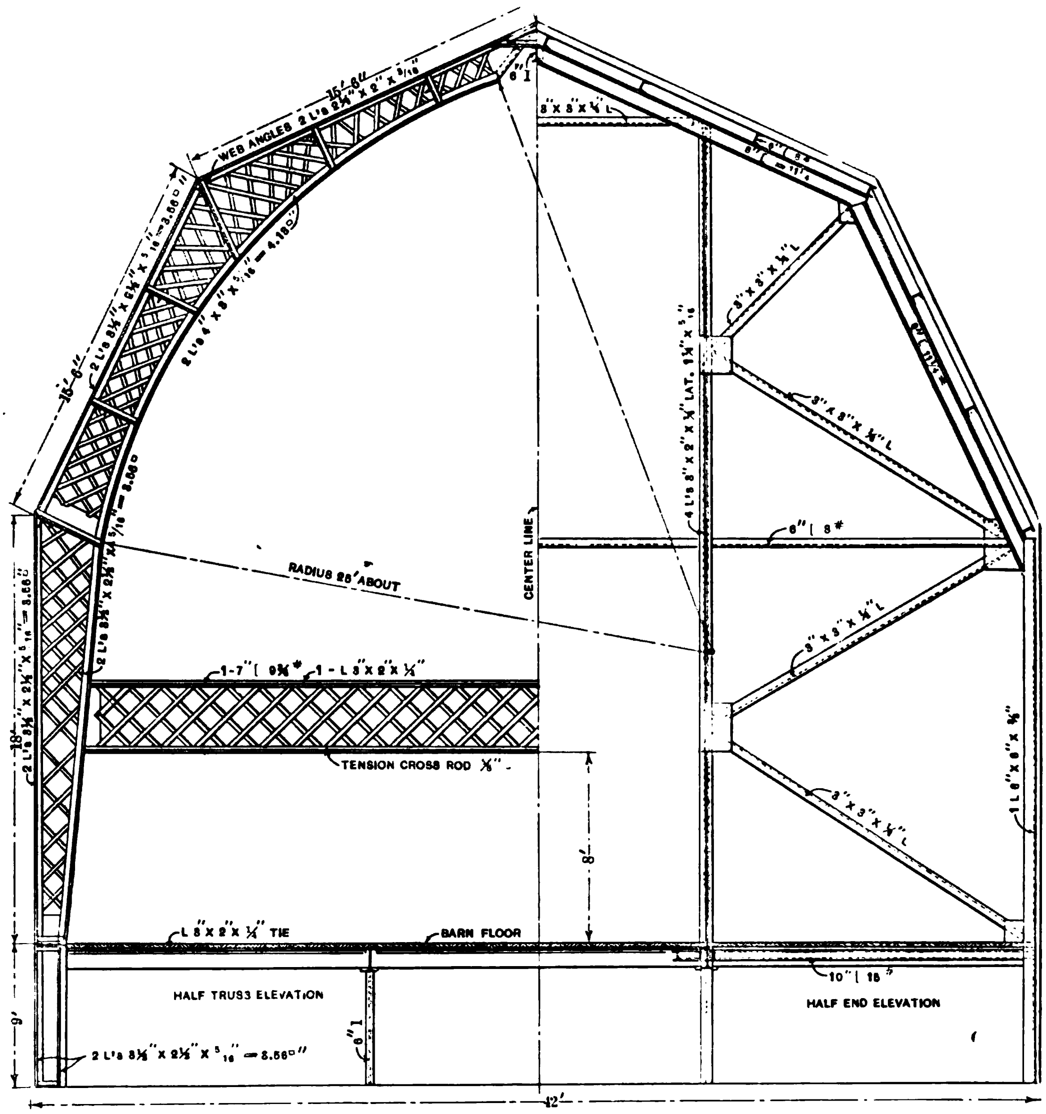
The form of construction employed is known as System "M" of the Standard Concrete Steel Company, which was invented by Guy B. Waite, and is described by Harold Godwin, civil engineer of the company, as follows:

"The main feature of the system is that the reinforcing of beams and girders consists of standard rolled sections perforated through their webs for the use of steel shear bars to transfer the stress from the tension steel to the concrete, which takes the compression. This varies from all other forms of reinforcement in which a multiplicity of small steel rods bound together are used as reinforcement. In the former case the centering is suspended directly from the steel rolled sections and requires a minimum of shoring to keep it in place, while the concrete is being poured, thus enabling the work to proceed on any number of tiers at a time, limited only by the restraining laws of the Building Department as to how many tiers of steelwork may be erected in advance of floors and walls. It also permits the use of much lighter forms than would otherwise be required in reinforcing concrete on account of this suspension of forms from the members themselves. The features of the construction of the slab are identical with those used in other types of reinforced construction."

The method of constructing this building, which is six stories in hight, has resulted in obtaining for Mr. Blanchard, the owner, an exceptionally low rate of insurance.

A FARM BARN OF STEEL FRAME CONSTRUCTION.

THE rapidity with which supplies of timber for building purposes are being reduced has turned the earnest attention of the public to the use of substitutes of various kinds, as witness the increasing employment of concrete in different forms and the application of structural steel for practically all classes of buildings. One of the latest applications of steel framing in the erection of a building has recently been made in connection with a farm barn three stories in hight for W. B. McClintock at Dryden, N. Y. The barn is 42 ft. wide, 96 ft. long and about 48 ft. in hight, and has been designed for the general purposes of the East Hill Fruit Farm. It has a capacity for more than 100 tons of hay and provisions for the present accommodation of 75 cattle, 10 horses, a number of wagons and other vehicles as well as large supplies of grain.



Half Elevations of Truss and End Bent.—Scale, ⅛ In. to the Foot.

A Farm Barn of Steel Frame Construction.

The stable portion of the barn is in the basement, while the first floor is devoted to space for wagons and general storage purposes. The hay loft extends very nearly three-fifths of the length of the building and has a clear hight of about 16 ft. to the center chords of the roof trusses. The structural steel is used for columns, beams, girders, trusses and bracing, the first illustration presented herewith showing details of the truss construction and also of the end framing.

The barn is so located on a side hill as to give ready access at grade to the first floor to teams and wagons, while the basement is also entered at grade from the opposite side on the lower slope of the hill. The steel framework is supported on a concrete substructure and is covered with wooden siding and a slate roof. Pleasing effects are produced by means of the roof trusses which were especially designed with an arch like outline which at the same time secured ample stiffness without obstructing the upper part of the interior.

The main framework consists of seven transverse bents placed 16 ft. apart, connected by purlins, by beams and girders as well as by two panels of laterals and sway bracing, all as clearly indicated in the diagrams showing plans and elevation. In each bent the roof truss and wall columns are made continuous and have sufficient transverse depth to provide for wind stresses and for sway bracing in the intermediate panels. The roof trusses are in fact hinged arches with a rise of about 37 ft., a clear span of 40 ft. and a radial depth varying from 15 in. at the foot and near the crown to about 3 ft. at the angles of the haunches. The lower ends of the trusses are vertical and the top chords of the intermediate parts are made with straight inclined lines giving two flat slopes on either side of the ridge and producing an effect closely approximating that of a gambrel roof.

The top and bottom chords are made with pairs of 3½ x 3½ x 5-16 in. and 4 x 3 x 5-16 in. angles, respectively, riveted back to back and connected by 5-16 in. side plates at the angles and by intermediate multiple intersection 1½ x ⅜ in. lattice bars. Two of the duplicate trusses in the five intermediate bents are connected about 8 ft. below the eaves to transverse lattice girders about 3 ft. deep which carry the hay floor. At the gable end of the building the roof trusses are replaced by a pair of intermediate vertical columns and by angle iron and channel members with diagonal bracing to make a balanced framework supporting the roof and walls, all as shown in the half side elevation.

The diagrams representing the half plan of the floor and the half plan of the roof clearly show the framing at these portions of the barn.

The transverse bents are connected by 14 lines of 6-in. channel purlins, by the trolley girder and by two panels of laterals and sway bracing, all as shown in the illustrations. The lateral and sway bracing is made with ¾-in. diagonal rods with screw ends, being provided with nuts which engage bent plate bearings riveted to the trusses, while the purlins are tied at their center points by ⅝-in. transverse sag rods with nuts at both ends.

The main floor consists of 2-in. planks laid on transverse wooden joists carried on the lower flanges of two intermediate lines of 12-in. longitudinal I-beams and by 12-in. longitudinal channels riveted to the roof trusses. The I-beams are supported by 6-in. I-beam columns and the floor is stiffened by transverse 3 x 2 x ¼ in. angle ties. The second floor is made of 2-in. transverse planks laid on longitudinal wooden joists supported by the lattice girder floor beams.

As there are heavy snows in the section where the barn is located the roof is proportioned for a dead load of 30 lb. per sq. ft. and both roof and walls have a wind load pressure of 30 lb. per sq. ft., all treated as a dead load.

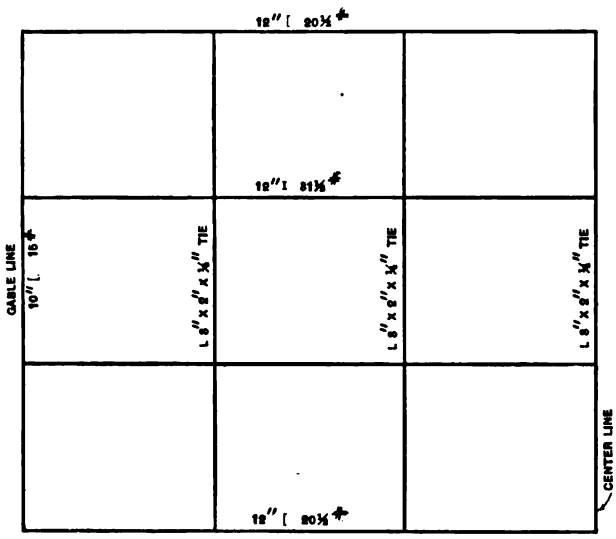
By reason of the fact that the barn is situated on a side hill advantage has been taken of this position to support the ends of the trusses on one side of the barn directly on a concrete retaining wall about 9 ft. high which serves as the rear wall of the basement stable, while the opposite ends of the trusses are supported at the same level by riveted steel columns which in reality form extensions of the trusses and serve as a framing for the front wall of the basement in which are entrances at the level of the basement floor. The runway girder in the gable is made up of 6-in. I-beams in two panel lengths connected to horizontal angles in the crown of the roof trusses by pairs of ⅝-in. rivets through the top flanges. The ends of the runway are web connected to the gable frames and the hoisting trolley runs clear from end to end of the building on the lower flanges of the I-beams.

In raising the frame work the truss sections were assembled in pairs in horizontal planes with their lower ends as near as convenient to their seats. After all connections and field splices had been hand riveted the completed trusses, weighing about 11,000 lb. each, were raised in position by a pair of gin poles. Each consisted of a round stick about 14 in. in diameter at the base and 65 ft. long rigged with a four-part Manila tackle, rove with 1-in. line.

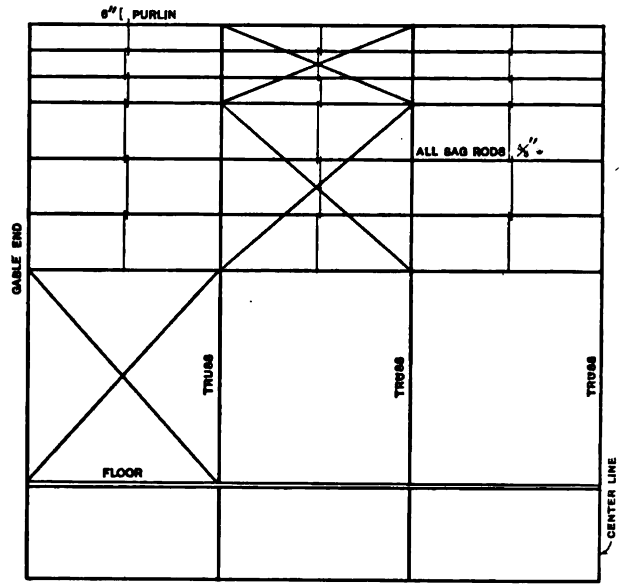
One of the end frames was assembled like a roof truss and was erected and securely guyed in position, while the gin poles were moved about 16 ft. further back and erected the first truss, supporting it in the tackles until the purlins and temporary cross bracing was connected. The gin poles were then released and advanced panel by panel, erecting the trusses, bracing, beams and girders complete, as they progressed, excepting the runway girder, and when the work of erection was substantially completed the gin poles stood free of the frame work at the opposite end of the building and were readily lowered with lines attached to the trusses. Care was taken to assemble all of the diagonal rods as fast as the trusses were erected and to keep the structure thoroughly guyed until the siding and roof were in place.

The building was planned by J. K. Britton, chief engineer of the Groton Bridge Company, Groton, N. Y., which fabricated and erected the steel framing. The structure contains about 83,000 lb. of steel and was erected by 10 men in 20 days. It is said that the use of the steel frame work greatly accelerated the construction, which was practically completed 30 days after the work of erecting the trusses had been commenced. In the planning of the barn the chief engineer was assisted in the way of several very valuable suggestions by Mr. McClintock, the owner, but no regular architect was employed.

A great deal of attention was given to the design of this barn and comparative estimates were made which showed that the cost would be only slightly in excess of that for an equivalent barn built entirely of wood, while the steel frame work would give increased strength and a rather more attractive appearance.



Half Plan of Floor.



Half Side Elevation.

Scale, 1-16 In. to the Foot.

A Farm Barn of Steel Frame Construction.

Heating Small Woodworking Shops.

In the larger factories having steam power plants the heating of the buildings is a comparatively simple problem that is so well in hand by the majority of manufacturers that it doesn't need any detailed discussion these days. There is, however, room for a little discussion and a few suggestions in regard to heating the small factory, especially those driven with something other than steam power. Lots of small woodworking institutions these days, says a recent issue of the *Wood Worker*, either use electric power or gasoline engines, and in these the problem of keeping the place comfortably warm in cold weather may seem a little difficult. It really isn't, however.

The problem of heating the small woodworking plant is practically the same as the problem of heating the residence, rather than the problem of heating the larger factories. There are for this purpose two or three different systems which may be turned to just the same as in larger undertakings. The three methods are, hot blast, steam and hot water. In the use of either one the plant can utilize its scrap stock or turn to coal, just as occasion may seem to warrant. One can use the hot blast system just the same as is used in residences. By making the proper installments in the basement, or by excavating and thus supplying a means for installing the heating apparatus, one can heat a small factory very comfortably and arrange to burn either the waste products from the factory, or coal, depending on whether or not there is a market for the waste that is worth while. It is easier to keep the fire with coal than with wood, because it requires less frequent renewals, but even with waste either an automatic or semiautomatic feeding device can be arranged for keeping the furnace supplied so that it will not require such constant attention.

To heat with either steam or hot water one can follow out the same ideas that prevail in connection with their use in the dwelling. Or one can vary it somewhat if so disposed, and, instead of special hot water or steam heating apparatus, install a regulation steam boiler of small capacity in a separate room. This can either be put up above ground or it may be put down in the ground, with return pipes from the heating system run to the boiler, so it will not require much additional water, and thus economize in heat. Boilers arranged in this way have been used to supply steam for the dry kiln and also to heat the factory, either directly with steam or with coils and a hot blast fan. In fact, there are several ways to keep the small woodworking factory comfortably warm without going to excessive expense. Most of them can be made much safer than the use of stoves and arranged so that they will require less attention. All one needs to do is to give a little thought to the subject and get the literature of and make a study of the different systems used for heating houses.

No matter what heating system is taken up, the thing that should be kept in mind is that it is important to have the factory warm in the morning; don't wait until the time to start to work to get the factory heating apparatus started up. It is much better, in fact, if you have a night watchman at the place, to keep it warm all night. It doesn't take much more heat in the end, and is more satisfactory in every way. Where no night watchman is kept make it a point to have some man start the heating apparatus long enough before time to start to work to get the frost all out of the building and both the temperature and the circulation going properly before working time. Now is the time to get at these things, too; don't wait until the frost comes and cold weather is upon us, but start to work on it early enough to give careful attention to every detail, and when your heating system is finished properly it will give a great measure of satisfaction.

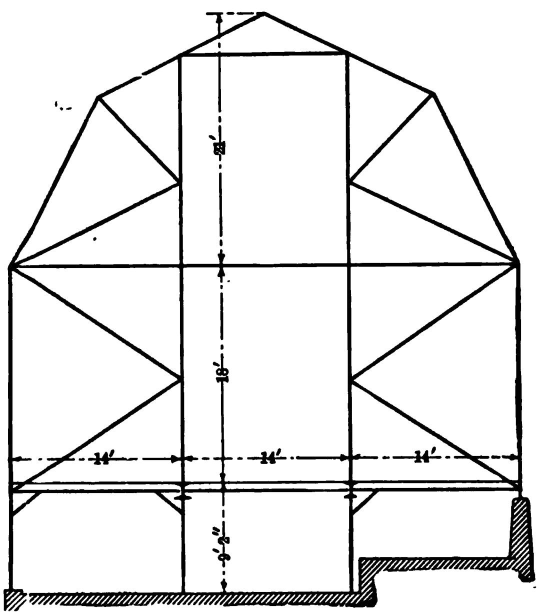
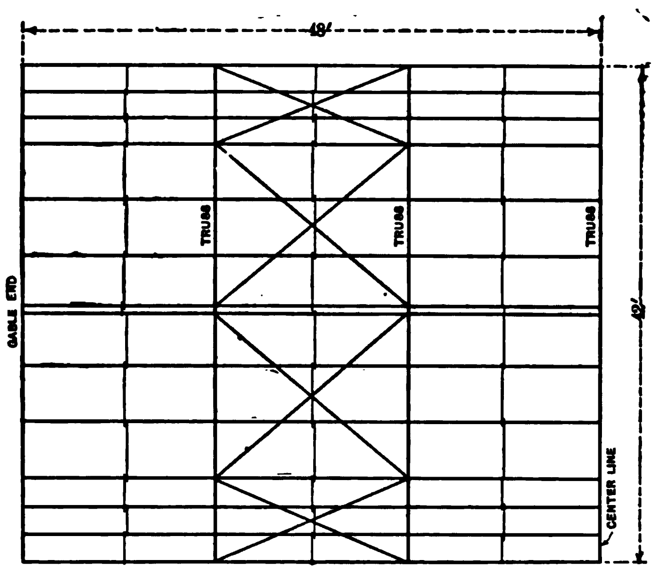


Diagram of End Framing.



Half Plan of Roof.

Scale, 1-16 In. to the Foot.

A Farm Barn of Steel Frame Construction.

Plan of a Model Kitchen.

In the modern dwelling more attention is given to the location and arrangement of the kitchen than was formerly the case, when it was considered only necessary to provide a space in some out of the way part of the house and fit it with a sink and a flue connection for the cook stove. Plans of what are characterized as "model" kitchens have been presented from time to time in these columns, and the subject is one in which many are vitally interested, as the convenience and arrangement of the kitchen has much to do with the health and comfort of those in the home. Something like a year ago the Household Economics Department of the Nebraska University issued literature on the subject indicated by the above title and giving the experience and observation of members on the construction and equipment of a kitchen of this character. The central idea was compactness and convenience of equipment, with a view to lessening the labors of the housewife. A like department of the Missouri University has supplemented the Nebraska plan with designs of what constitutes a model kitchen according to the Missouri idea. At a recent housekeepers' conference, held at the university, the design of a model kitchen was discussed and unanimously recommended to home builders. The conclusions reached may be detailed as follows:

There is perhaps no place in the home where more unnecessary time and energy are used than in the ordinary kitchen, and it was suggested at the conference how steps, time and energy may be saved in a model kitchen. The walls might be covered with sanitas paper in imitation of tiling, it being comparatively cheap, easily cleaned and attractive looking. Metal tiling is more sanitary but more expensive. It is cheaper perhaps than true tiling and perhaps as satisfactory. A modern kitchen cabinet, with all its conveniences of having working materials at hand, may be placed where there is a good light next to the stove, on the one hand, and the cold pantry on the other, with the sink at the back. The stove should be well lighted and placed within convenient proximity to the kitchen cabinet, the sink, and not very far from the dining room door. It should be provided with a hood or canopy to carry off the odors of cooking, and the house further safeguarded from odors by the possibility of a direct draft from the windows across the room between the stove and the other rooms. Until electricity becomes cheaper a gas range is recommended as the best for use, although gasoline or blue flame kerosene stoves may be used where gas connections are impossible. The high ovens now made in some ranges save many a backache. The easily cleaned refrigerator in the conveniently placed cold pantry has an ice door that can be reached from the outside, saving the kitchen floor the dripping and footprints that generally mark the iceman's path.

Cold Air Box.

Outside the pantry window is a box in which the food can be kept cold during many months of the year without the use of ice. If well finished and painted the color of the house on the outside, this need not mar the exterior appearance of the house. The shelves in the pantry afford room for storing food materials. A small table on rollers can be moved into the cold pantry for pastry work, when the kitchen is too hot. It can conveniently find place between the kitchen cabinet and stove when frying or other cooking makes a table at that point convenient. In kitchens where sink and china closets are far apart such a table saves many steps at dishwashing time. In this kitchen the lower shelf of the china pantry is convenient for the reception of dirty dishes from the dining room table. Here they can be scraped and piled and passed through the window onto the shelf at the right of the sink. A window at the end of the drain board would give light for the dishwashing and allow (if the view be good) a chance for inspiration during the mechanical work of dishwiping. The window into the cupboard over the drain board may be made small, allowing simply for the passage inward of the piles of clean dishes, or may be made large enough to give access to the back of all the shelves in that part of the pantry, allowing each dish to go directly from the dish towel to its place on the pantry shelf. The opening may be closed with glass or wooden doors. At the farther end of the kitchen would be a place for the ironing board near to both stove and windows, but entirely out of the way of other workers in the room. It may be hinged to the wall at one end and folded into a wall cabinet when not in use. Inclosed shelves below would give place for the irons, holders and wax. The hights of the ironing board, sink and table should be suitable to the hight of the worker. A high stool can be used to advantage at the sink and kitchen cabinet. Every kitchen should have at least one comfortable chair. Steamers save fuel and the energy of watching to prevent burning. Moreover, steamed vegetables are much more nutritious than boiled vegetables, since the water extracts most of the salts. The fireless cooker saves still more fuel and is valuable in preparing all foods that need long cooking at a temperature somewhat below that of boiling water.

What Is Done for the Unemployed in European Countries.

The result of a study by W. D. P. Bliss of what is being done for the unemployed in European countries are presented in Bulletin No. 76 of the Bureau of Labor of the Department of Commerce and Labor. In their treatment of the problem European countries usually recognize three general classes of the unemployed—the employable, the unemployable and the vagrant, the incorrigible, or more or less vicious.

Public employment bureaus in Germany have grown rapidly in the last 20 years, both in numbers and efficiency. In a recent year, for example, according to an official report, there were in Germany over 400 public employment bureaus, finding places in that year for some 550,000 persons. In France also the public bureau has become very important, the law since 1904 making the maintenance of such bureaus compulsory in all towns of 10,000 or over.

In Great Britain a means of relief for the trade union man out of work which has been developed to great proportions is the trade union out of work benefit.

In the "Ghent" system the trade union out of work benefit is supplemented by the addition of sums contributed by the municipal or communal, or in some cases the provincial or general government. This system has been largely developed throughout Belgium and has spread to other countries, notably France. In Switzerland the attempts to establish a system of insurance against unemployment have attracted much attention, though they cannot be said to have been successful.

In Germany, Switzerland and German Austria "home shelters" are organized into a general system of homes or hotels for working men traveling in search of work in all the larger cities and towns. Here workmen can find lodging for a night or two either by paying a small sum, or, if unable to pay, by doing a little work in the morning. These are in all cases private institutions, maintained in many cases by trade unions, or not infrequently by religious societies.

Connected with these home shelters there has been developed, particularly in Southern Germany and a few other portions of the German Empire, a system of smaller relief stations under Government administration or support. These relief stations are already organized in many portions of the Empire in such numbers as to be within walking distance of each other and all are connected by telephone. A workman traveling in search of work can go from shelter to shelter and at every point learn in which direction he can look for work with the most hope of success. If unable to pay for his shelter, he is required to work in the morning and travel in the afternoon, and the time he can stay at any one shelter is strictly limited. Legislation has been enacted in Prussia looking to the establishment of this system all over that kingdom. In the cantons of Switzerland, which have accepted the system, and in considerable portions of Germany, tramps and irresponsible vagrants have largely disappeared from the community.

The most notable efforts in dealing with the unemployable are the so-called "labor colonies" of Germany and the less known but successful colonies of Switzerland. The German colonies, which have grown rapidly, so that there are now thirty in various parts of the Empire, are agricultural colonies, maintained almost wholly by private philanthropy, where any workman unable to find work can find shelter so long as he conforms to the rules of the colony. He is free to go at any time, but while in the colony must do the work assigned to him. The actual criminals are sent to penal establishments. The better grading of various classes of labor colonies for various classes of the unemployed is the aim of the Swiss colonies, most of which, however, are in their beginnings.

Akin to the labor colonies are the penal colonies, notably of Belgium, Switzerland and Holland, to which are sent those arrested for begging, persistent idleness and other minor offenses.

ONE of the improvements in what has heretofore been the prominent residential section of Fifth avenue, Borough of Manhattan, is the business structure that is being put up at the corner of Forty-seventh street and the avenue, on the site now occupied by the dwelling of Perry Belmont. The new building will be nine stories in hight, will front 25½ ft. on Fifth avenue and 100 ft. in Forty-seventh street. The front will be of French limestone, and the Fifth avenue entrance of Levanto marble. The building will be erected for Arthur Tooth, who will occupy the ground floor and basement, his galleries being on the top floor behind the cornice. No windows in this story will be visible from the street, but all the galleries will be lighted by skylights. It is stated that the structure will be of a much higher class than the ordinary store and loft building usually erected on the avenue. According to the plans of architect Henry Otis Chapman, the front of the store will be in marble and bronze, and the store floors in marble, with a winding marble staircase from the center of the store. All cornices, railings and the front door will be of bronze. The cost of the building is estimated at about $150,000.

SOME PROBLEMS IN STAIRBUILDING.—III.

By Morris Williams.

We shall next show how to lay out a flight of cylinder stairs with a curved stringer and a wreathed rail. A plan of a flight of stairs of this type is given in Fig. 19, showing a stretchout curve at the bottom of the first flight, a 10-in. cylindrical well hole and a quarter turn curve at the upper end of the second flight connecting with the level landing of the second floor. The total hight for this stair as indicated on the story rod measured from floor to floor is 11 ft. 8 in., which equals 140 in. Assuming a riser of 7 in. depth the number of risers required to reach from floor to floor will be found by dividing 140 in., the total hight, by 7, which equals 20. This then will be the number of risers required for the two flights.

As shown in the plan, Fig. 19, the first flight contains 13 of these risers, reaching from the first floor to the

The stringer is placed on the drum, as shown in Fig. 20, and held tight against it by means of cleats screwed to the drum, and the space shown on the stringer from *a* to *a'* is to be filled tightly with narrow strips called "keys" glued to the veneer. The stringer is left on the drum for the keys to set, after which it is ready to be cut for the treads and risers.

In Fig. 21 is shown how the stringer is prepared for bending. At *a* is shown an edge view of the veneered portion, while *b* shows the back face of it, the lines indicating the direction which the keys will assume when placed on the veneer in the space from *a* to *a* in Fig. 20. The stringer should be marked for the treads and risers as shown at *c*, *c*, *c* and *c*, in Fig. 21, before it is placed on the drum.

In Fig. 22 is shown another drum and a piece of a

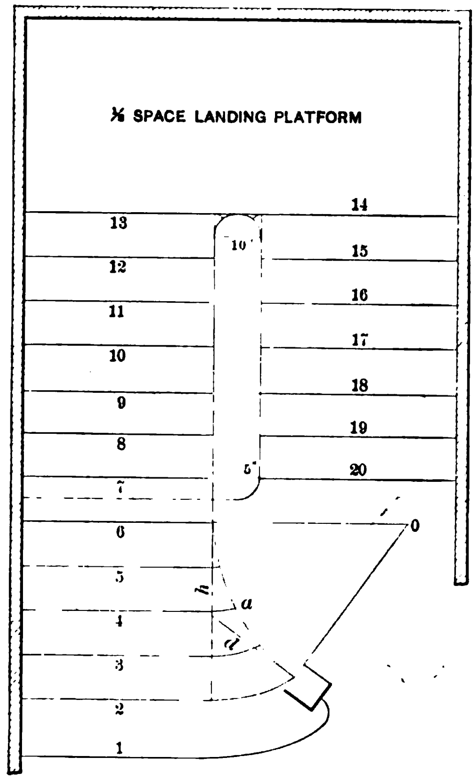


Fig. 19.—Plan of Cylinder Stairway Containing Stretchout Curve at the Bottom, a 10-In. Cylindrical Well Hole and a Quarter Turn at the Upper Landing.

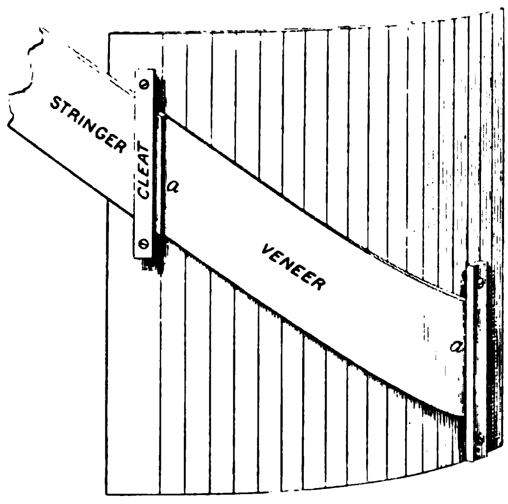


Fig. 20.—Stringer Fixed on Drum for Bending.

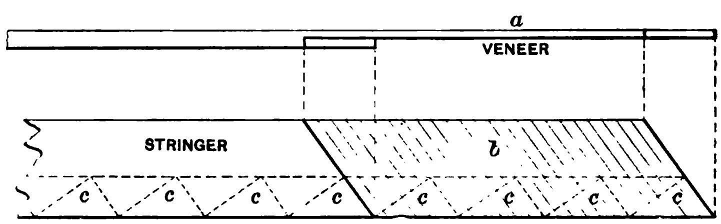


Fig. 21.—View of Stringer Prepared for Bending.

Some Problems in Stair Building.—III.

half space landing, and the second flight is shown to contain seven risers reaching from the half space landing to the second floor landing.

We will next find the width of a tread suitable for a 7-in. riser to guarantee safety and comfort while stepping up and down the flights. The most convenient reliable rule for this purpose as previously stated is to multiply the hight of the riser by 2 and subtract the product from the number 24, giving 10. This then is the relative proportional size of a tread that will suit a 7-in. riser to guarantee safety and comfort.

Now make a pitch board of the foregoing dimensions, viz.: 7-in. riser and 10-in. tread. The method of laying out a pitch board was explained in connection with Figs. 11, 12 and 13 for the stairway shown in Fig. 9, and the method of applying the pitch board to a cut and mitered stringer was shown in Fig. 10.

In Fig. 20 is shown a drum and stringer prepared for bending that portion of the stretchout curve at the bottom of the first flight. The drum is made to coincide with the curve shown in the plan, Fig. 19, at *a*, where the dotted curve shows the outside face of the stringer.

stringer bent around it. This one is for the 10-in. cylinder of the well hole. The process of preparing the stringer and bending is the same as that just described for the portion illustrated in Figs. 20 and 21, except that for this piece of a stringer it will be necessary to lay out a pattern or template, of its true form.

The manner of laying out the pattern is shown in Fig. 23. Describe the semicircle *a n b*, with the radius of the cylinder, as shown, which represents the concave face curve of the well hole stringer, then with *a* and *b* for centers and *b a* for radius, describe the arcs crossing at *o*.

From *o* draw a line through *a* to *c;* and also one through *b* to *d*. The distance from *c* to *d* indicates the stretch out length of the semicircular curve *a n b*. Again draw a line from *o* through the points 13 and 14 as shown to *w* and *g* respectively. Draw the perpendicular lines as shown from *c w*, *n g* and *d;* upon the line drawn from *w*, set off from *w* the hight of two risers as shown at *s* and 13. From point 13 draw the line 13 *s;* and from *z* measure the hight of one riser to 14 and draw the line 14 15. Again from *s* draw a line to 12 and set off from 12 to *h* the hight of one riser; from *h* draw the line *h* 11 and drop a riser as shown from 11. Now draw the pitch of the bottom flight through *h* and *s*, and the pitch of the upper flight from 15 to 16. Draw the lines *m* and *m* as shown, parallel to the respective pitch lines. Now take the distance from 15 to this line on the compasses and placing one leg in *s*, draw the arc shown. Again place one leg in *z* and draw an arc as shown. Now draw a free hand curve to touch the arcs, thus forming the soffit of the cylindrical stringer. Draw a line through 14 and 12, and square to it draw lines from 15 and *h*, thus completing the pattern which indicates the full length of the piece of stringer required to be bent on the drum for the cylinder and also the form of the steps in and adjoining the cylinder.

After the stringer has been bent on the drum as shown in Fig. 22, the pattern, having been cut along the lines of risers and treads, and also the line of the soffit, is applied to the concave face of the bent stringer which is then cut to the lines for the risers, treads and soffit. The piece of stringer for the quarter turn at the landing of the second story is usually prepared by the simple method shown in Fig. 24. The pattern is usually made of thick, stiff paper.

Two pieces, as shown at *a* and *a*, are jointed together, well glued and screwed, then the concave face is worked with a round plane to the curve of the quarter turn. At *d* it is shown how the cylinder is fastened to the stringer and at

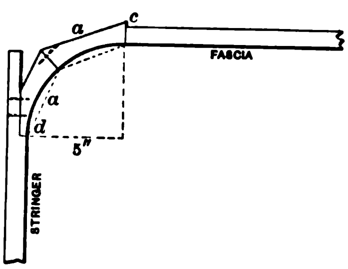


Fig. 24.—Stringer Cylinder for the Quadrant at Landing on Second Floor Connecting to the Landing Face.

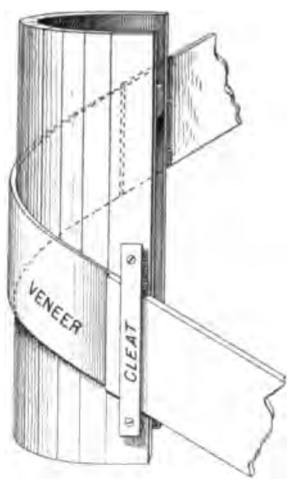


Fig. 22.—View Showing How Cylindrical Piece of Stringer Is Bent on Drum.

made square to the line *o s* and the tangent *d h* square to the line *o h*, which are called the springing lines.

It will be observed that this plan is a reproduction of the stretchout curve and tangents as shown in Fig. 19. Measure from *h* to *n* the hight of four risers, which on reference to the plan, Fig. 19, are shown to be the number of risers contained in the plan curve of the wreath, viz.: risers 3, 4, 5 and 6. From *n* draw the elevation of the steps 7, 8 and 9, as shown; from *d* draw the line

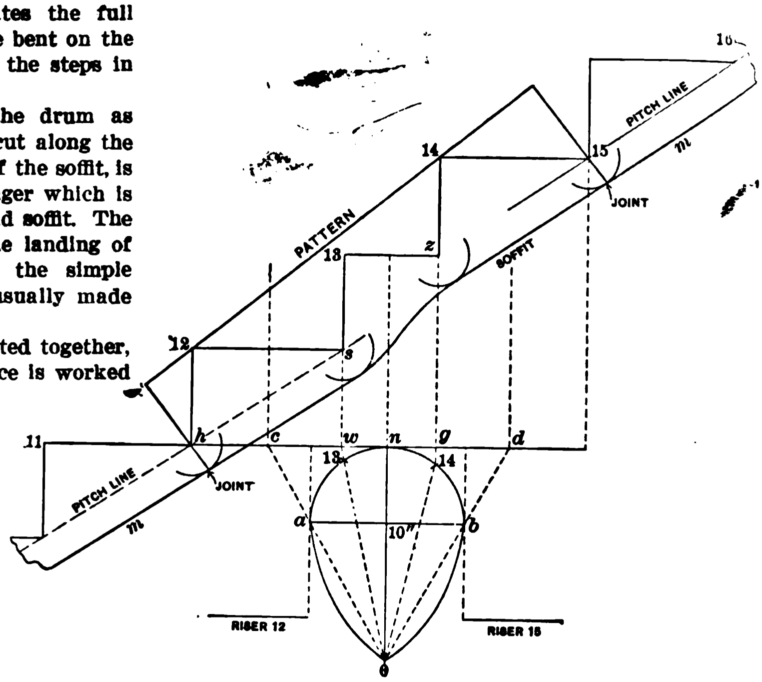


Fig. 23.—Pattern to Bend Around the Concave Face of the Cylinder to Mark for Cutting Treads and Risers.

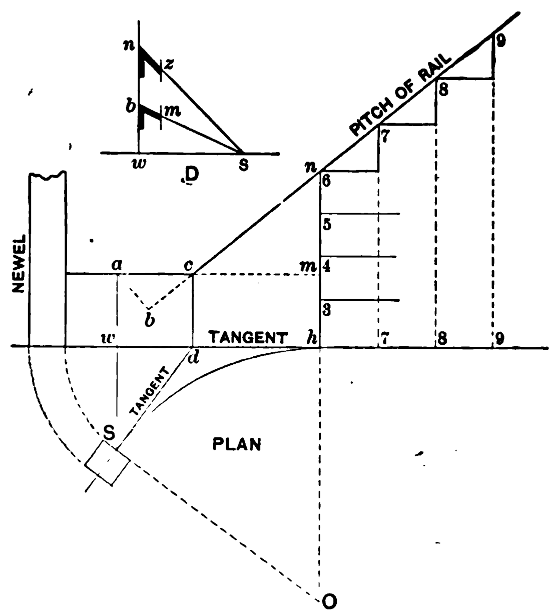


Fig. 25.—Plan and Elevation of the Stretchout Curve and Tangents.

Some Problems in Stair Building.—III.

c that it is merely butted against the landing fascia.

Having in the foregoing explanation and diagrams described how the various curved portions of the stringer are prepared and bent, we will now proceed to show how to lay out the wreaths of the rail to stand over and above these various curves of the stringer. Commencing with the stretchout curve at the bottom of the first flight first draw the diagram shown in Fig. 25, to obtain the pitch over the plan of tangents *s d* and *d h*, and also to find the bevels to twist the wreath. From *o* as center draw the plan curved line to represent the center line of the rail shown in Fig. 19, behind the dotted curved line *a*; then draw the tangents *s d* and *d h*. The tangent *s d* is

d s and through *n* to *c* and *b* draw the pitch line of straight rail, as shown. Now draw a level line from *c* through *a* to the newel post. This line will be the elevation of the level plan tangent *s d* and the pitch line *c n* will be the elevation of the plan tangent *h*. Draw *s w a*, and from *a* draw the line *a b* square to the pitch line *c n*.

To find the bevels make *s w* in diagram D just above, equal to *s w* in Fig. 25, and *w b* in the diagram equal to *a b* in Fig. 25. Draw a line from *b* to *s* in the diagram and the bevel at *b* will be the one required to apply to the end *n* of the face mold shown in Fig. 26. To find the bevel to apply to the end of the mold shown in Fig. 26 make *w n* in diagram *d* equal to *m n* in Fig. 25 and draw a line from *n* to *s*. The bevel at *n* will then be the one required.

In Fig. 26 the most simple method known to lay out the face mold is shown. Draw the plan of the stretchout rail as shown from *s* to *h* and parallel to the level tangent line *s d* draw the dotted lines 4, 4, &c., across the plan of the rail as shown. From the points where these lines cut the ground line as at 2, 2, &c., draw perpendicular lines to cut the pitch line *c n* at 2', 2' &c., and from the points 2' on this line draw lines parallel to the line *s c* of the elevation as shown by 1' 3, 1' 3', &c., and make each line equal in length to their corelative lines on the plan of the rail. Now through the points 1', 1', &c., trace the inside curve of the face mold and through the points 3' 3', &c., trace the curve of the outside of the mold. The method just described is known as the "ordinate" method.

In Fig. 27 is shown how to lay out the face mold by means of pins and strings, which probably is the most common method practiced by stairbuilders generally. Draw the plan of the center line of rail and the tangents *s d* and *d h*, as shown. From *d* and *h* draw the lines *d c* and *h n;* connect *c n* and prolong indefinitely to locate *b* and 5. From *s* on the plan, draw the line *s w a;* with *d* for center and *d s* as radius, revolve point *s* to *g;* upon *g* erect the line *g s'* and connect *s' a c*. Now draw a line through *a* from *b* square to the pitch line *c n*. From *c* as center, revolve point *s'* as shown, to cut the line previously drawn from *b* through *a* in *s"*, and connect *s"* to *c*, thus determining the angle *c* between the tangents as plan center line of rail. On each side of 2 measure to 1 and to 3 a distance equal to one-half the width of the plan rail.

To find the points on the major axis to insert the pins, take the distance *o"* 7 of the major axis in the compasses, and the point 1 on the minor for center and describe the dotted arc cutting the major axis in *z* and *z*, respectively. These are the points where the pins are to be inserted to hold the string to describe the inside curve. Again, take with the compasses the distance *o"* 6 shown on the major, and from point 3 on the minor describe the dotted arc, cutting the major in *y* and *y*. These then will

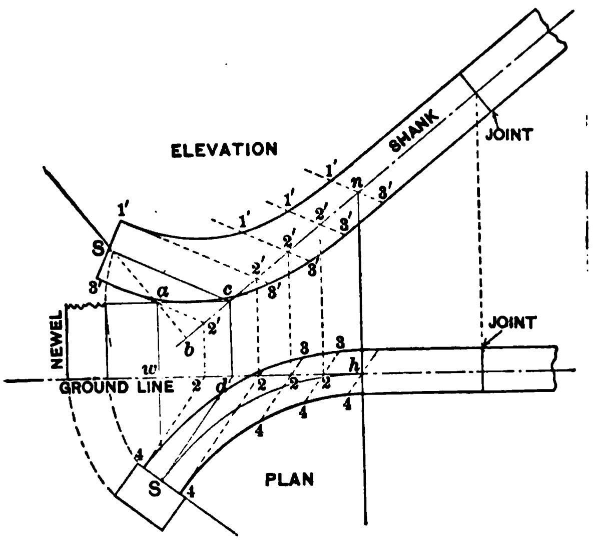


Fig. 26.—Laying Out Face Mold by Means of Ordinates.

Fig. 28.—Showing the Appearance of Wreath for the Stretchout Curve After It Is Squared and the Bevels Applied.

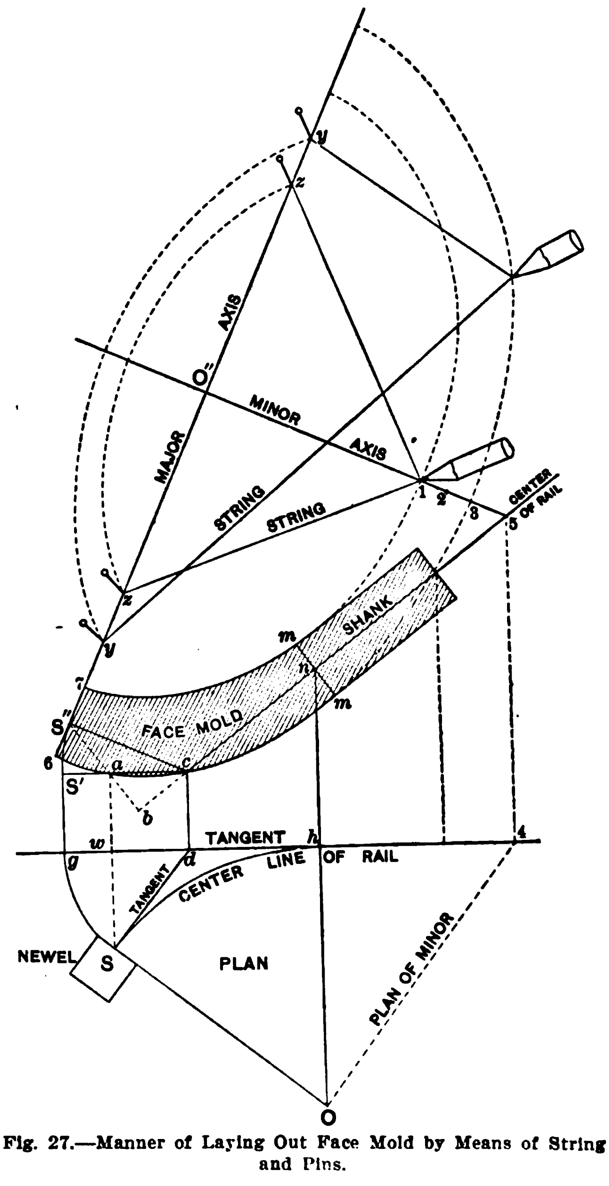


Fig. 27.—Manner of Laying Out Face Mold by Means of String and Pins.

Some Problems in Stair Building.—III.

required on the face mold to square the joints. On each side of *s"*, as shown at 6 and 7, set off the distance *n z'* taken from the bevel *n* in diagram D, Fig. 25, thus determining the width of the mold at the end *s"*. Again on each side of *n*, place the distance *n m*, equal to *b m* in, diagram D, Fig. 25, thus determining the width of the mold at the end *n*.

We will now need to find the major and minor axes of the ellipses that contain the inside and outside curves of the mold. Draw a line from *o* in the plan, Fig. 27, to 4, parallel to the plan level tangent *s d*, and at 4 erect the line 4 5. From 5 draw the line 5 *o"*, parallel to the line *c s"*, making it equal in length to the line *o* 4, the plan line of the minor axis. Through *o"* and square to the line *o"* 5, draw a line to *s"*. The line 5 *o"* will be the semiminor axis, and the line *o" s"* will be the semimajor axis of the ellipses that will contain the curves of the face mold. Now measure from *o"* along the semiminor axis to 2, a distance equal to *o s*, the radius of the be the points on the major at which to insert the pins to hold the string to describe the outside curve. Now, fasten the string tight to the pin at *z* and *z* on the major, stretch it out, as shown to 1 on the minor, place the pencil, as shown, and sweep the inside curve all around from 1 to 7. Again, fasten the string to the pins at *y* and *y*, extend it to 3 on the minor axis, and sweep the outside curve, as shown, from 3 to 6.

The face mold, as shown in the diagram, is but a very small part of these ellipses, extending only from *m m* at the end *n* to 6 7 at the end *s"* of the mold. The remainder of the curves is drawn to show that the face mold for a wreath is merely a portion of certain ellipses, so as to emphasize the necessity of knowing how under all conditions of wreath construction to find the axis of the ellipses containing the curves of the face mold.

In Fig. 28 is shown a view of the wreath after it is squared and the bevels applied to each end and directed toward the inside of the wreath.

Life of the Lodgepole Pine.

In a bulletin from the United States Forester's Office is a description of the lodgepole pine, which sometimes grows to be 300 years old.

The pine got its name from its wide use by the Indians as a support for their tepees. Since the Indians of the Rocky Mountain region dragged their lodge poles to the plains when on hunting trips, a timber of requisite hight but small diameter was sought, and this the lodgepole pine provided without trimming. The names of white pine, black pine, spruce and tamarack are also applied locally. In Wyoming lodgepole pines are more numerous than any other trees, and the species is largely represented in the forests of Colorado, Utah, Montana and Idaho, and to some extent in Washington, Oregon and California. It grows from sea level to 11,000 ft. elevation, and is noted for its variable form and quality. In the Rocky Mountains the wood is lighter in weight and color, less resinous and straighter grained than on the Pacific Coast.

It quickly succumbs to fire on account of its thin bark, but to a certain extent guards against extinction by this cause by producing fertile cones at the early age of from six to ten years. Reseeding after a fire is favored also by the persistence of the cones, some of which do not shed their seeds for a number of years, and by the readiness with which the seeds germinate on mineral soil of burned-over land. A large proportion of the seeds germinate; they are usually borne annually and in large quantities; and since they are small and light, they are carried by the wind as far as 200 yd. from the seed tree.

The yield runs as high as 20,000 board feet an acre, though it does not often run over 7000 board feet. The tree is of small size, seldom exceeding 18 in. in diameter and 90 ft. in hight, but it usually forms dense stands. It is valuable for poles, hewed ties, mine props, stulls, logging poles, converter poles and box boards. The demand for lodgepole pine for hewed ties is especially strong for two reasons: the wood hews easily, and, since the common size of the tree is from 11 to 14 in. in diameter breast high, there is little hewing to be done.

Experiments on a large scale looking toward the use of the tree for paper pulp will be tried by the purchasers of timber from one of the national forests. Three of the largest timber sales of the Forest Service are of lodgepole pine. One of 165,000,000 board feet is in the Medicine Bow National Forest on the Colorado-Wyoming line, and one of 50,000,000 board feet each in the Big Horn Forest (in Wyoming) and the Hell Gate Forest (in Montana). In the Hell Gate sale the saw timber brings $4 per 1000 and the converter poles 10 cents each.

Circular No. 126 of the Forest Service, available upon application to the Forester at Washington, contains tables showing the average number of lodgepole pine trees to the acre, and the associated species in Wyoming and Montana. The principal associated trees are Douglis fir, Engelmann spruce and Alpine fir, though tamarack, Western white pine and Western yellow pine occur also in some places with lodgepole pine. The Douglas fir decreases and Engelmann spruce increases in the mixture going south from Montana through Wyoming, Idaho and Colorado.

Thirty-eight years ago lodgepole pine was cut for railroad ties in southern Wyoming. Only the best trees were taken, and the trees left are now approaching merchantable size. By the settlers the pine is used for many purposes, especially for house logs, fuel and fencing. Because of its tendency to decay when set in the ground fences are built on top of the ground and braced, thus increasing the life of the "post" from 3 to 15 years.

OWNERS of timber in different parts of the country are organizing associations with a view to protecting their holdings from fire, as it is safe to say that fires in this country have destroyed more timber than lumbermen have cut. The plans of the organization in different parts of the country include a system of patrol by rangers resembling the work done by the United States Forest Service in guarding against and extinguishing fires. When timber was abundant the waste passed almost unnoticed, but now that a scarcity is at hand and an actual wood famine threatens in the near future the owners of forest lands are taking action to save what is left.

The Use of Reeds Instead of Lath in Plastering Houses.

The following information concerning the use of reeds as a substitute for lath in plastering houses in Bohemia is furnished by Consul Joseph I. Brittain at Prague, in a report recently furnished the Bureau of Manufactures:

The reeds are found in abundance along the banks of ponds and on swamp lands. They grow from 4 to 6 ft. high and are about ¼ in. in diameter, some even larger. They are woven into mats in width the length of the reeds. These mats are woven by using galvanized wire placed close enough together to catch any odd ends.

The mats are fastened to ceilings by special nails driven about every 6 in. There are two methods for preparing the ceilings for the mats: (1) By nailing to the crossbeams strips of wood 5½ in. wide by ½ in. thick and 1½ in. apart, to which the mats are fastened; (2) nailing to the crossbeams lathing 2½ in. wide by ½ in. thick, to which are fastened the mats. The first method is used in the construction of houses of the better grade and the second in cheaper grades of houses.

Here the houses are built of brick, having rough surfaces, to which the plaster is applied to the inner walls direct without the use of laths of any sort, these being only used on the ceilings. The reed matting sells to contractors at 2½ cents per 1.196 sq. yd.

It does not appear that there would be any saving of lumber if the United States were to adopt the use of reeds in place of ordinary plastering laths, as a solid wood surface under them is necessary. The reeds, on account of their frailness, could not be attached directly to the studding used in constructing the walls of an American frame house.

Women are largely employed in Prague and elsewhere in Bohemia as ordinary day laborers in the construction of buildings; they mix mortar, sift sand and carry bricks and mortar to various parts of the buildings being constructed. For such service they are paid from 32 to 37 cents per day. Women also unload coal, carrying it from the wagon on the street to the cellar of the building. For this they are paid 40 cents per day, and work from 6 a.m. to 6 p.m., with an hour for dinner.

Bulletin on Trussed Roofs.

The engineering experiment station of the University of Illinois, Urbana, Ill., has recently issued what is known as bulletin No. 16, which briefly presents the results of several years' study of trussed roofs by Prof. N. C. Ricker of the department of architecture. The information presented is of such a nature as to be of suggestive value to all those interested in the designing and construction of trussed roofs.

About 50 trusses of a selected type anw of different proportions and arrangement were designed in long leaf pine and steel and changed until the assumed and actual weights of the trusses agreed. Other trusses were likewise designed in white pine and steel and a few entirely constructed of steel. To perform this work as conveniently and as rapidly and accurately as possible, it became necessary to devise simplified formulas and tables, with a systematic method of treatment, all of which are fully explained in the pamphlet.

The results illustrated are mostly shown in graphic tables for ready appreciation. The most important features are a new formula for the weights of trusses; per cent. of weight to be added for connections; most economical ratio of depth to span of truss; distance between trusses; number of purlins per panel, and dimensions of panels.

It was found that white pine and steel trusses are about 10 per cent. lighter than those of long leaf pine and steel; also, that if carefully designed, steel trusses from 100 to 200 ft. span have about the same weight as those of white pine and steel.

A Two-Family Dwelling with Half-Timbered and Plastered Exterior.

THE English half timbered effect in connection with dwelling construction has been year by year growing in popularity, and many of the designs of the present day in which this treatment is a feature are both striking and attractive. The use of plaster or "stucco," as it is occasionally called, for the exterior of a building finished in what is known as "slap dash," "pebble dash," or "rough cast," style, is also a feature of current domestic architecture, and the two forms of treatment in combination, one being used for the first story and the other for the second story, are decidedly effective. A most interesting example of such external treatment of a building is afforded in connection with the design of the two-family dwelling which we present herewith. The plans clearly show the general arrangement of the rooms on the two floors, while the details indicate the construction and finish.

A noticeable feature of the internal arrangement is that every room in the house can be reached without the necessity of passing through any other. The sleeping rooms and bath room on each floor are arranged on one side of the hall or passage way, while the living room and dining room are on the other side. The kitchen is directly in the rear, accessible from the passageway or corridor through the butler's pantry. There are front and rear flights of stairs and though the tenants of the two floors have the same front door entrance it is only the vestibule that is used in common. The cellar is divided so as to give each family a laundry, fuel bins and heater.

According to the specifications of the architect the foundation walls are of stone, laid up in cement mortar. The walls are faced on the inside their entire hight, and on the outside from 1 ft. below the finished grade. The house is balloon frame; the cellar being 8 ft. in the clear and the first and second stories 8½ ft. in the clear. Bricks laid in mortar are used to fill in on top of the sills between all outside studding on the first floor to a hight of 4 in. above the floor, and also between the studding of the first floor partitions to serve as a "rat course." The cellar has a 3-in. concrete floor made up of 2 in. of Rosendale cement and 1 in. of Portland cement, smoothed off and left with a slight pitch from the center to the walls in each direction.

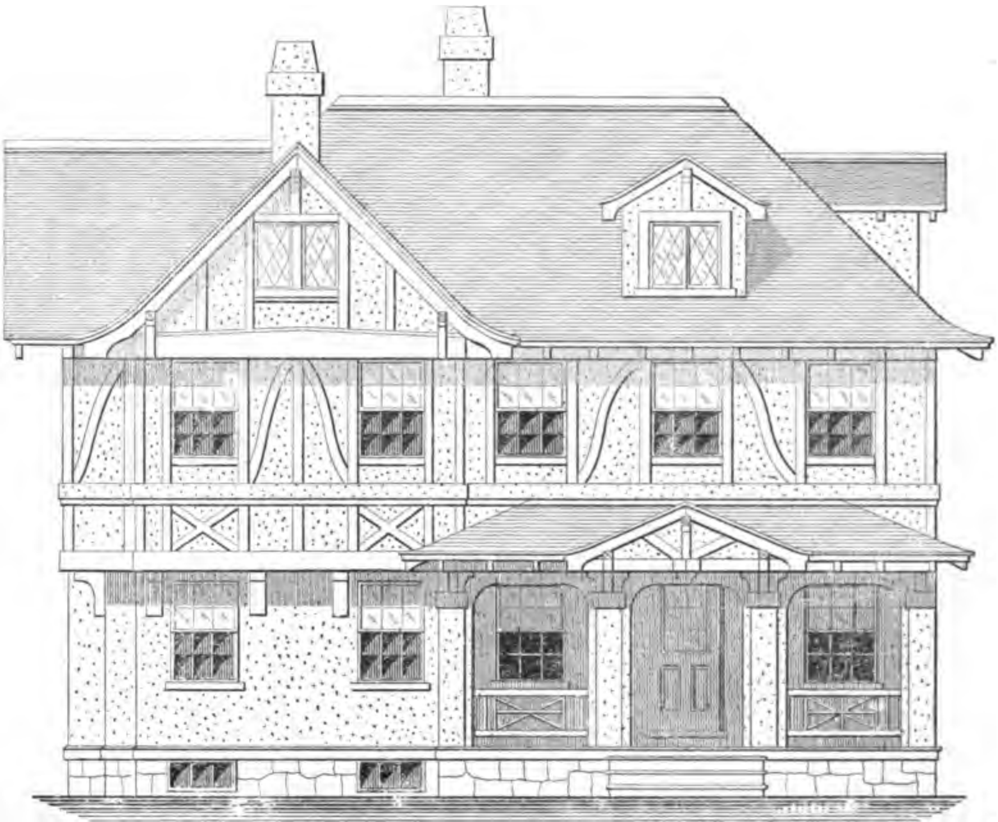
The sills and girders are 6 x 8 in.; the posts and girts 4 x 8 in.; the plates are of two 2 x 4s; the first and second floor joists are 2 x 10 in., and the second floor ceiling joists 2 x 8 in., placed 16 in. on centers. The rafters are 2 x 8 in., placed 20 in. on centers, and the valleys are 2 x 10 in. The floors are cross bridged, and headers and trimmers are doubled. The partition studs are 2 x 4 in., placed 16 in. on centers, doubled at all openings, and trussed over all doors. All unsupported partitions are trussed.

The outside walls and roofs of the dwelling are covered with hemlock boards over which is placed a layer of best quality Neponset building paper. This in turn is covered with wire lath, nailed to furring strips and covered with three-coat plaster work, the last coat being mixed with a little yellow ochre to give it the required color.

The roofs are covered with cypress shingles, laid 4½ in. to the weather. All outside finish is pine. The porch and piazza floors are of ⅞ in. hard pine boards, 4 in. wide, laid with slight pitch from house wall outward. The walls and ceilings of the rooms in the first and second stories are lathed and plastered with two-coat work.

The floors of the two stories are doubled, the under ones being of hemlock and the finish floors of Alabama hard pine 3-in. boards, with two thicknesses of Rosin sized I. X. L. paper between.

The inside finish is of whitewood with the exception of the kitchen pantry and back stairs, which is of North Carolina pine. The dresser on each floor is constructed with 24 in. counter shelf, four drawers and cupboard underneath and four 12-in. shelves above, and enclosed with swinging glass doors. The rear stairs have ⅞-in. risers, and treads of North Carolina pine, with base molding of the same material following up the rake of the stairs. All the sleeping rooms have 5 in. molded archi-



Front Elevation.—Scale, ⅛ In. to the Foot.

A Two-Family Dwelling with Half-Timbered and Plastered Exterior.—V. H. Wigglesworth, Architect, Chelsea, Mass.

traves with stool and apron. The base is 7 in. high, with 2-in. molding. The finish in the bath rooms is the same as that in the sleeping rooms, except there is no picture molding, but instead, a dado cap, 4 ft. high and 4½ in. wide. The finish of the hall is in whitewood and has a dado 3 ft. 6 in. high with a 4-in. molding. The finish of the front stairs is also in whitewood, except the treads, which are of North Carolina pine. The newel post is 4½ in. square, with molded cap.

The house is wired for electric lighting and call bells and is fitted with speaking tubes. The door into the hall is provided with an electric latch, and operated from the passage on the first floor and another on the door to the stair hall, operated from the passage on the second floor. There is also an electric latch on the rear porch door, operated from the kitchen of the second floor. The wiring provides for five automatics, one in each cellar, to light from the first story rear and second story rear; one in the front hall of the lower tenement; one in the lower hall of the upper tenement to light from the upper hall, and one in the upper hall to light from the lower hall. The lights are of the incandescent type, rubber covered wire being used throughout, and run in porcelain insulators in bays.

In the basement are two Magee furnaces for heating purposes, and having a capacity for maintaining a temperature of 75 degrees in all rooms when the weather outside is at zero. The plumbing in the bathrooms is of the open type, and the laundry tubs in the basement are soapstone.

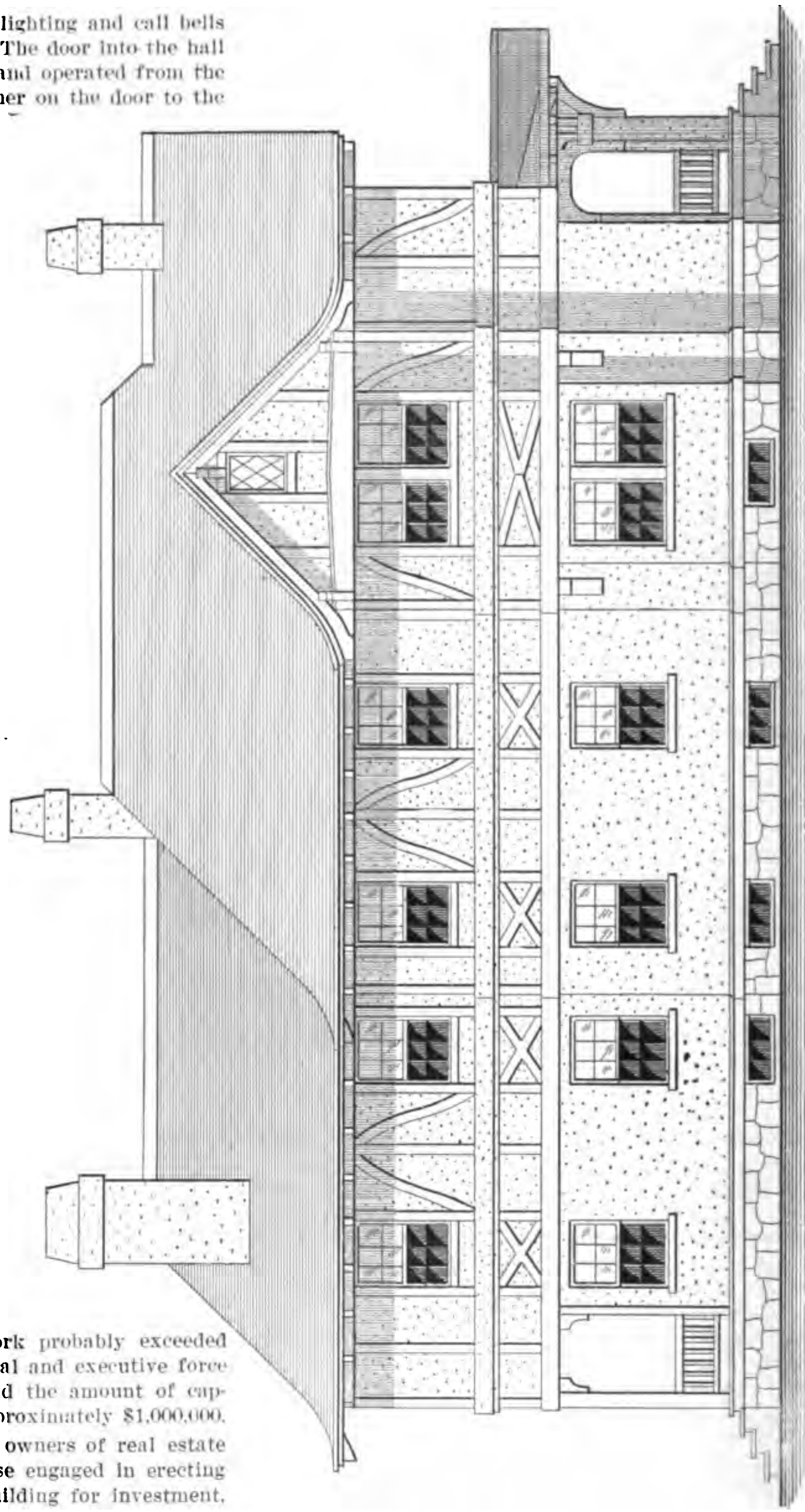
The two-family dwelling here shown was designed by Architect V. H. Wigglesworth, 174 Franklin avenue, Chelsea, Mass.

Metal Covered Woodwork.

The use of metal covered woodwork in high grade buildings of every nature has come to be an established fact, and the progress made by the manufacturers in this industry during the recent past will compare favorably with any other features of up to date building construction. During the busy portion of the year just past the number of mechanics employed in the manufacture and erection of this material in connection with shops located in Greater New York probably exceeded 1500 men, in addition to the clerical and executive force required in the various plants, and the amount of capital invested is estimated to be approximately $1,000,000.

It should be of interest to the owners of real estate in general and particularly to those engaged in erecting business properties, or who are building for investment, to know that the proper use of metal covered woodwork in their buildings can be made a positive source of perpetual income, says J. F. Blanchard in the annual review number of the *Record and Guide*. An explanation of this statement is found in the fact that insurance interests have recognized the merit, as a fire retardent, of properly constructed work of this nature, and are making concessions in rates, that in a short time offset the difference in cost of the initial expense, thereby making an annual saving of the amount of concession after the lapse of such period. Furthermore, as the reduction of insurance rates also applies to contents of buildings, a higher rental is obtainable, and a better class of tenants.

It is also of interest to note that advancement has not only been made in the volume of manufactured product, but the improvement in character of the finished work has been very great. Manufacturers have realized the necessity of competing with cabinetmakers, in following architects' details, and their success has been marked in this particular. Necessity has proved to be the mother



A Two-Family Dwelling with Half-Timbered and Plastered Exterior.—Side (Left) Elevation.—Scale, ⅛ In. to the Foot.

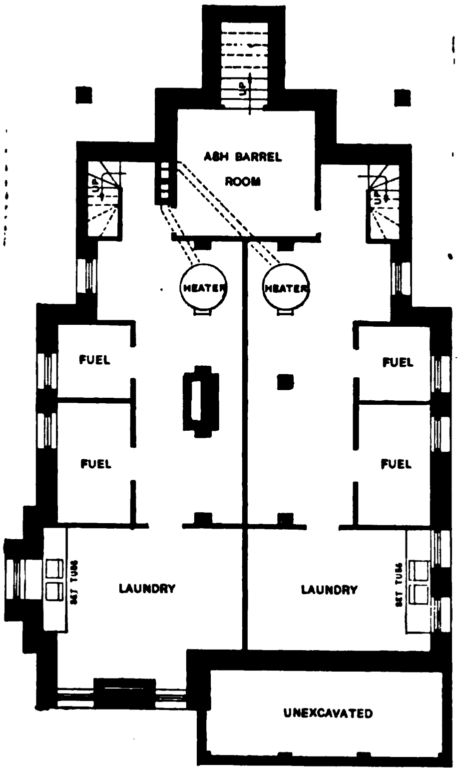
of invention, and new methods and new machinery combined with ingenuity and skilled workmen have made it possible to meet the most exacting demands in this particular, and in place of the crudely formed members that were considered some years ago to be the best that could be produced, we now find as sharply defined arises in molding as any woodworker can secure—and paneling, pilasters, columns and architrave work of every description worked out to the architect's drawings in the minutest detail.

Among the recently constructed buildings of prominence in which metal covered woodwork has been used to a considerable extent might be mentioned the Plaza and the Belmont hotels. All exterior window frames and sash are covered with copper; also all elevator, dumb-waiter and stair enclosure doors. A novel feature of the interior work is an arrangement whereby in case of fire the metal covered doors enclosing the stairways throughout the building close automatically, making fire-proof exits within the building accessible to guests from various parts of each floor. The telephone booths in the Belmont are also made entirely of metal covered wood-work, bronze having been used in this instance. These two hotels are undoubtedly the best equipped buildings of their kind in the world, from a fireproof standpoint, and this result is largely due to a liberal and intelligent use of metal covered woodwork.

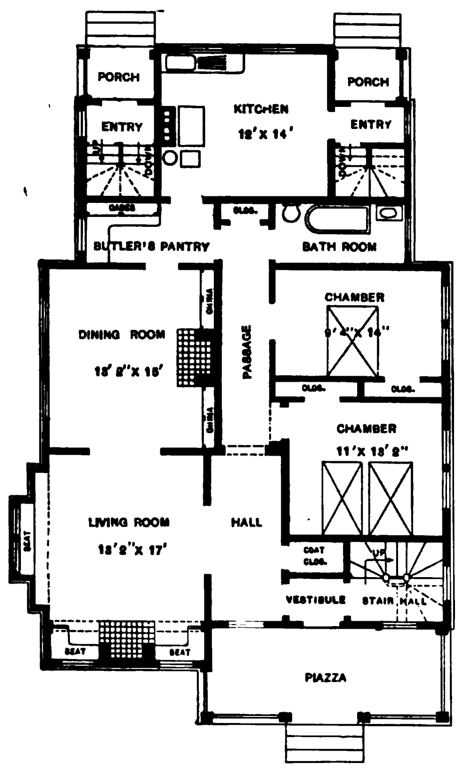
Metal covered woodwork is used very largely by the city in its school work. Every school building erected in Greater New York has all stair exits protected by metal covered doors, and this material is now being used very largely in the construction of pupils' wardrobes, teachers' lockers, bookcases, &c., thereby reducing the fire risk to a minimum. Inasmuch as the city carries no insurance on their buildings this precaution is certainly wise and speaks loudly in praise of this product.

The use of metal covered woodwork is not, however, confined to public buildings or business properties. It is being used to a considerable extent in the finest residences and apartment houses. The Brokaw residences and the Senator Clark house on Fifth avenue, also the Charles M. Schwab residence on Riverside Drive and many others throughout the city contain a large amount of this product and of the highest type of workmanship.

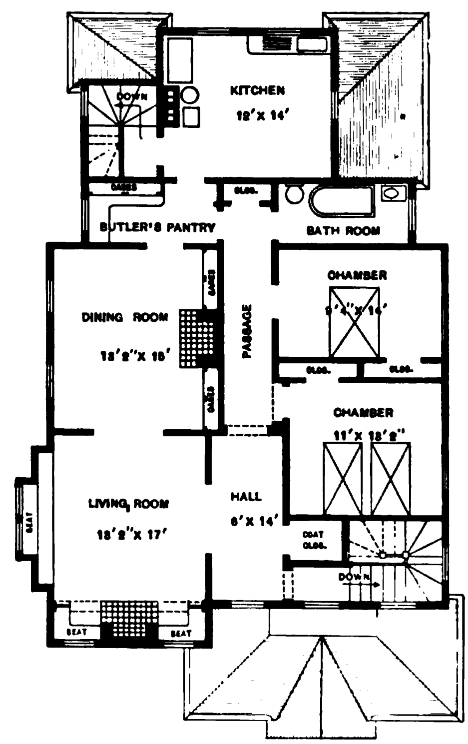
It would be impossible to estimate the aggregate amount of property value (to say nothing of human lives) that has been saved from loss by fire by the use of metal covered woodwork, but the figures would certainly be startling, and as it is now quite possible to not only have every piece of exposed woodwork in a building made fireproof by this method, and still retain architectural and decorative effects, but also to have fixtures and furniture made in the same manner, the future in this industry seems assured, believing as we do that its merits are bound to be recognized and that the demands of a discriminating public for the best possible protection against the most destructive of the elements will result in a much greater and more general use of this product.



Foundation.



First Floor.

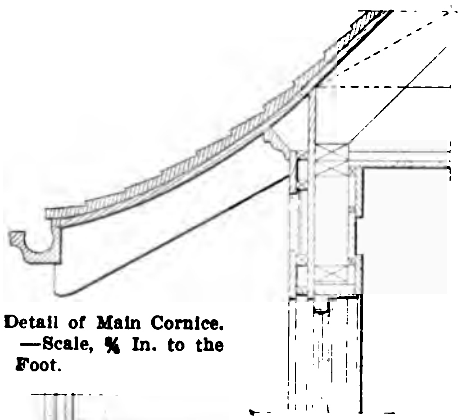


Second Floor.

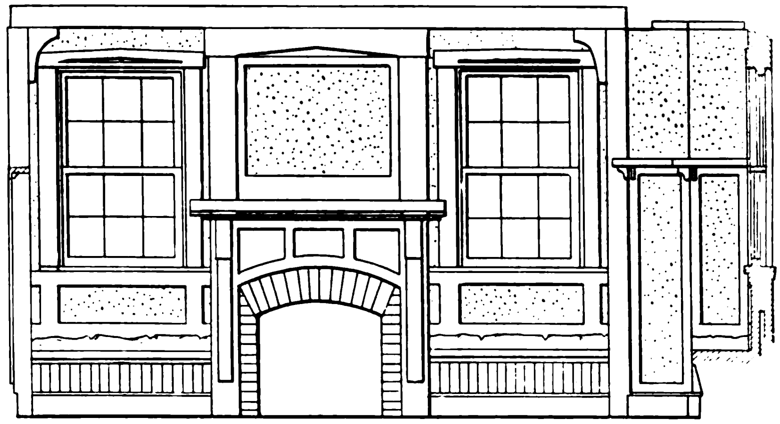
A Two-Family Dwelling with Half-Timbered and Plastered Exterior.—Floor Plans.—Scale, 1-16 In. to the Foot.

Method of Plastering Concrete Surfaces.

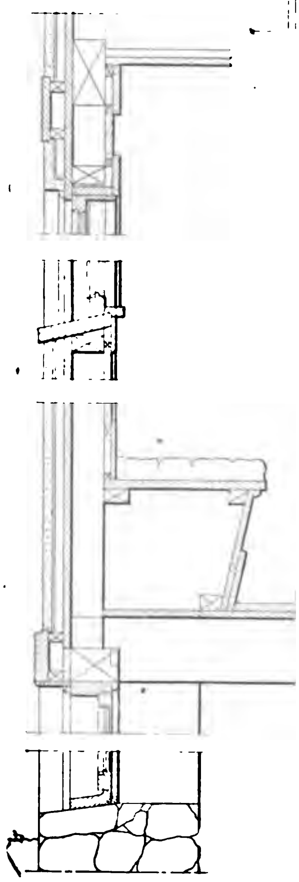
The new stadium at Syracuse University constructed of reinforced concrete has its exposed surfaces finished with plaster applied as follows: At frequent intervals wire nails were driven into the forms on the inside, so that the pointed ends projected about 2 in. outside of the rough concrete after the forms were removed, says *Engineering Contracting.* Before applying the plaster a small iron nut was put on each projecting nail. Wire lath was then spread against the surface and fastened by bending the projected ends of the nails over it with a hammer. The nuts served to keep the lath about ¼ in. away from the concrete. The wire lath used was 2½ mesh No. 20 wire; the nails were about 4 in. long, and the nuts were either square or hexagonal and about ¼-in. high. The plaster was put on in two coats of a total thickness of from ¾ to 2 in. The scratch coat was composed of 1 cement, ¾ lime and 3 sand mortar, and the finishing coat 3-16 in. thick, of 1-1¾ cement and sand mortar; the sand was white beach sand. To carry the plaster to the desired lines iron templets were placed at intervals and the plastering finished to them. Before the



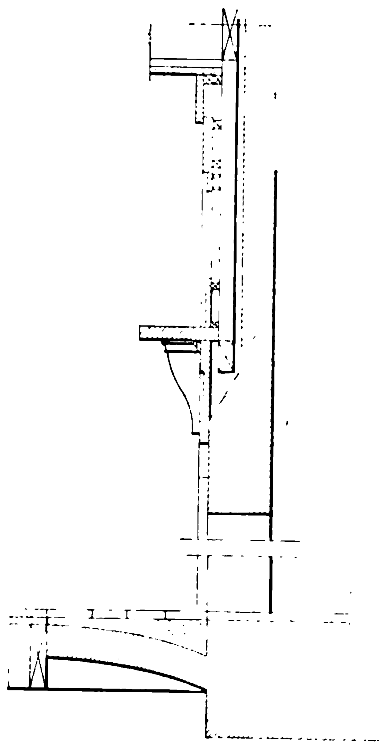
Detail of Main Cornice. —Scale, ¾ In. to the Foot.



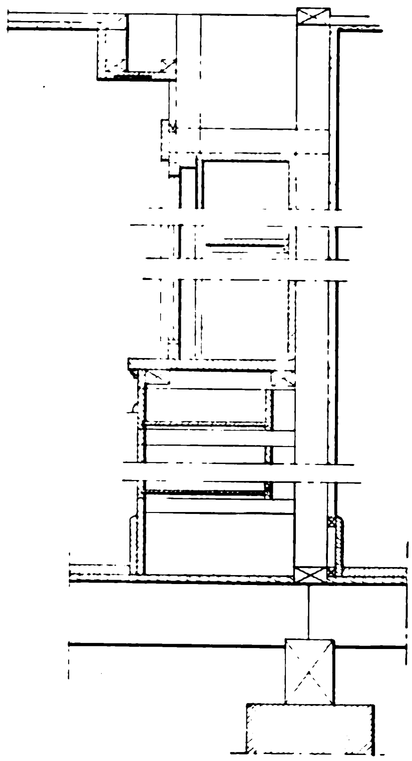
View in Dining Room Looking Toward the Fireplace and China Closets.



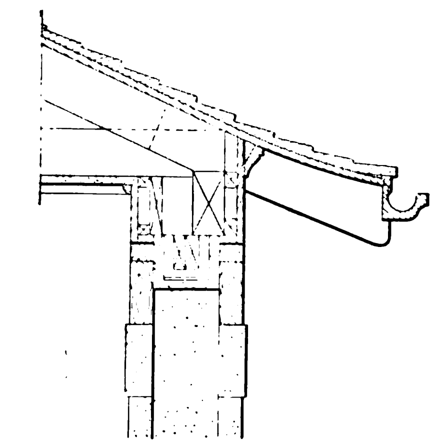
Section of Window Frames and Seat in Living Room.—Scale, ¾ In. to the Foot.



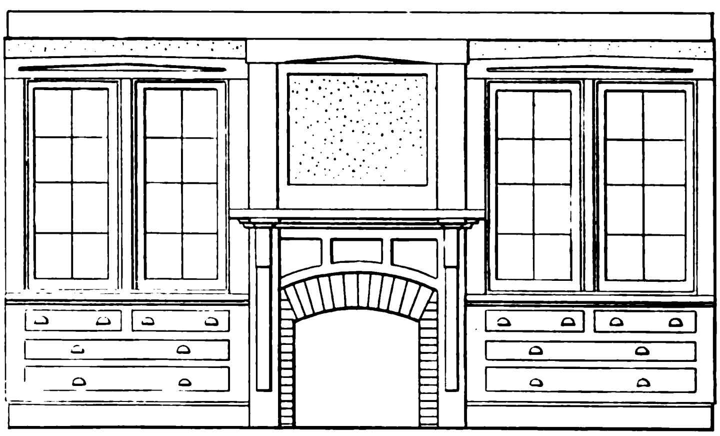
Section of Mantel in Dining and Living Rooms.—Scale, ¾ In. to the Foot.



Section of China Cases in Dining Room.—Scale, ¾ In. to the Foot.



Details of Porch Cornice.—Scale, ¾ In. to the Foot.



View in Living Room Looking Toward Fireplace with Seats Either Side.

Miscellaneous Constructive Details of a Two-Family Dwelling with Half-Timbered and Plastered Exterior.

finishing coat had commenced hardening the templets were pulled out and the voids filled. The second coat of plastering was put on when the scratch coat commenced hardening, and was troweled to a smooth finish. While the plastering was being done the work was protected from the sun by wooden sheds, which were erected over it and moved according to the progress. During the hardening of the plaster it was covered with burlap on top of which was a layer of sand kept constantly wet.

Brick Production in 1907.

During 1907 a production of 9,795,698,000 common brick was reported, valued at $58,785,461, a decrease in quantity of 2.31 per cent., and in value of 4.10 per cent., as compared with the production and value of the output in 1906, according to the United States Geological Survey.

New York held first place in 1907, as in 1906. A production of 1,494,807,000 common brick, valued at $6,499,-777, or $4.35 per thousand, was reported by Illinois in 1907, as against 1,195,210,000 brick, valued at $5,719,906, or $4.79 per thousand, in 1906—a gain in the latter year of 25.07 per ceint. in quantity and of 13.63 per cent. in value.

The average price per thousand for common brick in 1907 ranged from $10.04 in Wyoming to $4.35 in Illinois, the average for the whole country being $6, which was the same as that for Indiana. In 1906 the average for the whole country was $6.11, the extremes being $4.38 in Kansas and $9.69 in Wyoming. In value common brick constituted 45.64 per cent. of all the brick and tile products and 36.99 per cent. of all the clay products; in 1906 these percentages were, respectively, 47.30 and 38.07.

Growth of Interior Wood Work.

What is known as the mill work business, the manufacture and putting up of interior woodwork, in dwellings especially, has developed wonderfully the last few years, not so much in point of quantity as in quality. There has been a continual seeking for something better, for something different, and at present the builders of good homes want a wood that furnishes naturally something near the color scheme they have in mind, and this they went finished natural or with a slight stain. They don't want the old paint coloring, but they want a wood that shows a grain and has distinct characteristics of its own and generally they want it dull finished; not highly pollshed or covered over with a cheap, glary varnish, but well rubbed and neatly finished.

All this is pretty well known to the woodworking trade, but now there comes a new idea that is startling at first, but eventually carries us back to old times, says a writer in a recent issue of the *Wood-worker*. There is quite a tendency to decorate rooms all over; that is, finish the interior walls with woodwork of one kind and another instead of plastering, calcimining or papering, especially where the builder can afford it. It is rather expensive to do this in conformity with modern ideas because of the artistically laid panels and the use of practically clear stock that can be finished natural. But in spite of its expensiveness it is gaining in favor with those who can afford it and it is adding materially to the volume of the woodwork of the planing mill.

This recalls old times inasmuch as in the earlier days, in what might be termed the pioneer days of modern home building in this country, most of the houses were ceiled with lumber, both on the walls and overhead, and either finished natural or painted in whatever colors were desired. Lots of excellent lumber has been put up and had the figure spoiled by painting. Some of the old-time houses, instead of ceiling overhead, had dressed and beaded beams or heavy joists which were painted, and the bottoms of the floor on top of it were painted, too, and this made the ceiling of the room. There is now quite a tendency to turn to this old beam effect also, but, of course, in a different manner, just as they would return to interior wood decorating in a different manner.

In the earlier days the idea was to get an interior lining for the house at a comparatively small expense, and very little was thought of the artistic features of the wood itself. Generally where some one wanted to put on style, as it was called in those days, they painted the ceiling. Then came the plastering, which began in the cities distant from the source of supply, where wood was scarce, following next into the prairie sections of the country, where lumber was also valuable, but finally coming into such general use that plastering lath and plaster practically crowded out wooden ceiling in nearly all house building. So now to have plastering begin to give way to interior wood decorations for the walls naturally recalls old times, but it is not carried out in the old-time way. Artistic effects are studied and designs are varied wonderfully and different kinds of woods are used, making it expensive rather than economical, but the people want it, and it looks like there is going to be quite a lot of this kind of interior woodwork in the next few years.

Asbestos Slates.

According to a German publication, a firm in Munich has succeeded in artificially rendering asbestos waterproof, and has put upon the market a product known as asbestos slates, which are thus described: "These asbestos slates, it is claimed, are as hard and as strong as the natural slates, and can therefore be laid on wall or roof constructions without any wooden laths being necessary. They are very easily worked, and can be bored, nailed, and cut just like wood, without any danger of splitting. They form a fireproof covering for inside and outside wooden walls, are valuable for insulation work of all kinds, even for electrical purposes; are of great use in building carriages as insulating material under the seats, for use in postal telegraphic work for insulating switches; for covering iron and wooden constructions; for use as fireproof doors for closing off single rooms in stores, warehouses, &c.; for lining wooden doors, and for covering walls and ceilings of all kinds so as to protect them from fire, heat, cold, dampness, disease, germs and vermin."

Testing Wood with the Microscope.

A new line of work, consisting of the microscopic examination of wood after it breaks in a testing apparatus, has just been started by the office of wood utilization in the United States Forest Service.

The structure of wood is complex. Every species has several different kinds of cells, each of which has its own size and form. There is also a wide variation in the number and arrangement of the cells in different species. These differences in structure have their bearing on the strength of the wood.

For some time past the Forest Service has been carrying on a large number of tests on many kinds of wood in order to determine their strength, stiffness, elasticity and other physical properties, so that they may be used to the best possible advantage in construction. The application of microscopic work to such tests should give a better knowledge of the conditions on which the strength of wood depends.

Laymen will not understand the significance of the proposed microscopic investigations so quickly as architects, builders and other wood users, who in these days of growing scarcity of the more valuable woods will find the knowledge invaluable.

Other problems connected with the structure of wood, such as the preparation of wood plup and the treatment of wood with preservatives, will no doubt be aided by this new study.

The $1,500 Kind.

"Ah, that's pretty!" said Mr. Snooks, looking over a number of architectural designs. "What is that?"

"That," said the architect, "is a $1500 bungalow."

"What will it cost to build it?" asked Mr. Snooks.

"About $8000," said the architect.—Judge's Library.

Carpentry and Building

WITH WHICH IS INCORPORATED
THE BUILDERS' EXCHANGE.

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14-16 PARK PLACE, NEW YORK.

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(Entered at the New York Post-Office as Second-Class Mail Matter.)

DECEMBER, 1908.

Invectives Against Mechanical Ventilation.

Students of heating and ventilation have to suffer every little while from the well meaning but unfortunately damaging criticism of a man looked on by the public as capable of expressing an opinion on the subject. This expert is usually a doctor of medicine identified with the health bureau of the community. He visits the building which should avowedly be properly ventilated and finds, usually through the sense of smell, that conditions are not as they should be. He notes that some kind of a mechanical system is installed and immediately comes his dictum that such a system falls far short of the mark. That it may be faulty in some detail, or that it is the layout of a man incapable of creating a satisfactory design does not seem to occur to him, but instead the closed windows said to be a necessary condition of proper operation coupled with irritating odors are sufficient for an invective against the mechanical system as a class. There is small comfort for the heating engineer and contractor in this, but they will continue in their work if they are sure of their ground. If there were not successful mechanical ventilating plants backing up with accomplishment the requirements of theory, it would be different. But there are, and the mistakes in one plant cannot long be used to condemn all.

Fresh Air and Sanitation.

The inconsistency of humanity is frequently manifested. A notable instance was brought to light when the health officer of Greater New York found it necessary the past summer to insist upon the breaking up of a camp composed of people living in tents, who had left the thickly settled portions of the city for the shore in order to derive the benefit from a change of scene and outdoor life with an abundance of fresh air. The history of military operations amply shows the necessity of efficient sanitary precautions wherever a large number of people congregate even for a short time. Apparently those who are impressed with the benefits to be derived from fresh air had given no thought to the necessity of making proper disposal of the wastes. The negligent manner in which the wastes were treated gave promise of being a menace not only to their own health but that of the community, and led to the health officer taking steps which disbursed the camp. At the same time the same officer, with his assistants, witnessed the evacuation of a hotel building in the midst of Coney Island which had no proper sewer connection, and under his order was untenantable until proper sewage disposal arrangements are provided. This experience only shows again that the advice of a broadminded man should rather be given attention than that of those who are enthusiastic upon some one subject, as that which has led to the appellation "fresh air fiend."

The Union's Right to Fine Their Members.

Much has been accomplished by the courts of the several States in the past year or two in establishing the limits within which difficulties between employers and their employees may be legally carried on in the attempt to secure settlement under the duress of strikes. The Massachusetts Supreme Court has just made another contribution to this class of legal precedent in a decision which determines the principles underlying the rights of the several parties where a labor union seeks to use the punishment of the fine in compelling its members to join in a strike, the court holding that the union may be enjoined from imposing a fine under these conditions on the ground that a third party, the employer, would be a sufferer by the action. The decision in a previous Massachusetts case is affirmed, in which it was held that "the imposition of such a fine by which members of an organization were coerced into refusing to trade with the plaintiff (the employer), not a member, to his great damage," was inconsistent with the ground upon which the right to competition in trade is based, and against him was not justifiable. The case just decided was that of the Willcutt & Sons Company vs. Driscoll and others, members of the Bricklayers' Benevolent and Protective Association, in which the plaintiff prayed for an injunction restraining the union from imposing fines on members where the sole purpose was to compel workmen to go out on strike. A strike was in progress, and the defendants found two men at work for the plaintiff, one a journeyman who had been a member of the union, the other a foreman who was then a member. These men were threatened by the defendants with fines of $100, but refused to leave their work. The defendants reported the fact to the union, and it was voted to prefer charges against the two for working contrary to the union rules. A temporary injunction was issued, restraining further action. In deciding the case for the plaintiff the majority of the court holds:

> If it were only between the person fined and the party imposing the fine, then with some degree of plausibility it might be said that the former had no right to complain or at least had waived the right; but it is manifest that neither of the immediate parties to the fine can, either by agreement among themselves or waiver, justify the invasion of the right of a third party, if any he has, to object to it. It cannot be successfully contended that as against the right of some party other than the association and its members an act, otherwise a violation of the third party's rights, is any less a violation because done by some member in obedience to a by-law. An interference with the right of a third party cannot be justified upon the ground that the intruder is acting in accordance with an agreement between him and some other person. In a word, so long as a fine is imposed for the guidance of members in matters in which outside parties have no interest, or in which there is no violation of a right of an outside party, then no such party can complain. But when the right of such party is invaded it is no defense, either to the person fined or to those who have imposed the fine, that the invasive act was done in accordance with the by-laws of an association. If it be said that the member fined may take his choice either to leave the organization or abide by its rules to which he has before assented, and that where there is a choice there can be no coercion, the answer is that in almost every conceivable case of coercion, short of an actual overpowering of the physical forces of the victim, there is a choice. The highwayman who presents his cocked pistol to the traveler and demands his purse under pain of instant death in case of refusal offers his victim a choice. He may either give up his purse and live or refuse and die. And so the member of a labor union has the choice either to pay the fine or leave the union. Is it difficult to realize what that choice is in these days of organized labor? Is it too much to say that many times it is very difficult, indeed practically impossible, for a workman to get bread for himself and his family by working at his trade unless he is a member of a union?

The court goes on to state that labor unions are entitled to protection to the extreme limit of the law, but holds that to allow such fines threatens a free labor market. A minority opinion of the court, signed by two justices, states:

The law does not do so vain a thing as to allow the formation of labor unions and to declare their right to initiate and by lawful means to carry on a justifiable strike, and then refuse them the use of the only practical means by which their acknowledged rights may be secured. What seems to us the fallacy of the majority opinion is its failure to act upon the fact that the strike in this case was upon justifiable grounds, and, of course, was lawful. The right of an employer to conduct his business without interference in the labor market is subordinate to the right of his employees to strike and to maintain the strike in a lawful manner. As against this right of the employees the employer has no right to have their labor flow to him uninfluenced or undiverted.

The opinion of the minority of the court in this case appears to be more reasonable. Unions are formed for the purpose of securing advantages for their members, either by making demands for better terms from employers or by resisting reductions in wages. This being recognized, how are they to enforce discipline among their members except by fines? They must not resort to violent methods, and when they simply use the peaceful means of a fine it would seem wise not to interfere with such a regulation.

An Office Building That is Fireproof.

One of the features of the new 17-story mercantile and office building now in course of erection at the corner of Fourth avenue and Seventeenth street, Borough of Manhattan, N. Y., is the fire resisting qualities of the particular type of construction employed. The idea is to reduce the fire risk to a minimum and meet to the fullest extent the requirements of the New York Board of Fire Underwriters and the New York Fire Insurance Exchange. This has been secured through the adoption of the skeleton steel frame type; that is, making use of steel columns, beams and girders protected for all basement and outside columns in Portland cement mortar and for all interior columns by at least 3 in. of hollow terra cotta blocks laid in Portland cement mortar. The floor arches throughout are of hollow terra cotta blocks in Portland cement mortar extending 10 in. below the soffit of the beams and all floors cement finished on a concrete filling.

The windows in the court walls and party walls will be of standard hollow metal glazed with wire plate glass, and the windows on the street fronts will be of Kalameined metal covered frames and sash. The stairways are to be constructed with extra heavy cast iron stringers and risers with sheet iron treads. All doors leading into stairways will be of the standard "Richardson" type with hinges, locks, &c., approved by the New York Fire Insurance Exchange.

The elevator shafts will be of standard construction inclosed in 6-in. terra cotta block partitions. A complete 50 per cent. sprinkler equipment with all necessary apparatus will be installed, the sprinkler pipes throughout the building being concealed. An automatic fire alarm service, a special building signal service and the watchman's clock system in each stair landing on every floor of the building are other features to be incorporated, looking to the protection of the structure against destruction by fire. The architects of the new building are Goldwin, Starrett & Van Vleck, 150 Fifth avenue, and the general contractor is the George A. Fuller Company, New York City.

IT is expected that the new Oliver annex to the Southside Hospital, in Pittsburgh, Pa., will be ready for occupancy by the first of the year. The building is 80 x 120 ft. in plan, five stories in hight, and will have a capacity for 250 patients. A unique feature of the structure will be the ventilating system, which, it is said, has been adopted in no other institution in the country except the new Pennsylvania Railroad Station, in Manhattan, N. Y. The air is first washed and dried, and then the proper amount of humidity added before it is pumped into the various rooms. Public wards will be located on all of the first three floors, with semi-private wards for patients who are partially supporting on the third. The operating rooms will be on the fifth floor, and on the roof will be recreation space and sun parlors for convalescents. The interior will be finished in marble and oak, while the wards will have floors treated with a cement asbestos composition.

Meeting of National Association of Cement Users.

The fifth annual convention of the National Association of Cement Users will be held in Cleveland, Ohio, during the week of January 11 to 16, 1909. The headquarters and meetings of the convention will be at the Hotel Hollenden, Superior avenue and East Sixth street. The association has in contemplation a valuable series of papers, which will make the programme of the convention highly attractive. A number of reports of importance will come up for consideration, and which it is expected will provide additional specifications, thus increasing the number already adopted.

The exhibition of cement products and appliances will be held at the Central Armory, which is admirably suited for the purpose and is located only two blocks from the convention hall.

Convention of Brick Manufacturers.

It has been decided by the Executive Committee to hold the twenty-third annual convention of the National Brick Manufacturers' Association in the city of Rochester, N. Y., during the week, February 1 to 6, inclusive, 1909. The headquarters will be at the Seneca Hotel, one of the city's largest and newest hostelries.

The American Ceramic Society will hold its session on Monday, Tuesday and Wednesday forenoon of the week in question, and the National Paving Brick Manufacturers' Association will meet Monday and Tuesday, February 1 and 2, as will also the National Clay Machinery Association.

The sessions of the National Brick Manufacturers' Association will begin Wednesday afternoon, at 2 o'clock.

Minnesota State Association of Builders Exchanges.

The Minnesota State Association of Builders' Exchanges will hold its seventh annual convention in the city of St. Paul, December 9. Many important matters will come up for consideration, and the programme is such as to indicate a most interesting and instructive meeting.

An Eight-Story Office Building Occupied by a Single Concern.

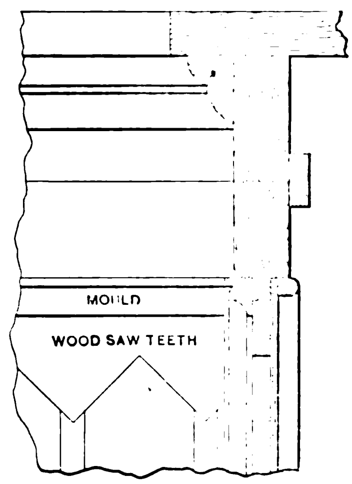
An office building to be occupied exclusively by one concern is the eight-story and basement structure just completed in Pittsburgh for the Jones & Laughlin Steel Company. The building fronts on Third avenue, Ross street and Second avenue, with an alley in the rear, and is so constructed as to allow for four additional stories when they become necessary. The design of the exterior is in the Elizabethan style of architecture, with rough red bricks and Craig sandstone trimmings. The building is well lighted throughout, and the finish is white Italian marble for the corridors and toilet rooms, San Domingo mahogany for the directors' room, and paneled walls in brown for the various offices, the furniture being quarter sawed oak. One of the unique features is the storage vaults for records in the basement, all of which are said to be fire and flood proof. The architects of the structure, which will house a force of some 300 workers, were MacClure & Spahr of Pittsburgh, Pa.

CORRESPONDENCE.

Constructing a Bookcase.

From H. M. L., Newport, Ky.—I am sending by this mail drawings and photograph of a bookcase which I constructed last winter, and which proved so useful and satisfactory that I have concluded to use it as the basis of an introduction to the readers of *Carpentry and Building.* The case was made of blue poplar stained with Johnson's Wood Dye No. 125, and finished afterward with wax, and polished. This style, however, can be changed to almost any finish desired. The case measures 3 x 5 ft. 2 in. Below the bottom shelf are two 5½ in. drawers, which are completely within the case, and are partially concealed when the doors are closed. These drawers are for models, rules, pencils, paper, &c. Between the middle shelves is a small desk compartment with a drop lid, all as clearly indicated in the photographic view. Beside this, at the left, is space for a typewriter, although the photograph shows it filled with books. The upper shelf

View of Bookcase as It Appears with Doors Opened.



Detail of Top of Case and Upper Portion of Door.

Constructing a Bookcase.

I placed close to the top of the case, and on it keep blank paper and other material required by a student.

The closed doors were rather difficult to make, but a glance at the detail drawing will show that the saw tooth to receive the wooden bars is made of a separate piece, tacked in, while the trim mold is placed outside of this and the glass behind the saw tooth and bars. Just under the desk portion of the case, and clearly shown in the photographic view is the space where I keep my copies of *Carpentry and Building,* with the half tone plates belonging to them, all of which give me the greatest pleasure and profit in the way of practical points. In fact, I regard *Carpentry and Building* as one of the most valuable publications which comes to my address.

I am interested in two of the Correspondence Schools, whose books may be seen on the shelves of the case, and in this connection I desire to say that I consider this case especially well adapted for students who wish to have their books and papers in convenient shape for use and reference.

Design Wanted for Squirrel Cage.

From J. E. D., Milton, Iowa.—Will some of the readers of the paper who have had experience in the particular line mentioned tell me how to make a squirrel cage, illustrating the matter with such sketches as may be necessary for the purpose? My boy has a number of squirrels, but the cage is a small one and he wants to make something that is more commodious where they will have plenty of room. He wants a large wheel at one end of the cage, and the latter should be well lined with tin, so that the squirrels cannot gnaw through. This inquiry is somewhat out of our regular line of contracting and building, but we all have ideas how things should be done, and it is possible that some of the readers may be in a position to afford the information desired. Please state the kind of materials that is best to use in constructing the cage.

An Appeal for More Correspondence.

From Jack Plane, Portland, Ore.—Considering the matter, month in and month out, it seems to me that the most interesting part of *Carpentry and Building* is the Correspondence Department, and I believe if a vote were taken by the readers of this valuable paper the majority would indorse this expression. In making this statement, of course I do not wish to detract in the least from the value or attractiveness of the remainder of the table of contents, but the popularity of the "Correspondence Department" is due more to the variety of topics published, and the great diversity of their treatment. The information given in this way each month has been of benefit to me, and I feel grateful to each one of its contributors. It has, however, just occurred to me that I have been absorbing all this information without giving anything in return—I have been reaping without having sowed—and fear this is a failing common to many another reader.

Now, I believe the interest and usefulness of this department can be increased many times if each of us will take this to heart and contribute his mite. Every reader ought to be "good" for at least one idea or a new rendering of an old one. I, therefore, say to the thousands of readers of this practical exponent of our craft:

"Do not hesitate! Write it out and send it to the Editor. Do not be afraid of your penmanship or your lack of practice for preparing matter for the press. Because a man cannot flourish a pen is no sign that he cannot make a first-class joint or make a good job. Don't think because you know a thing that it is perfectly familiar to every body else or because a 'kink' is old that it is not valuable. Please remember that new readers are being constantly added, that new apprentices are bobbing up every day, and that knowledge is becoming every minute a more important factor in every craftsman's race for success."

The old-time short cut forgotten yesterday seems like an old friend well met when we read of it to-day. In these things "age does not wither nor custom stale."

If you have originated an idea or a method let us share it with you, that all may be helped. "From every man according to his ability; to every man according to his needs," might well be placed at the head of the Correspondence columns.

Come on, brothers! Put your shoulders to the wheel, and give us a lift. The winter nights are here, and we have more time in which to write. Let us all turn loose and surprise the Editor. "In a multitude of counsel there is wisdom," you know.

Note.—We heartily indorse the spirit of our correspondent's communication, and trust that the practical readers will seriously consider what he has to say, and respond accordingly.

Finding Length of Rafters with Steel Square.

From G. L. McM., Tacoma, Wash.—If "Afraid-to-Sign-His-Name" will secure a Nicholls Framing Square, frequently advertised in CARPENTRY AND BUILDING, he will have all the information he asks for—and more—and will relieve the correspondence columns of the burden of repeatedly publishing simple matters every good mechanic ought to know. What say you, brothers?

From C. J. M., St. Johns, Newfoundland.—For the benefit of the correspondent "Afraid-to-Sign-His-Name," whose inquiry appears in the August issue relative to finding the lengths of certain rafters, I submit the following for publication, which, though not mathematically correct, yet is sufficiently so for all practical purposes:

8 in. to 1 ft. of run, common rafter 14½ in. Hip rafter for same, 18¾ in. First jack for same, at 24 in. from corner, 29 in.

9 in. rise to 1 ft. of run, common rafter 15 in. Hip rafter for same, 19¼ in. First jack, at 24 in. from corner, 30 in.

10 in. rise to 1 ft. of run, common rafter 15⅝ in. Hip rafter for same, 19¾ in. First jack, at 24 in. from corner, 31¼ in.

11 in. rise to 1 ft. of run, common rafter 16¼ in. Hip rafter for same, 20¼ in. First jack, at 24 in. from the corner, 32½ in.

12 in. rise to 1 ft. of run, common rafter 17 in. Hip rafter for same, 20⅞ in. First jack, at 24 in. from corner, 34 in.

It would be well to remember in this connection that the length of the common rafter for 1 ft. of run is also the length of the first jack at 1 ft. from the corner in all rectangular roofs.

Estimates of Time Required in Framing Wooden Trusses.

From Arthur W. Joslin, Boston, Mass.—I notice in the September issue the inquiry of "A. W.," Omaha, Neb., who asks for information on the above subject, and I therefore offer some comments, which I trust may be of service to him. There are, however, so many kinds of trusses and the circumstances under which they would have to be framed and erected vary to such an extent that it is impossible to give any absolute costs to be followed in all cases for a given type of truss.

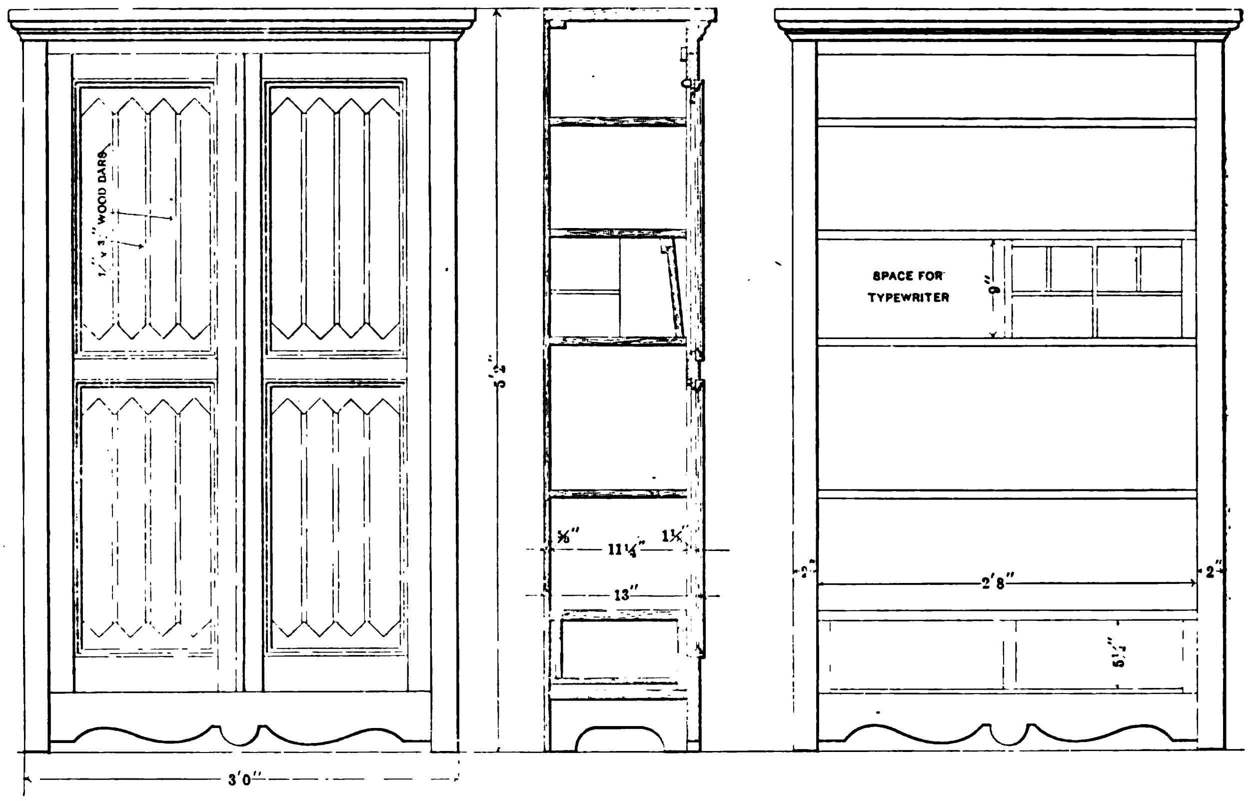
However, it is only by costs that have been worked out in actual construction and erection of trusses that we get a basis from which to work. By taking these costs, comparing the particular problem in hand with a similar one among the tabulated costs, picturing in the mind the probable circumstances surrounding the work and using judgment, one can come very close to the probable cost he is seeking. I say "probable" in connection with "costs" as above used, for I am referring to labor costs, and I consider all labor costs which are worked out in advance of any work in connection with building, theoretical and problematical. The cost of the stock in a truss or trusses should be a very simple matter to work out, especially in all but the very complicated hammer beam, gothic or curved trusses. Except in the cases of such trusses as the latter, the labor usually bears a certain approximate ratio to the quantity of material.

The first thing therefore to find out is the number of feet, B. M., of stock required for the truss or trusses under consideration. This determined, the labor should be estimated at a price per 1000 ft., B. M., to be reasoned out mainly by judgment and "past performances." My own experience has shown costs for labor to be about as follows:

Light trusses, such as shown in Kidder's Hand Book, edition, of 1905, chapter 25, Figs. 1 to 21, inclusive, except Fig. 12, to be from $18 to $24 per 1000 ft. of stock.

Heavy trusses of the same types, where there is sufficient rigging to properly handle and erect them, cost from $22 to $25 per 1000 of stock.

Costs as above assume trusses that will not show when structure is completed, or, if showing, are all in



Elevations and Section Showing Case with Doors Closed and Also as It Appears with Doors Removed.

Constructing a Bookcase.

the rough timber and not built for looks. The same trusses built of dressed stock, very neatly framed and fitted, chamfered and all marks smoothed off, would cost for labor, erected, about $30 per 1000 for the very light ones, up to $40 per 1000 for heavy, long span ones.

Such a truss as the one shown in Fig. 12 of Kidder's work would probably cost about $40 per 1000 ft. stock for labor, if the stock, including the large waste of getting out all curved members, were taken into consideration in determining the quantity.

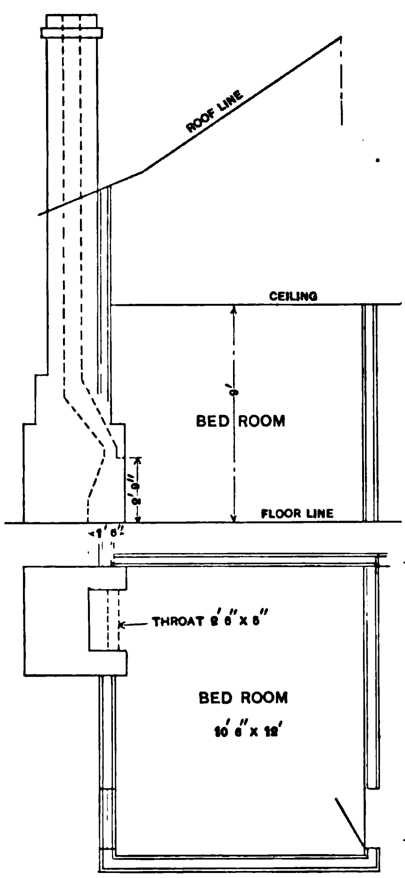
The lattice truss, such as shown in Fig. 22, I have no tabulations upon. This truss is seldom used in the East in building work.

I have no tabulations on the costs of the scissors trusses, such as Figs. 25 to 30, inclusive, although we have built some of the various forms of this truss. My judgment would be that the costs would be slightly less than quoted above, except in case of Fig. 29, which I should say would be worth $50 per 1000 ft. of stock for labor.

Examples like Figs. 32, 33 and 36, which are structural trusses built of finished material, becoming a part of the architectural treatment and finish, as well as carrying the superimposed loads, are difficult to estimate. I should, if figuring these trusses, analyze the labor in each truss, taking it piece by piece, complete, including erection, thus determining the labor per truss rather than per 1000 ft. of stock. The stock should then be figured out and added to the total cost. You can readily see that in these architectural and finished trusses that it would be impractical to work from the quantity of stock, as in no two cases are the details or conditions the same, and in some cases hard wood, such as Georgia pine or oak, would be used and in others soft wood, like pine or cypress. With the same detail the cost of labor would be very much less for trusses of soft wood. In purely structural trusses either hemlock, spruce or hard pine would be used, and there would be no difference in the labor worthy of notice between them.

We recently built in connection with one of our buildings four trusses, 63 ft. clear span, carrying a slate roof and heavy stucco ceiling. There was 9000 ft. of stock, including ordinary cutting waste in the four trusses. and the actual total labor cost for framing and erecting was $22 per 1000. The trusses were too bulky to be set up on the floor and lifted into place completely assembled, although we had a steam rigging, which would have handled them easily, except for their length and the cramped quarters in which we were obliged to work. As it was, the trusses were set up piece by piece, all hoisting being done by the steam derrick, and in the tabulation of costs the derrick and engine time is included.

The above constitutes a long answer to a short question. and I trust contains the information the correspondent is after.



Figs. 1 and 2.—Plan and Elevation of Room and Side View of Chimney.

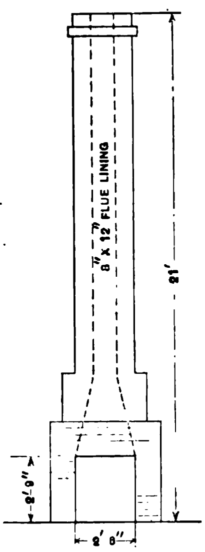


Fig. 3.—Front View of Fireplace and Chimney.

Why Does the Fireplace Smoke?

Why Does the Fireplace Smoke?

From F. B., Bolton Landing, N. Y.—I am in trouble with a fireplace and appeal to *Carpentry and Building* for rescue. The thing smokes. Of course we all expect a fireplace to smoke if we build a fire in it, but we expect the smoke to go up the flue and not out into the room. In this case a portion of the smoke goes up the flue and a portion into the room—enough to make it very unpleasant for the eyes and lungs.

A practical mason built the fireplace and chimney, and I have had other practical masons examine it since, still no one seems to find any cause for it smoking, unless it may be because of the small size of the room, it being 10 ft. 6 in. x 12 ft. x 9 ft. high. I send three sketches which need very little explanation, as I have tried to show very clearly the construction of the whole thing. Fig. 1 shows a plan of the room with the location of the fireplace, also the door and window. Fig. 2 shows a side elevation of the fireplace and chimney and a section of the room and attic with the roof lines. The dotted lines indicate the back of the fireplace and the flue, while Fig. 3 shows a front elevation. The chimney is all on the outside of the house and is made of stones, while the fireplace is faced up with brick in the room. The chimney is lined inside with 8 x 12 in. flue lining the length of the straight portion of the flue. The chimney extends about 12 ft. above the ridge of the house, as indicated in the elevation. There are no other ridges higher than this one. While there is a draft to the fire which will draw a newspaper up into the flue, the smoke will come out into the room.

I would be very glad to see this appear in the columns of your paper for the consideration of the many practical readers. I will take this opportunity to say that I have been a subscriber and reader of *Carpentry and Building* for the past 15 years, and have derived a great deal of benefit from its pages. I have all the 15 volumes now and expect to increase the number the same as my years are increased.

Now will some of the brother chips blow the smoke up this chimney flue and not let it come into the room? There must be some chimney experts in the craft as well as expert "shinglers" and "door hangers." Perhaps they are all dead—the shinglers and door hangers, I mean, but I hope Providence has spared some of the "smoke blowers."

Some Questions on Roofing Silos.

From A. D. C., Johnsonville, N. Y.—I have been a reader of *Carpentry and Building* for several years past and have found it a great help to me in my business. I note with interest the queries and answers appearing from month to month in the Correspondence Department, and as I have a few questions for consideration I come to the practical readers for information.

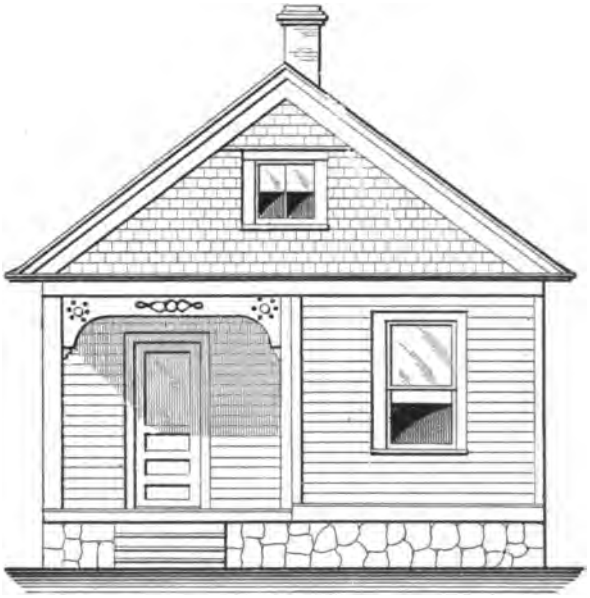
Can any brother carpenter give me a recipe for making slaters' cement? Also furnish drawings and plain instructions on roofing silos, both round and octagon?

What is the best way to form a plate for a round 14-ft. silo? Do the roof boards need a support between the plate and peak, the pitch being 9 x 12?

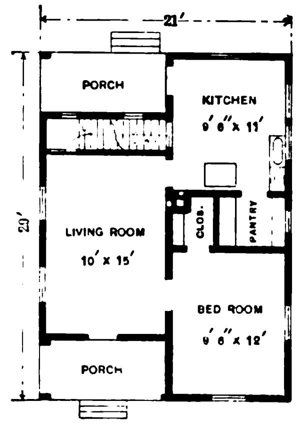
I would also be glad to have some of the readers tell me the rule for cutting the corner rafters on an octagon roof, the size of the silo being 14 ft. and the pitch of the rafters as mentioned above.

Designs for Workingman's Cottage.

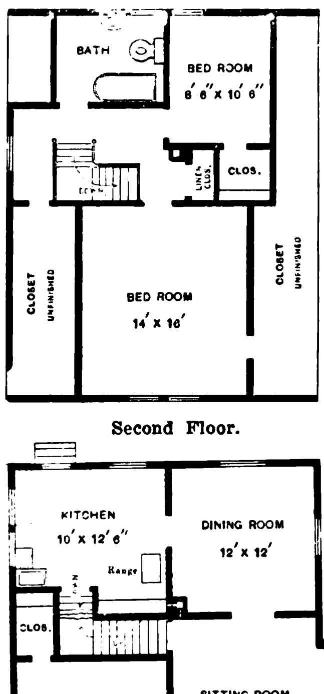
From S. M. Preston, Ouray, Colo.—I am sending under separate cover blue prints of a three-room and a



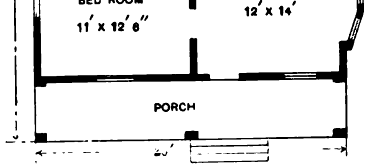
Front Elevation of Three-Room Cottage.



Floor Plan.



Second Floor.



First Floor.

Front Elevation of Six-Room Cottage.

Designs for Workingman's Cottage.—Scale.—Elevations, 1/8 *In. to the Foot.—Floor Plans,* 1-16 *In. to the Foot.*

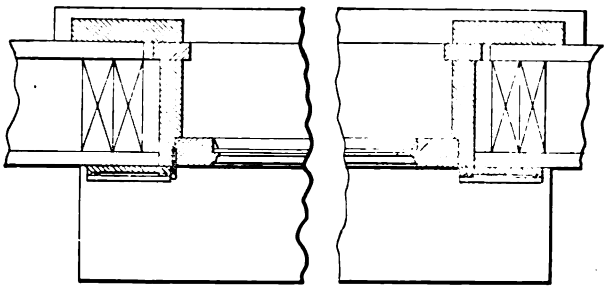
six-room cottage which may meet the needs of "F. C. B.," St. Thomas, whose inquiry appeared in one of the earlier issues of the year. The cottages will cost in this section of the country about $1200 and $1800 each, with stone or concrete foundations—cellar not walled—and rooms plastered two coats in cement plaster. I expect to build these houses shortly, and when completed will send photographs if desired.

A Veteran Reader's Opinion of Carpentry and Building.

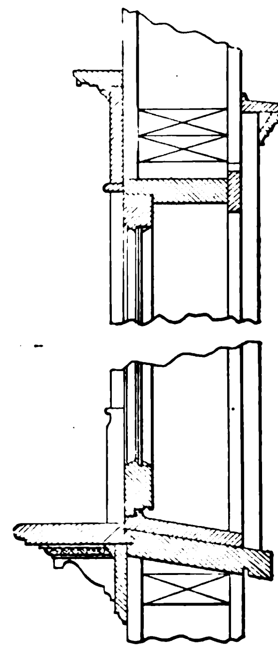
From L. H. Hand, Kenilworth, Ill.—I wish to compliment you, and express my appreciation of the very artistic manner in which you have treated the drawings accompanying my articles on Wood Pattern Making. In this connection I also desire to say a word as to *Carpentry and Building*. In my opinion it is in a class by itself. It is just what the apprentice needs; what the journeyman should have; what the foreman requires, and an absolute necessity to the party who owns the building. It is reliable in every point, from the first and last advertising pages of the cover clear through the book. I have had it for my mechanical guide since its birth, and can safely say that no single copy ever fell under my eye that did not contain many times its cost in actual information. Nevertheless, I often wonder at some of the questions asked by correspondents, as I never read a question now but I can readily call to mind where the identical idea had been fully discussed in some previous number. The only way I can account for this is that the parties asking have not read the back numbers. I am of the opinion that the "Science of Construction" should be an open book to the careful student of XXX volumes of *Carpentry and Building*.

Constructing a French Casement Window.

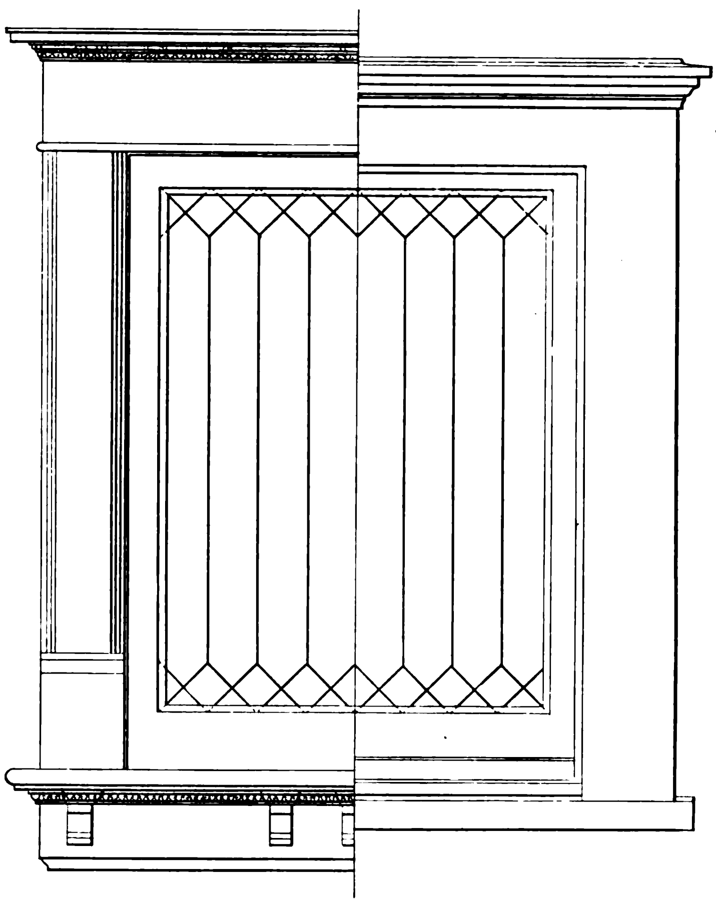
From W. F. Gernandt, Fairbury, Neb.—I am sending a blue print copy of a casement window which swings in, hoping that it will be appreciated by the readers of *Carpentry and Building*, when advised that this construction of window has been used by the writer for the past six years in all buildings having casement windows, and in connection with which I desire to say they have never shown any leaks and are absolutely waterproof. Several years ago the pages of *Carpentry and Building* carried considerable discussion on this class of windows, and the subject has also been considered by several other architectural monthlies. There appears to be a prevailing



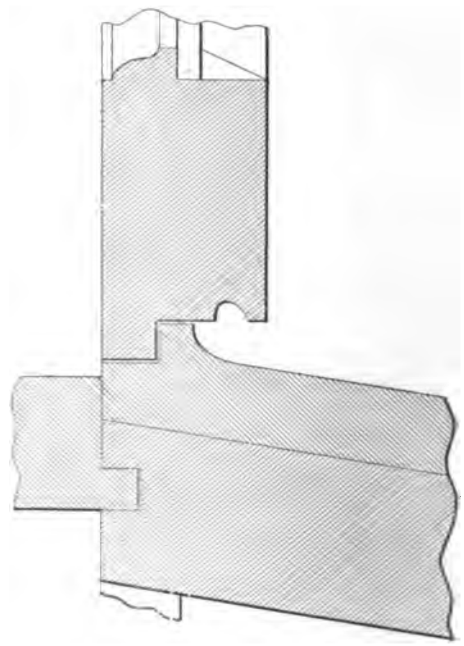
Horizontal Section Through Window.



Vertical Section Through the Window.—Scale, 1 In. to the Foot.



Interior and Exterior Elevation of Window.—Scale, 1 In. to the Foot.



Detail of Bottom Sash Rail and Sill.—Scale, 6 In. to the Foot.

Constructing a French Casement Window.

thought that this class of window cannot be made water tight, consequently most of the windows are made to swing outward, which is very objectionable for the reason that when the sash are open heavy winds tend to damage them. There is also the question of the screens not being placed where they should be.

I have two windows of this construction in my own residence, and will say that on Saturday, June 27, of the present year, this city was deluged with one of the worst rainstorms which the writer has ever witnessed. There were 2.82 in. of rain fell in 40 minutes, driving fiercely against these windows, and yet not a sign of water came in anywhere, while nearly every other window on that side of the house showed leaks, principally through the driving of the water under the bottom sash rail of the check rail windows.

This casement window construction has also been used on other fine houses of brick and frame, these in most cases being in very prominent places, such as ingle nooks, over dining roof buffets, &c., and experience has yet to show the first leak in any of them. In each and every case after heavy driving rainstorms the writer made special trips to the buildings having such windows and can truthfully state that the problem of constructing a casement window to swing inward and so as not to leak has been solved. No doubt the illustration of this construction will be a boon to many readers of your valuable paper, especially to those who are following the architectural profession.

Renewing the Life of Files.

From J. N., Lafayette, Ind.—Will you please tell me the process for recutting old files?

Answer.—To resharpen files by the acid process.

wash the files thoroughly with a scratch brush in a strong solution of sal soda (washing soda) in hot water to clear them of grease, dirt or metal that may stick between the teeth. Then wash in clean hot water to remove the soda, and dip in a bath of one part nitric acid to four parts water, contained in an earthen vessel. The glazed baking pans of a size to hold several files are very good for this purpose. Turn the files over constantly to allow the acid to act on all sides and the gas bubbles to escape. The time of immersion must depend much on experience and the fineness of the cut, say, from 1 min. for a fine cut to 5 or 6 min. for the coarser cuts. If the very coarse files are found on examination not sufficiently sharp, redipping from 2 to 3 min. will often improve their sharpness. With a little experience files of different grades may be sharpened at the same operation by giving attention to the time of immersion for each grade. Acid baths of less strength with longer immersion of the files may be used with a little experience. Thorough washing in hot water and drying is the final operation, but if the files are to be laid aside for future use they should be greased with vaseline while warm from the wash bath after drying. Some prefer to dry the files when required for immediate use by a dip in a strong hot soda or lime water bath. In conclusion, it may be stated that in mixing the acid with the water, care should be taken to pour the acid very slowly into the water, as the heat action is very great.

Cardboard Models in Roof Framing.

From L. T., Houston, Texas.—In glancing over some of my back files of *Carpentry and Building* I noticed in the issue for October, 1906, page 337, a problem in roof framing making use of a piece of pasteboard and headed "Short Cuts in Roof Framing," by "L. H. H.," Vincennes, Ind. What he has to say impels me to give him in return the problem indicated on the inclosed diagram. Say, for instance, we have a house 24 ft. wide, the half of which is 12 ft., and calling the feet inches, we will say 12 in. Measure back from the end of the house at each corner or at the side plate, 12 ft. and draw the diagonal which will be the seat of the hip and common rafters. I then space off my rafters C V W X Y Z placed 2 ft. on centers. Next I square across from D to B, and at B square up at right angles from D to B, say 8 ft., as 8 and 12 give the so-called one-third pitch, or up to E and the distance from D to E gives the length of the hip rafter. Then square up from the line B C the same as B E, giving the point F. From F to C is the length of the common rafter.

The next step is to square up at right angles from the line D P until it intersects the line D E at Q, which gives the rise of the longest jack rafter. Measure up the same distance from P at right angles from P to V, then the line V G will be the length of the longest jack rafter. Continue in the same manner down the line until the operation is completed.

It will be noticed that the heavy black marks indicate where the knife should be used to cut half through the pasteboard in order to form the model. The line D B must be cut half through the pasteboard and D E and E B are cut entirely through the board. To make a long story short, the lines L Z, M Y, N X, O W, P V and B C must be cut half through the pasteboard as shown by the heavy black lines, while B F C, P G V, O H W, N I X, M J Y and L K Z are cut entirely through the pasteboard. After this has been done D E B is raised up and the pasteboard bent at the lines D B. After being raised the hip rafter is up, as shown in the drawing of the model.

Cut the line L K and K Z through the paper and L Z half through, thus turning up the shortest jack rafter.

The lines U L, T M, S N, R O and Q P are only to illustrate where I obtain the rise of the jacks. After these cuts are made in the pasteboard the hip and the main rafters are up, and all the jacks will come up in their proper places. So far the roof is framed.

I am not a subscriber to the paper, but I have only missed one issue in the last three years. I am always glad to get the new numbers, as there is always something of interest to the practical building mechanic.

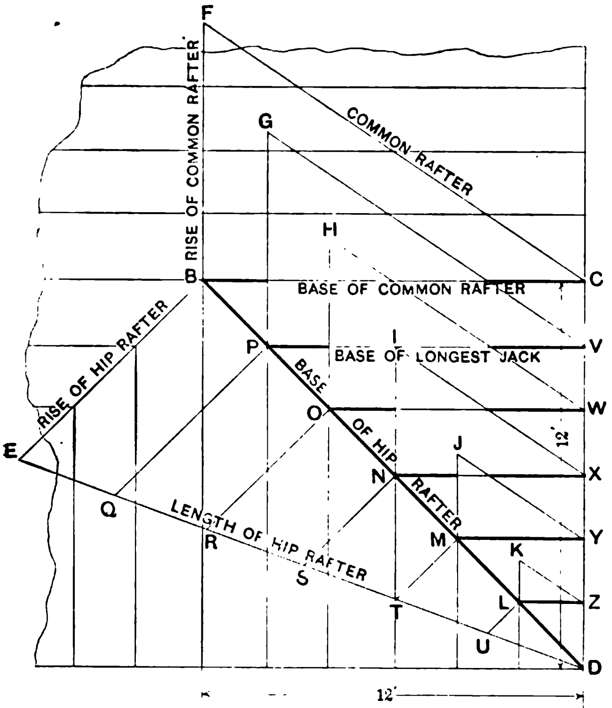


Fig. 1.—Diagram Showing the "Layout" of the Rafters.

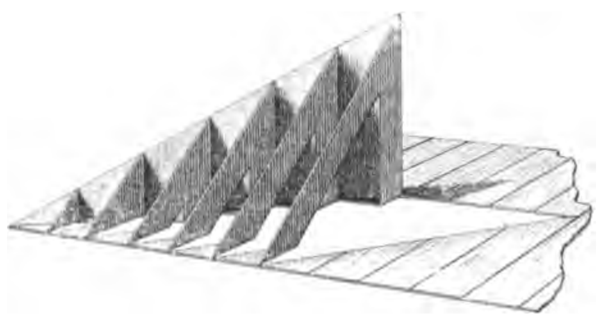


Fig. 2.—View of the Cardboard Model with Rafters in Position.

Cardboard Models in Roof Framing.

Relationship Between Architect and Contractor.

From J. H., Chicago, Ill.—I read with much interest the remarks presented by Albert E. Skeel before the Carpenter Contractors' Association of Cleveland, and published in the November issue of the paper. Mr. Skeel is certainly right in what he says about complaints made by the contractors. I have had an experience of 30 years as journeyman carpenter, foreman and contractor, and I think I know whereof I speak. I have never worked on or in a single building where the plans were drawn by an architect that it came out right. There was always a change to be made or something to alter for the simple reason that the plans were not correctly made. Architects may be draftsmen but not builders. The worst of it is, however, that the contractor has to make good the faults of the architect and pay for all his mistakes. If a contractor makes a mistake it is no more than right that he should suffer for it, but why is he required to pay for the errors of the architect?

There are some architects who are unfair to the contractors for they allow certain contractors to put in any kind of material or workmanship they see fit, while from others almost the impossible is required. I have seen men, by order of the foreman, put only three nails in a

14 or 16 ft. baseboard and fit fine oak doors with the hand axe and smoothed over a little with a block plane. When I protested I was told that it was good enough; in fact, I was too good for that foreman and I had to go. The architect never looked at anything. In another case with which I am familiar the architect allowed the contractor to add $700 to his regular tender, which amount was later to be divided between the architect and contractor, of course at the cost of the owner. As a matter of course, it would be a skin job, for the architect sold his right of protest by this action. But the honest contractor has to take a back seat as he cannot figure against such kind of people, neither does he have the ghost of a show with such an architect.

Certainly the contractor has much of which to complain and with which to contend. In the first place plans, specifications and details must be correct, and the contractor must have them so before he is able to properly estimate. The architect should be a practical builder, not a college baked one, and should be honest; then he can expect good work and the poor contractors and mechanics will have to go.

Some "Kinks" for the Carpenter.

From J. B., Providence, R. I.—I am sending some sketches with brief descriptive particulars showing a couple of "kinks" or "wrinkles," which may be of interest to the carpenter. The first of these is a method of keeping the stile and rail of a door from coming apart, as for example, from shrinkage. The device employed is so clearly indicated in the sketch that extended comment would seem to be unnecessary. The spring used should be capable of exerting a pressure of from 100 to 500 pounds. The best way to use this is to run the rod through the rails, then one nut, D, will answer for both stiles and one spring. Referring to the sketch, Fig. 1, C is the rod, D is the nut and E E are washers. The size of rod and spring must be determined by the work to be done.

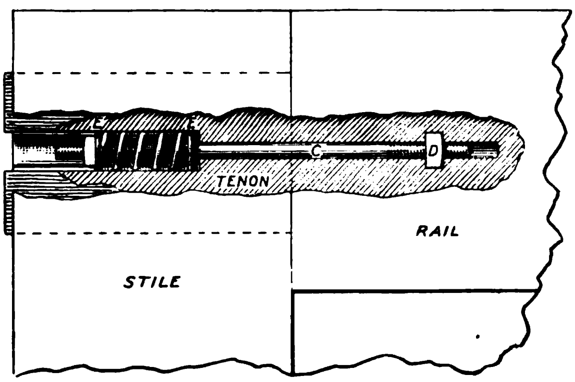


Fig. 1.—Keeping Door Stiles and Rails from Shrinking.

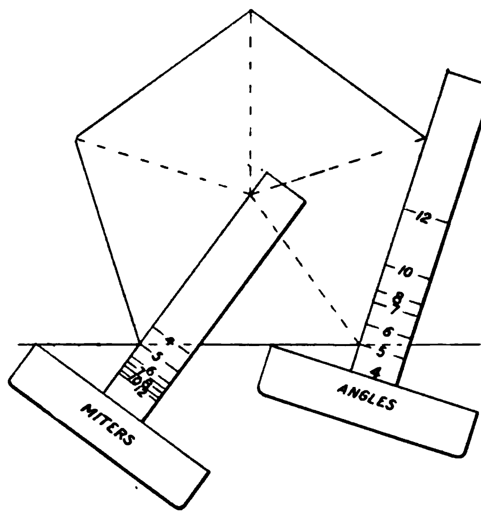


Fig 2.—Scheme for Marking T-Square.

Some "Kinks" for the Carpenter.

In the sketch, Fig. 2, is shown a scheme for marking a T-square so as to lay out angles and miters of polygons. One side or surface of the blade is used for angles and the other for miters, as shown in the sketch. If it is desired to mark a polygon it can be almost instantly done, also the miter. Points for as many polygons can be laid out on the T-square as desired. I use the same scheme on the try-square.

I have some other kinks which I hope to see used in subsequent issues.

Coloring Copper Work Green.

From G. L. G., New York.—Kindly let me know what is best to use on copper to turn it a uniform green color.

Answer.—The time honored custom has been to paint or spray the copperwork with a liquid acid solution which was supposed to give the required effect. A solution in which sal ammoniac is a component part has been recommended, but a number who have tried this preparation state that it gave no good result, and fault has been found also with other preparations, such as vinegar, salt and stale beer. The true green color—that is, the soft color so much sought—is, it is said, obtained only by time and the weathering action of rain and winds. The roof of Trinity Church, New York, the cornice on the Washington Building on lower Broadway, the Lenox Library and the roofs on the Columbia College buildings, New York City, all have the soft green color which was obtained by leaving the copper work to the weather. A peculiarity of all these buildings is that they are adjacent to green foliage from near-by parks, and the absence of such a desirable color on other buildings located a distance from parks has caused some to advance the opinion that gaseous acids associated with the foliage might aid considerably in this work. The beautiful green color obtained on country residences lends additional favor to this view, but it scarcely explains the green on the Statue of Liberty in New York Harbor. A fault found with acid preparations is that they turn the copper a very dark brown or black after a time. Some firms making a specialty of bronze and bronze powders have put out a paint or stain for this purpose, and the green on the Twenty-third street terminal of the Lackawanna Railroad is understood to have been obtained by this method.

Receipts for this work are many and varied. One method given is a solution of sal ammoniac and water. Add about 1 lb. of powdered sal ammonic to 5 gal. of water. Dissolve it thoroughly and let it stand 24 hr. at least before putting it on the copper. Apply to the copper with a brush just as paint would be applied, being sure to cover every place; let it stand for a day and sprinkle with water. If the water is put on too freely it will run the color and streak it. The color desired should be obtained on the morning following. Another way of producing the same effect is by using vinegar and salt instead of sal ammonic, using about ½ pound of salt to 2 gal. of vinegar. Still another method is to brush over the copper with a very dilute solution of cupric nitrate, to which a small quantity of common salt solution may be added. When the copper is entirely dry brush it with a fluid consisting of 100 parts of weak vinegar, 5 of sal ammoniac and 1 of oxalic acid. Repeat the operation after drying.

WORK on the Cathedral of St. John the Divine, in New York City, is making progress slowly and it will probably be a number of years before its completion. The 16 years that have elapsed since the beginning of the work have been devoted to the setting of the deep foundations and the building of one of the four great arches. The piers of the three other arches are built, as are also the columns of the choir. Of the seven chapels proposed, but one—the Belmont—is completed, at a cost of $250,000.

CABINET WORK FOR THE CARPENTER.

DEN AND WRITING TABLES.

By PAUL D. OTTER.

A TABLE for the general living room, library, or we might call it "den," should be serviceable and strong, for here it is that the man, like the pursued animal, seeks retirement and rest at the close of the day. Bamboo furniture and spider legged chairs do not appeal to him—even the feminine mind has discarded the flimsy, for the simple modern style is to her liking. Four legs and a board is the first logical thought, and additions other than necessary members used to connect these parts in the construction are useless. By this is meant brackets and other glued on parts having no relation to the purpose of the table.

An added value may be given the table, however, by inserting a drawer under the top and providing an under board or shelf where naturally in its place a strainer would be a part of the construction for purposes of strength.

The dusting and wiping over of a table along simple lines is more of a pleasure than source of irritation, for if properly finished it is improved by wiping. The suggestions indicated in Figs. 1, 2 and 3 are offered as a basis of the plain serviceable style which can be modified in many ways yet retain a simple character.

Many prefer a round leg or post. This should be of a simple shape, leaving a square top for inserting rails and having the shaft a perfectly plain round, the fullest size of square diminishing on a slight sweep as it comes to the floor. The simplicity of an Ionic column should be ever in mind to restrain one from the tendency to overbeading and hollows, which frequently mean nothing in turned work and are difficult to clean.

The table indicated in Fig. 1 of the illustrations is of the simplest type of construction, and for a room of little open space it will be found very serviceable, both for a reading and a card table as well. Fig. 2 shows a table designed for a general reading room. The Japanese feature of overhanging shelves gives a generous space for current journals which usually become dog-eared when left lying on the table top.

There are times when in dusting, as in other things, "a lick and a promise" is given between regular days, and a free table top is very desirable for an orderly appearance. This thought is suggested in the whim shown in the style, Fig. 3, with the built-up center shelf for the lamp or electrolier base and magazine pockets on either side which will partly conceal the ruffled condition of paper covered magazines.

The form of writing table shown in Fig 4 is becoming popular. It cannot be overfilled by papers and other matter not actual correspondence. In this respect it is desirable for the living room or reception hall or a small size is very appropriate in a spare guest room. The top always remains as a table top, the writing being confined to the center tablet panel flush with the top of the drawer when drawn out to a set stop. Under this panel is the larger compartment for paper and envelopes, while on either side of the partition are compartments full size or subdivided, as the fancy dictates, into a small space for loose pens, a long till for pen holders and pencils, while at the back end either at the right or left of the center writing tablet a fixed division should be made for a square glass or some appropriate form of ink well.

For neatness of finish, which should be in marked evidence on such a piece of furniture, the tablet and other divisions having been made of ¼ in. paneling, the walls should be fitted with a scant ⅛ in. material of the same or another kind of wood. The width of this paneling should allow for the ¼ in. thickness of top or till covers and form a rabbet for these to set upon. Usually such a table is made in mahogany and the drawer compartments in that wood also. The oak tables should have mahogany drawer divisions also, as this wood is very desirable for small work and a good after finish. In this form of writing table the sides of the drawer must be of the full length permitted by the interior of the table frame, but the drawer itself must be made to withdraw only to a certain fixed stop or check provided for the purpose. This is to avoid an overbalance when the drawer is being used as a writing bed. Some tables made are provided with a concealed counterweight, but this is unnecessary if the table frame is of a substantial pattern and the drawer stop is properly located.

The apparent waste space of the rear end of the entire drawer readily suggests a private drawer or compartment secretly accessible by throwing off the check or stop, which can be controlled by a simple mechanical device of an elbow joint or spring push button variety, placed entirely out of view at one or both sides under the drawer and somewhat to the rear. The drawer operates as an ordinary drawer, and the check is never used except when it is desired to utilize the private compartment.

A checking device which is at present in satisfactory use is illustrated in Fig. 5 of the drawings. Here the plate D is held in checking position by the stop screw properly located as shown. It is thrown forward when it is desired to pull out the entire drawer. This is done by swinging out under the drawer slide the shaped metal piece D. This when erect with the drawer stop screw pulled against it prevents further withdrawal.

In making such a piece of furniture there is opportunity for personality in the design as well as in ingenious devices which will characterize the article and give it increasing value.

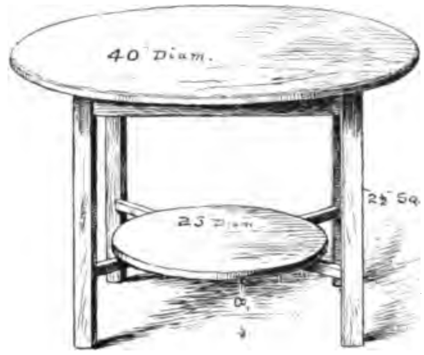


Fig. 1.—Table for Living Room or Den.

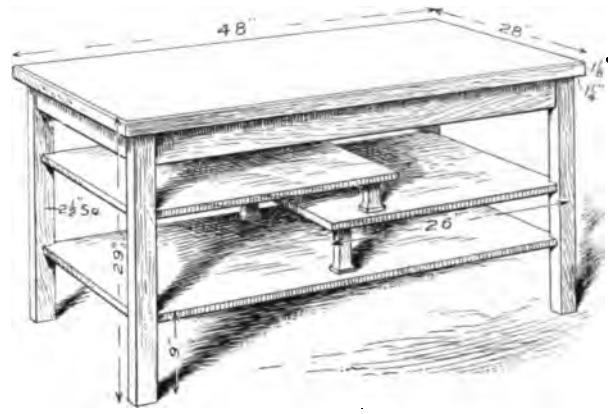


Fig. 2.—Table for a General Reading Room.

Cabinet Work for the Carpenter.—Den and Writing Tables.

ONE of the features of the local building improvements is a nonhousekeeping apartment house, conducted on the lines of a home club, which has just been finished in Madison avenue, above Fifty-ninth street, Borough of Manhattan, N. Y. It is a five-story structure, with a frontage of 175 ft. on Madison avenue and a central tower rising three stories above the main building. In this tower is one studio apartment to each floor. All the living and sleeping rooms of the building have outside exposure, and on the fifth floor is a large dining room, under the supervision of a caterer.

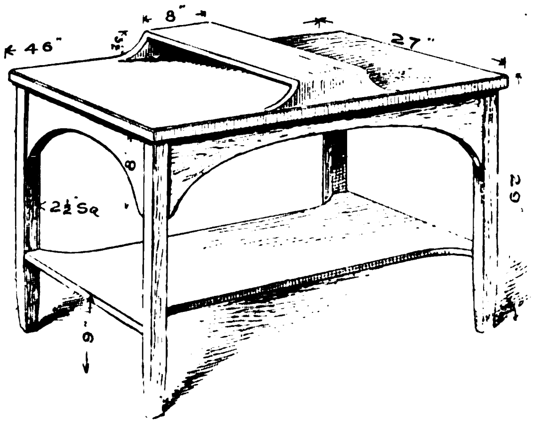


Fig. 3.—Another Form of Reading Room Table.

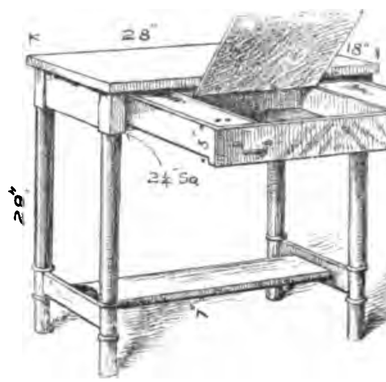


Fig. 4.—Writing Table with Drawer Open.

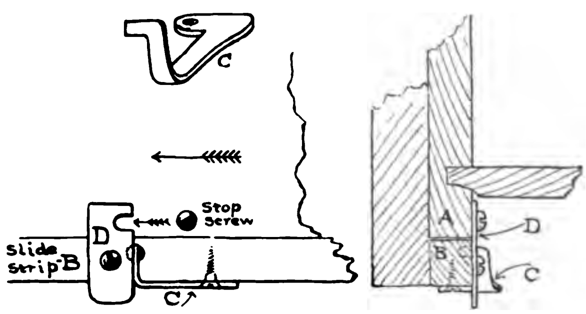


Fig. 5.—Details of Checking Device.

Cabinet Work for the Carpenter.—Den and Writing Tables.

Architects Criticized by Mill Man.

It is sometimes interesting to see ourselves as others see us, and the architects will no doubt be glad of a chance to read what a sash and door representative is reported to have said in conversation with the "Piece Stuff" department of the *Mississippi Valley Lumberman.*

"We have a whole lot of estimates which have fallen to my lot to figure out. The worst of it is that a good many of them are plans prepared by architects. I am not much given to profanity, but I am tempted to use a lot of cuss words every time some of this class of trade comes in. Many of the plans now gotten up by so-called modern architects are prepared by scale and do not have any size marked for windows, doors or any of the detailed work. I would rather have a rough sketch with some of the dimensions marked than all these elaborate drawings by architects. A good many of their specifications are not of a character to materially assist in getting out mill work. With very few exceptions the architects want something just a little different than the regular sizes. Just why they should specify a certain number of windows an inch or so smaller than the stock sizes and the balance of them just that much larger is something I am unable to figure out. There is no doubt but that they add 25 per cent. or more to the cost for the consumer by insisting upon this class of work. A great deal of the molding and other fancy woodwork is made in detail and often calls for a useless waste of a lot clear lumber.

"Some years ago we were successful bidders for the mill work for the construction of a number of railroad stations. Evidently they had dug up a lot of architect's plans which were prepared years ago. After studying over the detail for some time, I made up my mind that there was an opportunity for a good big saving. Getting the consent of the officials I made entirely new drawings and specifications, with the result that we were enabled to put up very much more serviceable and attractive structures and save considerable expense. I explained to the railroad people that on this particular job there would not be very much of the saving, but that in the future they could get bids which would be very much less than they could possibly secure with the old plans. Out of that two days' work I made for the firm over $500 above what they would have if they had been compelled to adhere strictly to the other specifications."

And the same party has some comments on filling government contracts, which are worth reproducing:

"In filling government contracts it does not do to deviate in the least from the plans as prepared by the government officials. Some years ago I offered some suggestions which I thought very decidedly for the benefit of Uncle Sam and incidentally would help our firm filling the contract. The army officer who had charge in a very blunt manner told me that, good or bad, all we had to do was to follow directions implicitly. Many a poor contractor has found to his sorrow that such is the fact. The government officials have a very arbitrary way of deducting allowance for minor deviations which seriously interfere with the profit account of the contractor. There is no way of successfully appealing from their ruling. I have known of protests sent to higher officials, which are still reposing in some dusty pigeonhole. Some years ago a contractor had considerable government work and he turned over the mill work to our firm. The plans and specifications were about the crudest I have ever had to work on. After consulting with the contractor, I got up details which did not leave anything out. He took them to the government officials and after a good deal of trouble got them to O. K. them. He only succeeded in doing this, however, by declaring that he would throw up the contract unless given more complete deails. Having once gotten their sanction we had no further trouble because they were the ones that eventually passed upon the bill.

"Speaking of government work, they are often very lavish in their expenditure. I remember having a good deal of trouble with the construction of a number of homes for some Indians on a reservation. The plans were for the most expensive construction, including some quarter-sawed hardwoods. After the homes were constructed the red men utilized them to stable their ponies while they lived in the tepees."

The Greatest Rocking Stone.

Rocking stones are found all over the world, being due generally to freakish forms taken by disintegrating rocks, although some have been artificially made. The most astonishing rocking stone in the world is in Argentine, at Tantil, 200 miles south of Buenos Ayres. It weighs over 700 tons, but is so balanced that it rocks in the wind and can be made to crack a walnut.

The Art of "Throwing" Chimneys.

A recently adopted method of demolishing large chimneys and regulating the direction of their fall by means of a carefully measured cut into one side of the base of the chimney is described in a late issue of the London *Builder*, by the "Steeple Jack," who makes use of it in connection with his operations. He says:

The hight ascertained and the pitch marked out with ropes, the center of the shaft is taken facing the space where the fall is desired. The circumference is next taken; then, from the center, the half of the diameter is taken each way. This gives the exact half of the chimney facing the place of fall. Then marks are made exactly at each foot on each side of the center line, until the halfway mark is reached. Then, commencing at center mark, each foot mark is numbered, the number corresponding on each side of the center marks, as shown in Fig. 1, until the halfway mark is reached. This insures the cut being made accurately, for as soon as the man on one side reaches, say, No. 4, he calls out to the man on the other side, and both are enabled to keep together. If the cut was, say, 6 in. out, it would mean the throw to be several feet out. If there is a good stretch of ground for the shaft to fall, a deep cut will throw the shaft like a tree, in fact, until nearly reaching earth. This causes the bricks to "stretch" out half the length of shaft over its hight; but if space is limited a thinner

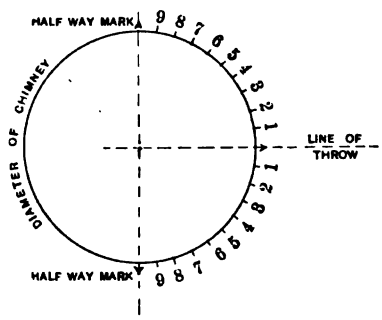


Fig. 1.—Plan of Chimney.

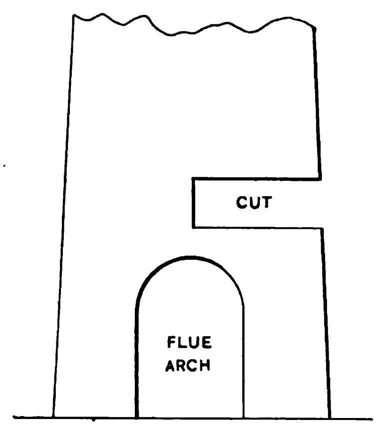


Fig. 2.—Diagram Showing Position of Cut with Regard to Flue Arch.

The Art of "Throwing" Chimneys.

cut is made, which causes the opening to meet quicker, thus breaking the shaft up in its fall, and dropping it in half its own hight.

When the halfway mark comes over a flue, as in Fig. 2, the arch must be propped up, or the tremendous weight of the shaft, coming on the arch, as it commences to heel, will cause the arch to collapse, thus changing the line of fall, and causing a disaster if houses or workshops are in the way.

A strict rule to follow is never to pass in front of the opening, and keep a sharp look out for signs of collapse. The first sign is the opening of a joint of the brickwork opposite the upper edge of the cut. A long disused shaft, or a rotten one, collapses when only one-third is cut, while a well built or dry shaft often does not fall even when cut to the halfway mark. Sometimes it will stand for hours after being cut before it falls.

This method is the cheapest. The old method, to prop with timber and burn away, takes a great deal of labor, apart from timber props, inflammable material (oil, several casks of paraffin, &c.), also risk of fire to surrounding property. This cutting method costs only a trifle; although I must say I am the only steeple jack who adopts it—it being considered risky; but I accept all liability as to damage to property, &c.

The highest chimney I have "thrown" in this way was 300 ft. high, and weighed over 3000 tons. It was located at Cornwall, England.

AN important improvement is about to be commenced at Long Beach, Long Island, in the shape of a concrete and terra cotta trimmed hotel building, which it is estimated will cost in the neighborhood of $600,000. It will have a frontage of 300 ft. on the boardwalk and 150 ft. in National Boulevard. It will be erected in the shape of a "U," the open side facing the ocean, in order to secure a maximum number of rooms with that exposure. The exterior will be in the Spanish Renaissance style of architecture, and the walls will be faced with a light colored brick. The central portion of the ground floor of the building will be occupied by stores facing the boardwalk. According to the plans of the architects, L. R. Kaufman and B. F. Stern, the building will contain many novel features, both as regards arrangement and construction.

Effect of Fire on Hollow Tile.

Frequent efforts have been made by architects and builders in some of the Western cities to induce the authorities to sanction an amendment to the building code whereby hollow tile blocks may be used for outer walls of buildings inside the fire limits. Recently the matter was agitated by the Los Angeles City Council, who declined to amend the building ordinance as a result of the report of Building Inspector Backus of that place.

After making a careful study of the uses and abuses of hollow tile blocks, the inspector reported to the Council substantially the following:

"In my estimation it would be extremely unwise to allow the use of hollow tile blocks for exterior or interior weight bearing walls within the fire limits, for the reason that it has been demonstrated that said tile is such an excellent nonconductor that the outer wall or shell of the tile will become red hot when subjected to an intense heat, while the interior wall of the tile is comparatively cool, the result is that the outer shell of the tile (owing to expansion) will break away from the connecting web, after which a wall of such tile carrying any considerable load would collapse by buckling.

"In the event of a fire in a building of ordinary construction, which might be located in close proximity to a structure built of hollow tile, there would be grave danger that the burning timbers falling against such a structure would penetrate the wall and thus set fire to the contents of said hollow tile building. Even an ordinary blow will fracture the tile in such a wall, and the backing of a heavy wagon against the building would be liable to cause quite a break, to say nothing of the opportunities offered to a mischievous boy or any one else armed with a heavy hammer, who could with very little effort break through the walls of such a structure."

Berlin to Have "Cloud-Scratchers."

A German architect who recently visited America with a view to studying the building methods in this country has returned to his native land, where he is said to have made a most eloquent defense of the "cloud-scratchers," as he called them. The notable fact in connection with the matter is that German architects have heretofore been much opposed to the towering skyscraper which is so common in the larger cities of America.

WHAT BUILDERS ARE DOING.

THE gradual return of confidence in the future is reflected in the reports from the leading cities of the country covering building operations for the month of October, which indicate a volume of increased activitiy as compared with the same month last year, when the country was in the throes of a money panic. Some of the percentage gains are in a way remarkable, especially for example that relating to the Boroughs of Manhattan and the Bronx. This great increase, however, is explained by the fact that a single permit filed in October for the new Municipal Building involved an estimated outlay of $8,000,000. Many of the other larger cities are reporting increased activity, and in the smaller places a great deal of new work is being projected, which augers well for labor during the months to come. It should be remembered, however, that in these small places the buildings are usually of a character which when a permit is issued of unusual magnitude it makes a somewhat remarkable showing in the way of percentage. Some of the cities which show a falling off as compared with October last year are Cincinnati, St. Paul, Columbus, Louisville and Newark. Capital for building operations is becoming more plentiful as confidence grows, and many projects which have been held in abeyance for some time past are being given new life with excellent prospects of their being carried to a successful termination the coming year.

Atlanta, Ga.

There has been a decided let up in building operations in the city the last month, as compared with September, the total value of new buildings being only a little more than half what it was at that time. The permits issued from the Building Inspector's office called for an estimated outlay of $244,077 in October, as against $436,019 in September and only $228,288 in October of last year.

It is, however, for the 10 months of the year that 1908 is ahead of the year before. From January 1 to November 1 of the current year, the value of the building improvements was $4,390,982, compared with $4,050,023 in the ten months of 1907. In looking over the figures for the different months it is noticed that in April the permit for the new post office called for an outlay of over $1,000,000, and eliminating this from the totals 1908 would fall considerably behind 1907. Building Inspector Ed. R. Hays, however, is optimist'c as to the future and points with pride to the steady growth of the city.

At the second quarterly meeting of the Atlanta Builders' Exchange, held on November 4, addresses on the subject of industrial education were made by Walter G. Cooper, secretary of the Chamber of Commerce; K. G. Matheson, president of the Technological School, and J. K. Orr, one of the leaders in the movement for industrial education. Much interest was expressed in regard to the meeting of the National Association for the Promotion of Industrial Education. to be held in Atlanta, November 19, 20, 21 and 22. The exchange pledged its warm support and President C. G. Bradt appointed a committee to work for its success, consisting of George B. Hinman, D. A. Farrell, Robert S. Wessell, Charles E. Sciple, P. G. Hanahan, M. E. Ford and George Dowman. The exchange has at present 135 members and the 'Change Hour in the middle of the day is doing much to awaken interest in the work of the organization.

Baltimore, Md.

There was a marked falling off in October in the value of the permits for building improvements issued by Building Inspector Preston, as compared with the previous months, the amount involved being smaller than any month in the year except January and February. There were 128 permits issued for improvements costing $254,000, and 44 additions costing $26,579, which gives a total of $280,579, adding 20 per cent. for undervaluation brings the total of $336,694.80. Among the operations for the month were 128 two-story brick dwellings, costing $139,250; 12 three-story brick dwellings, costing $41,400;; 4 two-story frame dwellings, costing $16,100; 6 three-story frame dwellings, costing $22,450; 1 $30,000 office building; two moving picture theatres, and one store.

The total value of the improvements projected for the 10 months of the current year was $4,965,522, and adding 20 per cent. usual for undervaluation, when the plans are filed with the building inspector, brings the total to $5,958,627.48.

Cincinnati, Ohio.

A notable feature of the building situation has been the terrific shrinkage in the value of the improvements for which permits were issued during the month of October, as compared with the corresponding period of last year. Building Inspector Kuhlman's report for last month shows that 523 permits were issued for improvements involving an estimated outlay of $425,095, whereas in October, last year, 537 permits were issued, for improvements involving an estimated cost of $1,028,830—a shrinkage of nearly 60 per cent.

Chicago, Ill.

Increased activity was a feature of the building situation in the city during October and the estimated value of the improvements projected show an appreciable gain over the same month last year. Permits were taken out for 980 buildings estimated to cost $6,242,315, while for October, last year, permits were taken out for 900 buildings estimated to cost $4,960,150.

The record for the first 10 months of the current year also surpasses that of the corresponding period of 1907. During the 10 months permits were taken out for 9157 buildings covering a frontage of 242,235 ft., and involving a total outlay of $52,021,380, while in the same 10 months of last year permits were issued covering 8587 buildings with a frontage of 233,039 ft., and involving an outlay of $51,385,-080.

Cleveland, Ohio.

The fifteenth annual meeting of the Builders' Exchange of Cleveland was held on the evening of November 11, and was attended by about 150 of the members. A brief business session was conducted in the exchange rooms on the third floor of the Chamber of Commerce Building, followed by a social assembly in the Chamber of Commerce Club on the sixth floor of same building. At the first session reports were presented by the officers and some of the important committees indicating that the exchange passed a prosperous and altogether successful year. The membership is still the largest of any exchange in the United States, and the financial strength has been increased by steady additions to the reserve fund.

An interesting feature of the meeting was the conferring of honorary membership upon E. H. Towson, the first president of the organization. The address in this connection was made by Col. C. C. Dewstoe, postmaster of Cleveland, who for many years was associated with Mr. Towson in the work of the exchange.

At the social assembly the report of the Board of Directors was presented covering the work of the year. It was shown that 589 meetings had been held in the exchange during the year, that the average number of visitations was 241 during the month of October; that 284 bulletins of information on building operations had been posted; that the telephone calls had numbered 500 per day; that many social meetings and luncheons had been conducted, and that the exchange committees had looked after legislation, the labor situation, and many other matters for the good of the industry in the city. The annual address of the president was read by George B. McMillan, the popular head of the exchange, who touched upon business conditions, the supply of building materials, the improved standard of construction, and other subjects of importance to the members. His address was optimistic, a cheerful view being taken of the prospects for the coming season with reviving activity in all lines of industry.

During the day preceding the meeting, ballots were cast for the election of the new Board of Directors. It was found that 204 votes were deposited, and that the following were the successful candidates: George B. McMillan, general contractor; C. S. Bigsby of the Garry Iron & Steel Company; Ira S. Gifford, plastering contractor; George A. Rutherford, carpenter contractor; Jacob Schade, carpenter contractor; J. Wentworth Smith, mason contractor; Henry A. Taylor of the W. Bingham Company; Elmer E. Teare of Potter-Teare & Co.; C. Thesmacher, sheet metal contractor, and R. R. Wills, painting contractor.

The directors met on the following day and organized by electing Mr. McMillan president for a second term, Mr. Taylor vice-president for a like term, Mr. Rutherford, treasurer; Edward A. Roberts, secretary, and Chester M. Harris, assistant secretary.

Building permits issued by the Building Inspector's office during October were 594 in number, amounting to $898,962, as compared with 830 permits aggregating $4,235,397, issued during the corresponding month a year ago, and 803 permits amounting to $1,088,757 issued during October, 1906. The large total of October, 1907, is due to the fact that a permit for the $3,000,000 Cuyahoga county court house was issued during that month. During October of this year there were 253 permits for frame buildings, amounting to $464,438; 52 permits for brick and stone buildings, amounting to $335,505, and 289 permits for additions and alterations, amounting to $99,019. Although no large building operations are being started a fair volume of small construction work is coming up for this season of the year.

Six bids were recently received at the Treasury Department in Washington for finishing the new Federal Building in Cleveland, the bids being for the floors, marble work, carpenter work, heating, and all the interior finishing. The contract will be awarded soon and the work started.

Denver, Colo.

The monthly reports of Building Inspector Robert Willison continue to show most gratifying increases as compared with the corresponding periods a year ago, in the value of building improvements for which permits are issued. October was no exception to this tendency, and according to the figures compiled in his office 307 permits were issued for new buildings and alterations estimated to cost $957,400, while in the same month last year 258 permits were taken out for improvements, involving an outlay of $578,810. This is an increase of 49 in the number of permits and $378,590 in the value of the operations.

Included in the October permits were 187 for brick residences; 10 for frame residences, 7 for apartment houses, 5 for business buildings, 1 for a refrigerator building and 32 for miscellaneous structures.

From January 1 to November 1 of the current year 2697 permits were issued for improvements valued at $8,520,720. In the corresponding period of last year 2272 permits were issued from the building inspector's office for building operations, involving an outlay of $5,700,409.

Detroit, Mich.

Building operations in Detroit for October fell behind the same period last year, actual figures as given out from the Fire Marshal's office, showing $1,049,450 for 314 new buildings and $90,370 for 62 additions; while for October, 1907, the figures were $927,700 for 327 new buildings and $274,450 for additions. This makes a total of $1,139,820 for October, 1908, as against $1,202,150 for the same month last year, with a balance of $62,330 in favor of 1907.

It is a peculiar fact that, while the total in October, 1907, was greater than that of October this year, the value of new buildings erected was not so large, the difference in favor of last year being in the value of the additions. The total figures for the ten months this year are $8,612,270, as against $14,226,300 for the entire year of 1907.

It may be of interest to know that there is a large demand at present in the city of Detroit for two-family flat buildings. In some cities of the country complaint is made because of the many flat buildings erected, but this is not true of Detroit and flat buildings will continue to be erected in large numbers.

Indianapolis, Ind

Figures compiled in the office of Building Inspector Thomas A. Winterrowd show that there has been a substantial increase this year in the construction of frame dwellings, the major portion, however, being of the one-story type. The principal reason advanced for the increase in building operations this year is that lumber and other materials as well as labor have cost less than was the case a year ago. While lumber is at present showing an advancing tendency, it is not expected that it will retard work to any extent, but that the total value of operations for the year will be in excess of 1907. In October the value of permits issued was $543,976, as compared with $479,515 in October, last year.

For the first 10 months of the year the value of the building improvements for which permits were issued was $5,429,911.82, while in the corresponding period of last year the valuation was $4,230,996.20.

Los Angeles, Cal.

There is an unusual degree of building activity in the city just at present and while ordinarily October in a presidential year is regarded as a rather dull period this year was an exception and the value of building permits issued was in excess of $1,000,000. Tourists are flocking to the Pacific Coast and it is expected that many will take up their permanent residence in this city. There were 749 permits issued in October for building improvements valued at $1,001,999, which figure compared with 771 permits in October last year for new buildings valued at $1,020,764. Last year many of the permits were for business structures, while this year the majority have been for dwellings. Real estate men declare that the showing for the month is phenomenal, but expect the activity to continue for some time to come. In passing it may be mentioned that of the total valuation for October $676,156 was the value of new dwellings for which permits were issued, the record surpassing that of last year and demonstrating that the people have increased confidence in the future of Los Angeles.

Memphis, Tenn.

According to the report of Building Commissioner Dan C. Newton, for the month of October 198 permits were issued for building improvements estimated to cost $290,118, while in October, last year, 268 permits were taken out for new buildings, alterations, &c., valued at $281,839. These figures would indicate that the work projected a year ago was confined principally to small buildings, while during October of the current year a number of costly improvements were projected. Among the latter mention may be made of the large warehouse to be erected by the Memphis Paper Company, costing more than $50,000. There were several handsome veneered brick and stone dwellings estimated to cost $82,000; several brick and stone structures to cost nearly $89,000; two of hollow brick block construction, and 60 frame buildings.

New York City.

The striking feature of the local building situation is the tremendous gain in the value of new work projected in October as compared with the same month a year ago. The actual number of operations is practically the same, but the large gain in valuation is due to the fact that the plans for the new Municipal Building, estimated to cost $8,000,000, were filed the last week in the month, thus bringing the total to somewhat unusual figures. There were 62 permits issued for improvements estimated to cost $13,149,750, while in October, last year, 64 permits were taken out for improvements valued at $5,660,650.

In the Borough of the Bronx 202 permits were taken out for new work costing $2,312,275, as against 142 permits for new buildings involving an estimated outlay of $1,518,275 in October, 1907.

For the 10 months of the current year 2060 permits were issued for building improvements in the Boroughs of Manhattan and the Bronx, estimated to cost $87,826,421, as compared with 2664 permits for improvements costing $88,907,794 in the corresponding period of last year. These figures do not include the cost of alterations during the two periods named which were respectively $10,187,490 and $16,591,600.

The increasing activity in building operations has also been displayed in the Borough of Brooklyn, where 1040 permits were issued for improvements estimated to cost $5,639,500, while in October, last year, only 480 permits were taken out for new work estimated to cost $3,535,500. For the 10 months of the current year the value of the improvements, repairs and alterations amounted to $36,198,341, as compared with $66,283,526 in the corresponding period of last year.

The constantly increasing demand for apartment houses and private dwellings in conjunction with the present lower prices of building materials has resulted in a project involving the erection of 200 three-story brick and stone apartment houses and 22 private dwellings, the estimated cost of which is placed at $4,150,000. The operation will begin immediately in what is known as the Martense Section adjoining Borough Park on the north and extending east and south of that development. The structures will be erected by the Realty Trust Company from plans prepared by Architect Albert Sawsey. The apartments will be an innovation in that section of Brooklyn, in that they will be constructed along the lines of buildings of similar character in the Borough of Manhattan. They will contain all the modern improvements, including steam heat and sanitary appliances, hardwood trim, mission dining rooms, parquet flooring, &c.

The October record of new construction work in the Borough of Queens included plans for 462 new buildings estimated to cost $1,468,680, these figures comparing with 423 new structures estimated to cost $1,928,842 in September of this year and with 352 new structures involving an estimated cost of $1,845,686 in October, 1907. The gain this year is largely in the erection of small dwellings mainly of frame construction. The figures were also materially swelled by the filing of plans of public schools and churches aggregating a cost of $500,000. The sections showing the greatest activity are those that will profit directly by new transit lines now in operation or soon to be completed. They include the North Shore District, tapped by the Queensboro Bridge; the Belmont tunnel and the Pennsylvania tubes; also the interior region bordering the main line of the Long Island Railroad and the Brooklyn Rapid Transit trolley line between Woodhaven and Jamaica.

The improved feeling of confidence which has developed since the results of the presidential election were known seems to be gradually expanding and the general outlook for building is regarded as most encouraging.

Philadelphia, Pa.

The trade is very much encouraged by the statistics showing the volume of business operations in this city during the month of October. Only twice in the past 10 years has the record for that month been exceeded—in 1901 and 1906—and it is believed that no better proof of the return of more active conditions is necessary, than that shown by the figures compiled by the Bureau of Building Inspection. These show the number of permits issued during October as 833, for 1274 operations, at a total estimated cost of $2,789,295, a gain of nearly $250,000 in value over that of the previous month.

The total for the 10 months of the current year, however, is still far behind that of last year, but it can hardly be expected that the gains during the past few months, which have marked the more active movement in the trade, could overcome the deficiency. For the 10 months past the total for 1908 shows 11,856 operations, at an estimated cost of $24,039,135.00, as compared to 14,813 operations costing approximately $34,675,565 for the same period last year.

There appears to have been no particular increase in dwelling operation work during the month, although the prospects for this class of work seem to be improving. So far during 1908 work was started on 5175 two, three and four story dwellings, at a cost of $11,438,450, while during the same period last year 8089 dwellings were authorized at an approximate cost of $17,651,455. It is to be noted, therefore, that $6,253,000 of the total falling off so far this year is represented by this class of work. As a partial offset to this loss an increase in flat and tenement house construction is to be noted. This aggregates but $400,000 so far this year, although this class of work is steadily increasing. Compared with September, a small decrease was to be noted in both dwelling houses and industrial establishments, but there was a marked increase in municipal work, schoolhouses alone aggregating a total of $606,600.

Surburban building shows a steady gain and a number of fairly good sized contracts for suburban dwellings have been taken by local builders, and plans for a large additional number, work on which is expected to be started early in the year, are being considered. Taken on the whole, builders view the situation much more optimistically and it is believed that with the return of more active conditions generally, the building trades will gain materially in the amount of work undertaken.

Portland, Ore.

The building operations in Portland during October were just about up to the average for the year, and considerably better than many contractors had anticipated. During the month 368 building permits were issued, valued at $829,755. This showed a gain of nearly $200,000 over September.

For the 10 months of the year ending October 31 the new construction amounted to $8,500,481, which was a loss of $300,000 as compared with the same month of last year. Contractors hold that this loss will be largely recovered in November and December, as they report a large amount of work in the architects' offices and in contemplation. The banks are lending more freely than at any previous time within the past year, and as rents are still high and materials and labor cheap the outlook is for an unusual amount of winter building. Of the total for October, $300,600, or about two-fifths of the whole, was for new frame residences, the bulk of the remainder being for frame business blocks and hotels.

Rochester, N. Y.

The report of building permits issued from the office of Fire Marshall Walter for October shows the value of the contemplated operations to have amounted to $572,967, as compared with $523,248 in September; $420,435 in October of last year. The operations were notable for the number of fine dwellings of which there were large numbers costing in excess of $4000.

The total value of the improvements for which permits were issued the first 10 months of the current year was $4,211,874, as compared with $6,265,210 in the corresponding period of last year. In 1906 for the same period the valuation was $5,211,189, and in 1905 it was $4,607,332.

San Francisco, Cal.

New undertakings in the building line have not been quite so numerous during the last few weeks, owing partly to the season and partly to the election, says our correspondent, under date of November 4. The record was, however, remarkably good all things considered. During October the building permits reached a total of 318, with an estimated valuation of $3,403,897, as compared with $3,799,543 for the month preceding and $2,500,000 for the month of October, 1907. November is expected to hold its own with October notwithstanding the lateness of the season. A number of large projects are being held up and it is expected that these will be brought forth now that the election is settled and builders feel sure there will be no change in the present state of affairs.

All during October good progress was made on the buildings under way, and it is given out that contractors are increasing rather than diminishing their crews. Certainly there is not the same evidence of idle mechanics in the city that was noticeable earlier in the year. Contractors assert that the workmen are holding more firmly to the union scale of wages than they did some time back. The contracts placed on record during October numbered 295, for a total of $2,893,122. Of this total about half was for brick construction.

The tendencies in the trade as regards the character of the new work are the same as during the last few months. Purely office buildings, as far as new work is concerned, have ceased to be seriously considered, the principal interest now being centered on retail store structures, apartment houses, small hotels, flats and dwellings, with only a limited number of the finer grade of residences being started.

The San Francisco city authorities have definitely decided to remove the ruins of the City Hall and build a new city building or group of buildings at a cost of about $5,000,000. A competition for designs will be opened to the architects of the world, for the preliminaries of which an appropriation has been made. It is planned to pay for the structure by a special 20-cent tax for five years instead of by a bond issue.

There is little change in the materials situation here. Lumber continues very cheap as compared with prices of a year ago, though there is just now a little tendency for dealers to hold prices a little more firmly than was done some weeks since. Brick is as for some time past, with manufacturers complaining that there is no profit at present prices.

The San Francisco Chapter of the American Institute of Architects held its annual meeting and dinner a week ago. The following officers were elected: Albert Pissis, president; William Mooser, vice-president; Sylvain Schnaittacher, secretary and treasurer; Henry A. Schulze and William Curlett, trustees.

Seattle, Wash.

With the single exception of San Francisco, the building record for Seattle for October was the largest of any city in the Coast or Rocky Mountain States. During the month 1439 permits were issued, for work estimated to cost $1,705,190. This total was swelled during the last week in the month by a permit for an 11-story steel and concrete building to cost $450,000, but otherwise there were no structures of unusual size.

Tacoma, Wash.

The building record for October in this city was unusually poor as regards new work. The contractors and workmen are fairly busy on work started earlier in the year, but the amount of new work started dropped to the low total of $145,899, the lowest October in several years and little more than a quarter of the total for September. The total of the building permits issued in October, 1907, was $208,640, and for October, 1906, was $264,365. The total of new construction for the past five months includes 1032 permits with a total valuation of $2,049,766.

Notes.

In discussing the bill for licensing builders in the District of Columbia, Building Inspector Ashford is in favor of three grades of licenses, to correspond in importance with the three classes into which the buildings of the district are divided. He would include repair work of all sorts not affecting in any way the structural stability of a building in the license of the lowest grade.

During the month of October 332 building permits were issued from the office of the building inspector of the city of St. Paul, Minn., calling for an outlay of $711,610. This is an increase of 57 in the number of permits as compared with the same month last year, but a decrease of $301,712 in the value of the buildings.

More new buildings were projected in October in the city of New Haven, Conn., than was the case in the same month a year ago. The building inspector's report shows an estimated valuation of $220,460 for new buildings, while in October last year the value of the new work projected was $186,428.

An Old English Church.

It seems to be the impression that the Church of St. Botolph in Boston, Lincolnshire, England, may be selected as the model after which the projected Cathedral in Boston, Mass., is to be erected, and in this connection it may not be amiss to present a few particulars concerning the English structure. At the outset, it may be stated, that St. Botolph's is a fine specimen of old ecclesiastical architecture, and is one of the largest churches without transepts in all England. It covers an area 99 x 283 ft., and has an imposing tower, which rises 263 ft., dominating the landscape for miles around. It terminates in an octagonal lantern, and was doubtless intended by the builders to serve as a lighthouse by land and by sea, as well as a campanile.

The founder's chapel is in the early decorated style of Edward II (1307), while the naive, aisles and western part of the chancel are of a somewhat later period. The restoration of the church was begun in 1843, the work lasting 10 years and costing $50,000.

St. Botolph's is closely linked with the daughter city by the memory of the famous John Cotton. He was its vicar for upward of 20 years before he fled in 1633 across the Atlantic to the American Boston to escape persecution for his Puritanical views, and there, as is well known, he preached until his death nearly 20 years later. St. Botolph's contains a chapel to his memory, for which Bostonians subscribed the money. The name Boston is a contraction of "Botolph's town," and it is commonly supposed to occupy the site of the Benedictine abbey founded by St. Botolph in 654 and destroyed by the Danes in 870.

Making Veneered Doors.

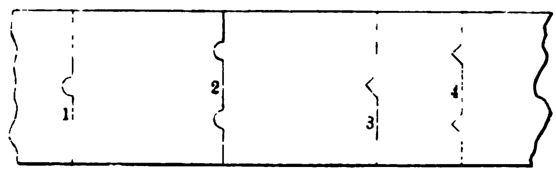
Nearly everybody doing mill work these days is interested more or less in the subject of making veneered doors. They are made all over the country, some places in small lots on special orders, other places in large quantities in standard sizes for the trade, and naturally, with the wide variation in the quantity of doors manufactured at different places, there is quite a diversity in the methods of manufacture, and this diversity applies to almost every detail. It is easy enough to take a section of a built-up veneered door and understand its construction, so that one could go to work and make another door that will look just like it in every detail, says a writer in a recent issue of the *Wood-Worker*. Yet, while that might easily be done, it is not so easy to understand what machinery was used and what methods were followed in the construction of the door. There are different ways of getting the same results, and the advisable way generally depends on the quantity it is desired to manufacture.

The thing about the making of veneered doors that seems to arouse the most active thought and inquiry, is the building up of the core, or frame body, out of strips. From time to time various methods have been illustrated for making various designs in core strips, but the planing mill trade as a whole does not seem to have settled on or accepted any one form of core strip as being the best or the most economical from the point of lumber requirements. That really is the first point we should get at, though, because success in doormaking probably depends more on this than anything else—getting a good core and getting it without having to pay therefor too much time required in machining it or waste of lumber in obtaining the shape desired.

Those who manufacture large quantities of doors, making this work a specialty rather than simply a factor in planing mill work, follow different methods, too. Some probably from choice and others possibly because certain other methods are patented. In one prominent door of this class the core strips are dovetailed together. This dovetail joint between the strips is not very remarkable in itself, but the method of handling the stock, of making this dovetail and putting it together, is. It is not only remarkable, but it is made possible or practical simply through the handling of large quantities. The work is done automatically on one machine, which receives stock from both ends, cuts the dovetails, spreads them with glue, automatically joins the strips together and discharges them from the machine at a rate that makes one think about the big Hoe presses taking blank paper from two different directions, printing it and folding it up together and discharging the papers faster than one can count. These door frames are not turned out that rapidly, but they do come out fast enough to make a man open his eyes, and the work is all done automatically on a machine that is quite large, and, of course, somewhat complicated, though really comparatively simple in its actions. The same machines are used for piecing together scrap stock in furniture factories, box factories and various other places where there is enough work of this kind to justify the use of automatic machines of large capacity.

While the making of veneered door cores in this way is decidedly interesting, it is not a matter that need appeal to the average planing mill man as being practical of adoption in his work. What the average planing mill man wants is some method of making such doors in comparatively small quantities on what machines he has, or by the addition of a few other machines that may also be found useful for other work besides that of doormaking. Practically every planing mill with anything like a full equipment has the necessary machines for milling door stock, so the problem really turns more on the kind of cores to make and how to handle the stock to the best advantage. The simplest way to build up veneered doors, aside from that of using a solid core, is to build them out of strips square jointed and glued together. This does not satisfy the trade, however, as it wants some kind of a tongue and groove joint between the strips to hold them together better. There may be some room for argument on this point, as to whether or not a square joint, properly made and well glued, will hold together as well as one in which a tongue and groove enters, but as long as the trade prefers a tongue and groove there is no need to argue over it, and it merely reduces itself to what kind of tongue and groove is best, along with which comes the other question of what size strips. There is not much question but what a dovetail joint, properly made, is the best thing in the shape of a tongue and groove joint that has ever been devised, but it is hardly practical to make joints of this kind where veneered doormaking is indulged in only in a limited way, because dovetail matching, without automatic machinery to do it with, is about the most expensive form of joinery in use. Referring to the accompanying sketch, 1 is single oval tongue; 2, double oval tongue; 3, single " V " tongue; 4, double " V." The latter is probably best for general use; it requires no more lumber than the single " V."

What seems to be the favorite method among the planing mills is to use a " V " tongue and to make it rather small. Some use single tongue and some use the double, and some use it both ways, being guided by the thickness of the door. Others prefer an oval or " U " tongue and groove, which is very good, too, and, carefully made and the groove not made too deep, it should offer the advantage of being less liable to damage in handling than the sharp " V " tongue. In the use of either of these tongues the main thing to guard against is making them too deep. It's a waste of timber and doesn't add to the value of the stock, for a body made up of as small units as the strips in a core door can hardly develop cracks large enough by shrinkage to dismember the very shallowest tongue and groove. Either of these joints may be made on an ordinary sticker or box board matcher, machines that nearly every planing mill has in operation.



Making Veneered Doors.

When it comes to the matter of size of strips used in building up cores for veneered doors, the practice seems to vary more than in the manner of making the joints, and various widths are used, from ⅞ up to something like 2 in. Some planing mills take stock of the thickness desired to make the door frame in question and rip it into strips, having established by practice a standard for 5-in. stiles and one for 6-in., so that it will work out right when faced with strips for sticking, of the same material that is used for veneering. Others, for the sake of using up scrap stock about the mill, take scrap from standard inch stock and rip it into widths to correspond with the thickness wanted in the door body. These strips go straight through the sticker and are matched sidewise, making what might be termed the narrowest kind of core strips, which certainly make an excellent body to veneer on, and the use of which should appeal to many a planing mill man, because it furnishes an opportunity to use up all kinds of scraps. Any length strip can be used, and it looks like it might be practical to build them together in almost any width and length and rip them apart afterward to conform to dimensions wanted, just as one would cut stock from lumber to make any given order for doors.

After the core is glued up, the best method of handling it is to take the stock to the top smoother or hand jointer and joint one face there, so as to get it straight and take out whatever wind there may be in the piece; then it can go to the planer for sizing.

In buying veneer for doors, where you have it cut to dimensions, it is well to have it plenty large. There is no need of unnecessary waste, but sometimes veneer stock will crook a little edgewise, and when this occurs it not only means you should have room to trim out the crooks and straighten it up, but it is best to do it before you put the veneer on. If you don't, in the work of gluing you are likely to get a piece on crooked and leave a spot bare.

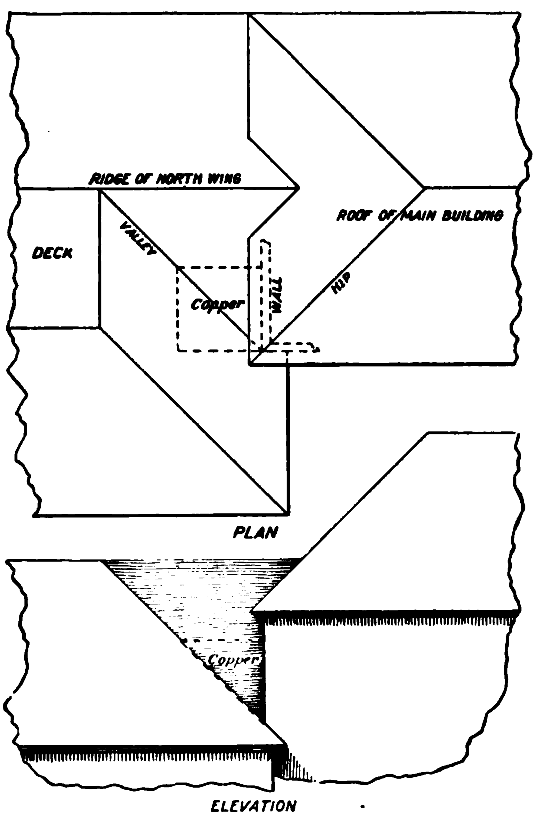
There are different methods of straightening the veneer up. Some do it on a rip saw, some use a box board matcher, some turn to that handy woodworking machine in the factory, the top smoother. The thickness of veneer to use depends materially on the work you are doing. In birch, gum and oak quite a common thickness is ⅛ in., so as to leave room for finishing down smooth at the joints, and sometimes people get oak as thick as ¼ in., where they can get hold of stock of this kind easily. When it comes to mahogany and fine, expensive woods, it must of necessity be used very thin, and, of course, the door frame must be sanded and smoothed down before the veneer is applied, so that very little finishing is necessary afterward.

Roof Condensation Trouble.

BY H. A. D.

The architect had an argument with me last week and could not be convinced that there was no leak in the valley on the north wing of a building where we did the work.

This wing is several feet lower than the main building, and the ridge of the roof of the wing runs into the slope of the roof of the main building, but most of the roof below the ridge stops against the wall of the main building. A valley starts 15 ft. out on this ridge and finishes at the bottom at the corner of the main building, making a triangular section of roof running to a point at the low end where the valley intersects the corner of the main building, and for 10 or 12 ft. up the roof we put on a copper watershed.



Roof Condensation Trouble.

This sketch shows the lay-out of the roof and valley Near the bottom of the valley the sheathing was wet inside the attic, but there was no snow, ice or water outside, and had not been any for several days as I had noticed this and formulated my theory before the architect kicked about the "leak." Several days earlier the sheathing had been wet underneath this valley all the way down, and also underneath the whole of the copper watershed, the wet section following the lines of this work because of the facility with which copper conducts heat away and therefore cools off the warm air inside and causes condensation when the air outside is very cold and the warmer air inside is very moist.

In this case these two extremes existed as the weather was very cold and the air in the building very moist from escape at air valves in the steam heating system and the drying of the plaster, so the sheathing became wet from the condensation. Naturally this followed down the rafters, and the sheathing at the low points became saturated while that near the top of the valley and the top lines of the watersheds did not get so wet and soon dried out when conditions improved, while that near the bottom remained wet longer and it was the dampness at that point which was reported as a "leak."

I explained this to the architect, but he would not believe it entirely, and said he would have to see a rain on the roof before he would believe the condensation theory. I then examined the watershed, valley and roof thoroughly, and was firmly convinced that there was no leak. The rain this morning showed the architect conclusively that there was no leak, as a very heavy rain, continuing for several hours, failed to let any water through, and he had to admit that he was wrong.

Advance in Wood Preservation.

"Timber thoroughly treated with proper preservatives will last almost indefinitely," says a Government expert who is an authority on wood preservation. "Engineers have known for years that this is true," he continues, "but up to the present time, at least in America, complicated and expensive plants have been necessary for the work and wood preservation has often been too expensive an operation to allow treated timber to come into general use."

Methods in wood preservation have undergone a marked change in the last few years, however, and the work which a few years ago was limited to a few experiments carried on in scattered parts of the United States has grown with such rapidity that wood preservation has become a business which figures most prominently in the industrial life of this country.

Each year railroads are treating an increasing portion of their crossties, miners their mine props, farmers their fence posts and the men of many other industries are bringing preservatives into play to close the pores and prepare the timber they use to resist the fungi which cause decay. The work points the way to one of the chief means of the conservation of the nation's forest resources, for as the length of the life of timber is increased the drain upon the forests is lessened and more wood made available for use.

In nearly all localities in the Rocky Mountain and Pacific States is found an abundant supply of certain kinds of timber which have only a slight commercial importance. Engelmann spruce, lodgepole and other kinds of pine, aspen and cottonwood are only a partial list of the kinds of wood which are strong enough and abundant enough to win high value for construction purposes were it not for one single defect which has prevented their general adoption. When exposed to the soil and weather they decay so rapidly that they have to be renewed too often to justify their use.

Dead timber of lodgepole pine and other species also is found in large tracts, but is sharply discriminated against by all constructing engineers and contractors. As a matter of fact, the dead timber, provided it is sound, is just as good as green timber of the same species; and indeed, in some ways is even more valuable. For it is well known that thoroughly seasoned timber is both stronger and more durable than the same timber when green. Timber which was killed by fire or insects and which is still in a sound condition, differs from green timber chiefly in being thoroughly seasoned—that is to say, it is stronger, more durable and lighter. And so not only are the freight rates considerably reduced, but a better grade of timber is secured.

Even in a thoroughly seasoned condition lodgepole pine, Engelmann spruce and the other species mentioned above, are by no means durable woods when compared with Douglas fir, Oregon cedar and the other kinds of wood which are used so extensively in construction work. And before they can successfully compete with such timbers, in spite of their lower price, they must be made to last longer under unfavorable conditions.

After several years' study the United States Forest Service has proved that in many cases the complicated and expensive plants are not necessary for the proper treatment of many kinds of timber; and that many of the timbers which decay most rapidly in the natural state are among the easiest and cheapest to treat. Many of the species mentioned above offer little resistance to the entrance of the preservative. The principle of the method is to immerse the thoroughly seasoned wood in a hot bath of the liquid, leave it in for a few hours, and then either plunge in into a cold bath of a preservative or else run out the hot liquid from the treating tank and fill it up again with liquid of a lower temperature. This requires only the simplest kind of machinery, and the cost of operation is so slight that even cheap timbers like fence posts and shingles can be treated by the average farmer of small means.

Although the Forest Service, by extensive experiments in all portions of the country, considers that the practicability of the process has been conclusively proved, more or less difficulty has been encountered in inducing others to adopt the process on a commercial scale. In order to demonstrate beyond any doubt that the process is adapted to commercial treatments, the Service has arranged to erect small treating plants—semicommercial in size— on several of the national forests. Tests will be made on the local timbers, and careful record kept of the cost of the work. The treated timber will then be placed in permanent position, where its future durability can be compared with untreated timber of the same or other kinds.

Three such plants will be erected this spring, and it is expected that they will be in successful operation by early summer. According to the present plans one plant will be erected at some locality on or near the Black Hills National Forest, South Dakota; another on the Holy Cross National Forest in Colorado, and the third on the Henry's Lake National Forest, near St. Anthony, Idaho.

The investigations in wood preservation by the use of creosote, which is nothing more than the dead oil of coal tar and zinc chloride, are considered of such importance by the Government that one branch of a bureau in the Department of Agriculture—the "Office of Wood Preservation" in the Forest Service—is given over entirely to the work of experiments in co-operation with railroad companies, mining corporations and individuals who desire to prolong the life of the timber which they use. Advice and practical assistance is furnished all who request it of the Forester at Washington.

To Make Concrete Watertight.

Great care should be exercised in handling concrete. While the materials employed may be perfectly graded and the proper proportions of cement and of hydrated lime used, yet if poorly mixed with water, or improperly placed, of if joints are left in the mass, the wall is likely to leak. In the first place, says *Cement Age*, the mixture must be thorough, and in the second place, sufficient water must be employed to give at least a mushy mix, so that it will settle into place with only a small amount of ramming.

Fully as important as the mixture is the bonding of the concrete between two days' work. For a small structure which must be watertight, it is advisable to place the concrete continuously, allowing no joint whatever, and not even permitting the concrete to stiffen up between the batches. Even an interruption of an hour in the middle of a hot day has been known to form a joint which will allow water to pass. If continuous work is impracticable, the old surface of the concrete must be thoroughly cleaned of all dirt and partially set cement, so as to expose the concrete.

It is recommended that a layer of soft cement paste or else 1:1 mortar be spread upon the old concrete after thoroughly soaking it. Lay the new concrete before the mortar shows signs of stiffening. Avoid the formation of joints through which water will pass. Such an accident should be guarded against by cleaning surfaces, for whenever partially set cement is left on old concrete trouble invariably occurs.

New Publications.

A Hand-Book for the Plumber, Steam Fitter and Tinner.—By H. G. Richey, Superintendent of Construction of United States Public Buildings. 529 pages. Size, 7 x 4½. Illustrated. Bound in flexible leather covers. Published by John Wiley & Sons. Price, $1.50.

This is one of a group of four books, all carrying the head, "The Building Mechanics' Ready Reference," each one being an edition for certain trades. It makes no pretense of giving comprehensive searching information about the various subjects covered, but is, as stated, a ready reference which the number of pages attests is remarkably complete. Rather than going at length into questions of the theory and design of heating, plumbing and sheet metal installations, it is a volume aiming to give within the one set of covers the practical and short cut information needed by the worker wanting to get the best results in the easiest and quickest way.

On the subject of heating, the warm air furnace is included as well as steam and hot water; illustrations are given to show the different systems of piping and some data on calculating for indirect as well as direct systems. For the plumber there is a considerable number of pages on the question of hydraulics, taking in the flow of water in pipes and of sewage in sewers. For the tin and sheet metal worker are considerable numbers of detailed sketches, and in all cases elaborate tables of sizes, weights, strength and other features of importance. One part of the book is given over to gas piping and gas fitting, and the last section of the book contains a lot of drawings of plumbing work, mensuration tables and wage tables. It might be said that the data on heating work falls under the adverse criticism now leveled on approximate rules which give the reader no conception of their real basis and do not help him in the growing practice of treating such problems from a heat unit standpoint. However, as stated, the book is primarily one of practical details rather than of engineering import. One interesting feature is a list of prominent makes of radiators, with such figures as the hight from the floor to the center of the tapping; another is a table of offsets for piping work. On tin roofing it quotes at length from an article in *The Metal Worker*, by W. B. Goddard, on putting on a tin roof. It gives a table of proper sizes of soil pipes and methods of supporting pipes, prints in detail the rules regarding plumbing from the Philadelphia Building Code, and details the specifications for plumbing work as laid down by the supervising architect of the Treasury Department.

The History of Expanded Metal.

Expanded metal, the commercial name for a material having a worldwide use and which consumes yearly many thousand tons of steel sheets in its manufacture, had its beginning in an occurence in which a half-grown hog played a prominent and useful part. The inventor, John F. Golding, then a Chicago newspaper man, was on a sleeping car on his way to New York in the fall of 1884, when his train was stopped for a while near a field of ripening corn, inclosed by a fence made of plain wire stretched from post to post. While looking out of the window, he noticed a pig approaching the fence, through which he passed by pushing his head and body between the wires, thereby gaining easy access to the desired corn. This was done with an air of assurance indicating that the spring of the wires had been numerously under previous tests.

The evident defect in the fence led Mr. Golding to study methods of prevention. His first conclusion was to connect the wires at intervals by perpendicular strands as is now done in the woven wire fencing in common use. This prompted the further inquiry, why not utilize sheet steel and make large meshes by slitting the metal and then push out or expand to form a diamond shape?

Realizing the value of the invention, Mr. Golding went to Washington and filed application for patents, and then sought the co-operation of capital, which he found in the person of Oscar Bradford, then president of the Curtis & Co. Mfg. Company, St. Louis, who interested Henry Semple Ames, Henry S. Turner and R. H. Floyd-Jones, all of that city, in a company of which he became president, which position he has held continuously to this time.

Mr. Golding's mechanical ingenuity devised practicable machines of the "guillotine" type, and the industry was launched, first as a material for fencing, but later its adaptability in smaller meshes for plastering lath and for concrete reinforcement led to an invasion of fields with wider opportunities.

Manufacturing plants were established in the leading European countries and Australia, and the business enjoyed a healthy growth, but realizing the necessity for more rapid methods of production Mr. Bradford began to look around for a rotary machine. The initial idea came from W. L. Caldwell, now of Canton, Ohio, which when improved upon by the inventions of Lewis E. Curtis of Chicago, reached fruition in a machine with a capacity twenty times greater than the old time guillotines. This second birth of the industry gave it an immense impetus, and it is now going forward by leaps and bounds to a development which will make it one of the leading factors in sheet tonnage. The manufacture and distribution of the material have been well taken care of by Chess Bros., Pittsburgh; the Eastern Expanded Metal Company, Boston, and the Northwestern Expanded Metal Company, Chicago. More recently the American Sheet & Tin Plate Company has entered the field under license from the Ames Steel Lath Company, St. Louis, which controls the patents on the rotary process.

Death of A. A. Raymond.

Alfred Augustus Raymond, inventor of the Raymond concrete pile and vice-president of the Raymond Concrete Pile Company, who recently died at Regina, Canada, was born at Lockport, N. Y., on December 17, 1848. His early years were spent in the South and West, during part of which period he acted as United States Marshal for Dakota Territory. In 1888 he moved to Omaha, where he engaged in the bridge building and contracting business with his brother Edmond W. The experience he gained in this connection with wood piles convinced him that this type of piling would eventually become obsolete on account of its not being in conformity with the progress made in other lines of construction. He therefore turned his attention to the development of a permanent substitute for the perishable wood pile, the result being the invention in 1898 of the concrete pile bearing his name.

In order to introduce his invention, Mr. Raymond moved to Chicago in 1900, where he succeeded in gaining the attention of architects and engineers, and by means of successful demonstrations convinced them of the advantages of his system of piling. The first actual work was performed in June, 1901, and justified all the claims made for the pile by its inventor.

Mr. Raymond was recently called to Canada to assist in the construction of a difficult piece of foundation work at Winnipeg, and to supervise a large contract at Regina. He died while at the latter place. He leaves a widow, two daughters and two sons. Of the latter, Gordon B. is now superintending work for the Raymond Concrete Pile Company of Canada at Regina, while Howard D. is assistant treasurer of the Raymond Concrete Pile Company, with headquarters at Chicago, Ill.

A MUNICIPAL INSTITUTE FOR PRACTICAL EDUCATION has been opened in Belfast, Ireland. The building occupies a site in the heart of the city, and contains 128 rooms, with an area for the five floors of over 133,000 sq. ft. Of the 13 departments in the institute, a building trades department has been established, covering woodworking, painting and decorating and a complete plumbing shop. There is also a trade preparatory school for boys intending to take up in dustrial occupations, and there are technical courses for engineering, one in mathematics, one in textiles, one in chemistry, one in commercial lines, one in art and one for women, covering cooking, dressmaking and the like. About $80,000 is provided for the maintenance of the building.

Lessons in Building Construction.

The special courses for the training of skyscraper workers were opened the second week in October, at the West Side Y. M. C. A. rooms, 320 West Fifty-seventh street, Borough of Manhattan, N. Y. The courses include construction in plan reading, estimating, drafting and structural engineering, and are designed to enable men in the building trades to read drawings and specifications with facility, to take off correctly the desired quantities and to lay out work. During the four seasons that these classes have been conducted, more than 400 men, many of whom are employees of building and construction companies in New York, have taken advantage of these courses.

CONTENTS.

BUNGALOW ERECTED FOR MR. THOMAS D. NESTOR, ON FREMONT AVENUE, SOUTH PASADENA, CALIFORNIA

HENRY L. WILSON, ARCHITECT

Supplement Carpentry and Building, December, 1908

[For Plans see pages 383-386]