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CARPENTRY AND BUILDING

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THE BUILDERS' EXCHANGE.

DAVID WILLIAMS COMPANY, - PUBLISHERS AND PROPRIETORS

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JANUARY, 1898.

Exhibition of the Architectural League.

The thirteenth annual exhibition of the Architectural League will be held, as in recent years, in the building of the American Fine Arts Society, No. 215 West Fifty-seventh street, New York City, the period being from February 12 to March 5, inclusive. The exhibition will consist of architectural drawings in plan, elevation, section, perspective and details; drawings of decorative work, cartoons for stained glass, models of executed or proposed work; completed work, such as carvings in stone, wood, bronze, wrought iron, mosaic, glass, textile fabrics and furniture and sketches and paintings of architectural and decorative subjects. It is desired by the management that when practicable all perspectives and elevations be accompanied by carefully rendered plans of the same. Large scale drawings or details of some portions of the work, or models of architectural detail and sculpture in wood, are among the features which it is expected will constitute an interesting part of the display. The competitions will be for the gold and silver medals, the Avery Prize and the Allied Arts Prize. The competitors for the gold and silver medals must be residents of the United States and under the age of 25. All the designs submitted must be the exclusive individual work of the contestants, and no studio or collaborated work is to be included. The subject will be "A Public Bath," details of which are given in a programme issued by Secretary George Keister, and to which all drawings must be made to conform. A press view of the exhibits will be given on February 10, the annual dinner of the League will take place on the evening of the same day and the League reception will occur on Friday, February 11.

New York Public Library.

The massive structure which it is purposed to erect on the site of the old reservoir, extending along Fifth avenue from Fortieth to Forty-second streets, New York, will give the city not only a public library, for which there has long been a pressing need, but a building of which it may be justly proud. Out of 86 separate sets of plans, submitted by 91 architects, the drawings of Carrère & Hastings were finally selected by the Board of Experts. The main facade of the building will be 75 feet back of the Fifth avenue building line, and it is intended to treat the foreground, which is 455 feet long, as a terrace, and in a formal way as a grand approach to the main entrance. The general style of architecture will be that of the Renaissance, and although based upon classical principles it will be modern in feeling. In the main Fifth avenue elevation Ionic columns or pilasters, 46 feet in hight, including the entablatures, will be used. Three great arches, each 35 feet high and 15 feet wide, with deep recesses, form the main entrance to a large monumental hallway, 80 feet high and 40 feet wide, extending through two stories. The same arches as shown in the facade go around all four sides of the hallway, and according to the plans the ceilings are to be vaulted with stone. Staircases at both ends, 12 feet wide, rise one flight to the main hallway on the second floor, and from there crossing this hallway another flight leads to the third floor, arriving directly at the entrance to the great reading rooms. An entrance on the Forty-second street side gives a direct approach to the lending and delivery rooms, which will occupy one of two courts, 85 feet square. A third and less important entrance on Fortieth street communicates direct with stairs and elevators for the service of the building. The north side, on Forty-second street, will be devoted to special reading rooms and separate rooms for maps, public documents, periodicals and music. In the rear of the building will be the main stack room, which will contain seven tiers of stacks, with the main reading rooms immediately over them. The location of the main reading rooms on the top floor is a rather novel but satisfactory feature, as it insures good light, perfect quiet and convenience for the occupants. In designing the library the endeavor has been to make the building monumental in character, with classical proportions and impressive in scale. Either white marble or Indiana limestone will probably be the material used in its construction. As a result of the consolidated Astor and Lenox libraries and the Tilden bequest, the new library will be endowed at the start with funds amounting to $8,000,000 and about 450,000 volumes. The sum required for the construction of the building, $2,500,000, has already been appropriated by the Legislature.

Manual Training Schools.

Beneficial results of a varied character are flowing from the establishment of manual training schools. Some of these are of a nature that was hardly foreseen by those who planted the seed for such institutions. Our methods of manufacturing, which are becoming more clearly defined every year, by which a man steadily runs a single machine or performs but one operation, are destroying the old ideas of learning a trade. A workman is now a specialist, just the same as men in other walks of life. The general mechanic, the all-around man, once so numerous in this country, is fast disappearing. Yet the apprentice in a country shop, in which a little of everything is done, can no longer claim superiority over his brother in the city, because the machinery in a rural shop is not apt to be of the most modern character. The country bred mechanic can do well in emergencies requiring self reliance and perhaps ingenuity, but if he enters a large manufacturing establishment the chances are that he will require considerable instruction to become able to run the improved machinery found there. The operations requiring special skill and superior knowledge are also likely to be invariably intrusted to old hands known to be able to do the work properly; so that the beginner stands no chance in that direction unless he is specially favored.

Scope of Manual Instruction.

The establishment of manual training schools, however, is filling a serious gap in our mechanical development, resulting from the causes enumerated. The instruction given is of such a wide scope in any branch taken up that the completion of the course fits the student to enter his vocation as a wage earner with a much more ample equipment than either the modern or the ancient apprentice. He not only possesses the practical knowledge requisite, but also has the scholastic training which makes him a thinker. The poorest manual training school gives instruction in drafting, mathematics and other studies, enabling the student to work from plans and, if he has any originality or mechanical talent, to prepare designs when required. But within very recent years a great impetus has been given to instruction of this character by the endowment of schools and colleges by wealthy men, who discern in the proper mechanical training of the rising generation a correct outlet for their own philanthropic impulses as well as a patriotic duty devolving upon them. This has resulted in signal instances in the equipment of these institutions with machinery and appliances of the most advanced character, far better than anything found in the average shop. The managers of these schools are not obliged to be satisfied with the simple tools and elementary machines once deemed entirely sufficient for the purpose. They are able to call upon the builders of the most ingenious machine tools for their best creations and to install in their workshops the latest developments of scientific construction. Graduates of such schools know how to turn out good work and are not satisfied with anything short of the standard to which they have been trained. Schools of this character are increasing in the West, in a section in which they are needed. Several have been munificently endowed by wealthy philanthropists within the past year or two, some of which are just being equipped. Builders of high class machinery are consequently finding in the growing manual training schools quite a market for their tools. But further than that, they are perceiving the effects of this special training in orders for such machinery from graduates who are now running factories or machine shops. The leaven is leavening the whole lump.

Seating Space in Buildings.

It often happens that a country contractor is called upon to make a rough sketch for a rural school, church or hall, and he is instructed to design the building to accommodate a given number of persons, and in order to construct his building to the proper dimensions to meet the requirement a knowledge of the space required by a single person to be comfortably seated will be requisite. There is no general rule in universal practice that covers this question, says a writer in the Canadian *Architect and Builder*. Boards of education, architects, chairmen of church boards and others, in this and other countries, have endeavored to formulate certain dimensions to be used for each individual present in a hall, church or school, but from some cause or other, unanimity of figures seems impossible. Generally the following figures will be found to answer all ordinary conditions: For halls, allow 18 inches frontage and 24 inches depth. This gives ample room, and in cases of emergency could be reduced to 15 x 20 inches, but this would necessitate some crowding. Of course, a great deal depends on the style of seat used. If orchestra chairs are used the space may be reduced somewhat, but if the old time wooden seats, benches or pews are provided, then the full dimensions of 18 x 24 inches should be maintained. Desks used for scholars in the public schools should be, for two scholars, 3 feet 10 inches long, with a seat the same length. Here it will be seen that a new condition arises—desk room as well as seating room will have to be provided for, and to give the greatest amount of comfort and allow for passage ways between desks, each scholar will require a space of 33 x 33 inches. Seats for scholars five years of age should be 9½ inches high; ten years of age, 13¼ inches high; 15 years of age, 15½ inches high; over 15 years of age, 16¼ inches high. Besides the space allotted for an audience, congregation or scholars, ample provision should be made for a platform, on which will be situated pulpit, reading desk, choir stand or other necessary furniture, according to the uses for which the building is intended. A little study of the foregoing will enable the country contractor to strike very nearly the size of the building required.

Combination of Brick Manufacturers.

At a meeting in the Chamber of Commerce Building, Chicago, Ill., held on December 11, 44 Cook County brick manufacturers were merged into one corporation. Among the firms taking part in the meeting were the Alsip Brick Company, Purington-Kimbell Brick Company, May, Purington & Bonner Brick Company, Harland Brick Company, Labahn Brick Company, Weber-Labahn Brick Company, Weckler Brick Company, Weckler-Prussing Brick Company, Riemer, Labahn & Kuester, and Sexton Bros. Company.

The officers and directors for the first year are as follows:

President, D. V. Purington.
Vice-president, W. H. Alsip.
Secretary, L. H. Harland.
Treasurer, C. Du Bois Howell.
Directors: D. V. Purington, W. H. Alsip, George Lill, Louis Riemer, W. H. Weckler, Alexander Burke, P. J. Sexton, Frederick Labahn and William Lorimer.

Chicago's Public Library.

The magnificent public library building which has been in process of erection in Chicago during the past five years was lately dedicated and thrown open to public use. It occupies an imposing site on the old and historic Fort Dearborn military reservation, and there has been expended in its construction nearly two millions of dollars. The building is massive and rather plain in appearance, but the lack of exterior ornamentation is fully compensated for by the mural decorations of the interior. The ceilings and walls are richly ornamented with beautiful designs, there being in the vast entrance hall a series of square mosaic panels bearing the names of Horace, Livy, Homer, Virgil, Cicero and Plato, while in another section are similar panels bearing the names famous in American literature, such as Longfellow, Bryant, Whittier, Hawthorne and Irving. Over the wide entrance to the delivery room is an inscription in mosaic to the memory of Benjamin Franklin, bearing the dates of his birth and death, with the words "Founder of the Circulating Library." In the room itself are ten mosaic inscriptions in as many languages, the text being of appropriate educational signification and the languages used being Persian, Chinese, Greek, Egyptian, Hebrew, German, French, Spanish, Italian and Latin.

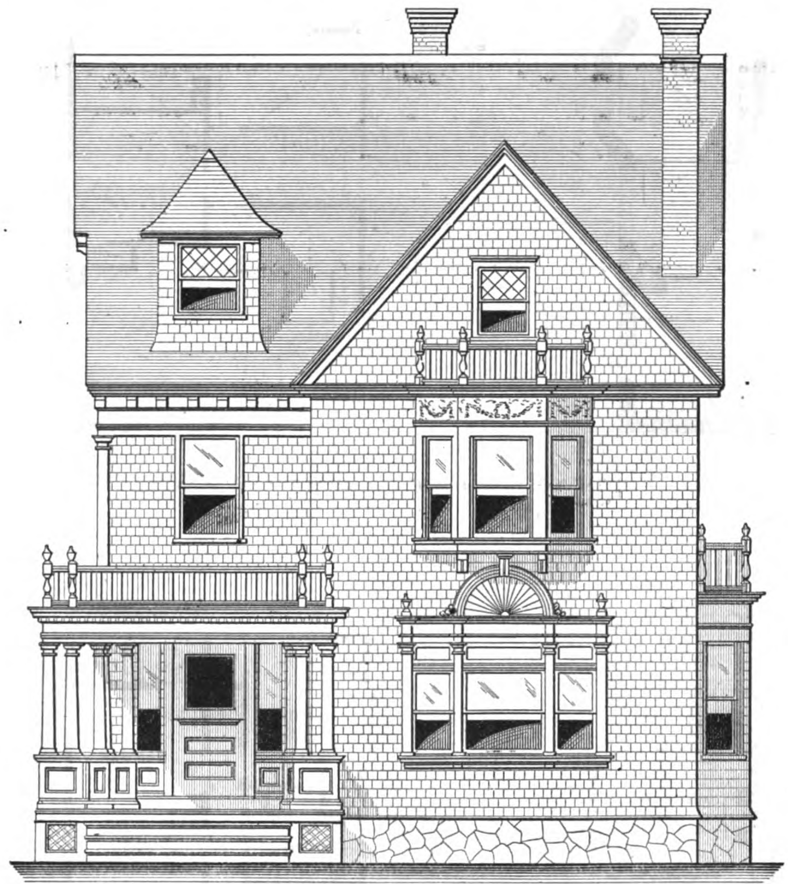
The most imposing division of the building is the reading room, which is 140 feet long, 33 feet wide and 55 feet high, lighted by windows on all sides. The unsightliness of huge supporting columns has been obviated by the use of heavy steel trusses for the roof supports. The delivery room is 136 feet long by 49 feet wide, and behind it are six large bookstack rooms having a capacity of 600,000 volumes. The stacks are conveniently divided into three stories each 7 feet high, the first one being just below the delivery room and the top one on a level with the main reading and reference rooms one floor above. Electric book elevators are placed at various points to convey the volumes from one floor to another. Adjoining the reading room is a reference room furnished with 22 tables and giving a seating capacity of 176 readers. There are also smaller study rooms in different parts of the building arranged especially for those who require a quiet place for literary or scientific research. Special rooms are provided for the librarian, the directors, those compiling the catalogues and all other special departments. The number of volumes now in the library is said to be a trifle over 220,000, while the book capacity of the building, when the stacks are completed, will be about 2,000,000 volumes.

A HOUSE IN HARTFORD, CONN.

DURING the past year there has been a considerable amount of building going on throughout the New England States, especially in the line of private dwellings of moderate cost. Many of these have been of a character of design well adapting them for suburban sites where the surroundings are picturesque and attractive, and no doubt many of our readers will be interested in examining the plans of some of them. We have, therefore, selected for this month an attractive example of New England architecture and show by means of the supplemental plates an exterior view of the dwelling as well as a glimpse into the reception or stair hall and the dining room. The accompanying floor plans show the general arrangement of the rooms, while the many details upon the pages which follow give an idea of the main features of construction. The residence is that of Charles B. Haskell and is situated on Wethersfield avenue, one of the beautiful residential thoroughfares of the city of Hartford, Conn. The entire exterior of the house is of shingles, the side walls being of a dark brown shade, while the roof is of a moss green. All the trimmings are painted a pure white, the exterior being carried out in the Colonial style, having at different places attractive bits of detail and special features.

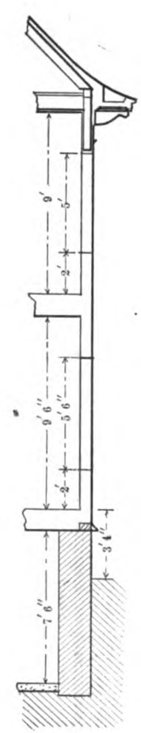
The plans were prepared by Architect F. R. Comstock of 252 Asylum street, Hartford, Conn., and from his specifications we learn that the frame is of first quality spruce, the bearing timbers being 8 x 10 inches; the first, second and third floor timbers 2 x 10 inches, placed 1 foot 4 inches on centers; the sills 4 x 6 inches, with halved and lapped joints spiked together; the girts $1\frac{1}{8}$ x 6 inches, cut into the studding for the support of the timbers; the plates 4 x 4 inches, with lapped joints and spiked together; the valleys, hips and ridges 2 x 10 inches; the main rafters 2 x 8 inches, placed 2 feet on centers, the other rafters being 2 x 6 inches; the piazza bearing beams 6 x 8 inches; floor beams 2 x 8 inches, placed 1 foot 8 inches on centers; the studding of the exterior walls 2 x 5 inches, and that of the interior walls 2 x 3 and 2 x 4 inches, all placed 1 foot 4 inches on centers.

The front porch, 12 x 14 feet, gives entrance to a recessed vestibule and through a "Dutch" door the staircase hall is reached The latter is finished with white enamel, the stairs having cherry treads, while the hand rail is stained a rich mahogany color, with here and there bits of ornamentation in London putty white enameled. The main newel of the staircase extends from the floor to the ceiling, supporting a screen of turned spindles extending across the end of the staircase hall, forming the library partition with the assistance of portières. The library, which measures practically 12 x 13 feet, contains a fire place and gives direct entrance to the dining room as well as to the parlor, which extends across the front of the house and is finished in old ivory enamel. In the partition between the dining room and the library is a projecting bay window or cabinet, supported on ornamental brackets and constituting a very handsome feature of the dining room finish. Under the cabinet on the library side is a bookcase built in the thickness of the wall, this also constituting a very useful and attractive feature. Among the details will be found an elevation of this bookcase with the projecting window above. The dining room is fin-



Front Elevation.—Scale, ⅛ Inch to the Foot.

A House in Hartford, Conn.—F. R. Comstock, Architect.

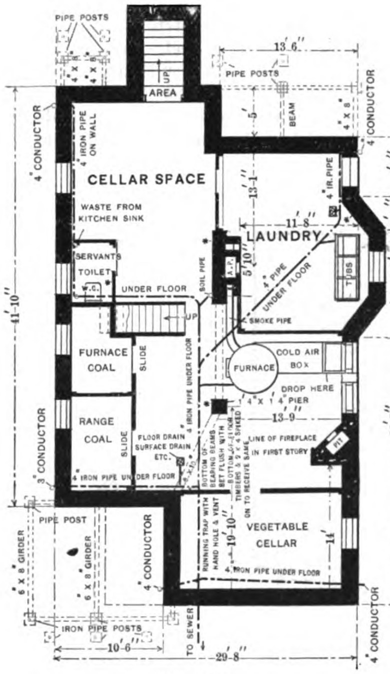


Section.

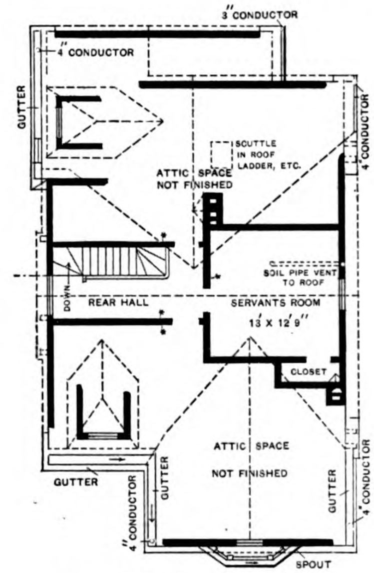
ished in selected oak and, in addition to the cabinet mentioned in connection with the library, has a built in china case of special design with glass doors, &c., an elevation of this being presented among the details.

In the designing of this house no little attention was given to the kitchen arrangement, this being a feature which often fails to receive the consideration which its importance deserves. An inspection of the floor plan will show in connection with the kitchen a rear hall, a space for the ice box, a closet with shelving and a pantry fitted with counters, cupboards, shelving and the like. There is also a butler's pantry, which gives entrance to the dining room. Another feature is the direct communication between the kitchen and the staircase hall by means of the passage way under the main stairs. In this passage way is located the stairs leading to the cellar, and a closet which serves as a coat room. One of the special features of the first floor arrangement is a large piazza at the rear of the house for the use of the family, and which has an entrance to the dining room.

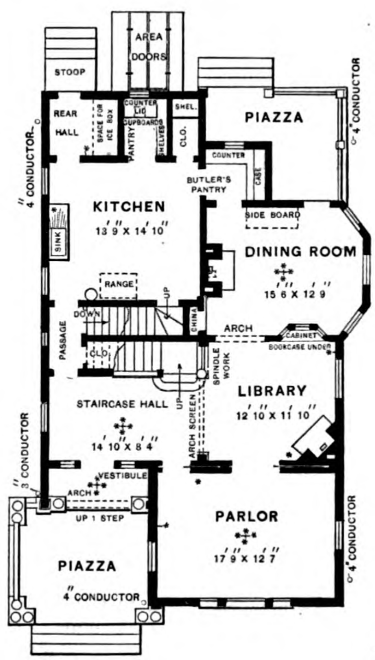
The second story has four large chambers, although the front one is used as a sitting room. It will be seen that there are numerous closets, servants' staircase, bathroom, &c. The entire second floor is finished in white pine, painted to harmonize with the interior decorations. There is one room finished in the attic with plenty of space for trunks, &c. The house has a complete system of electric wiring, also electric automatic gas wiring, with speaking tubes and electric bells. The heating is



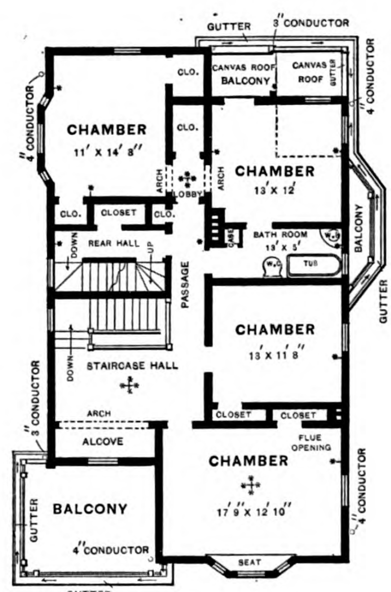
Foundation.



Attic, with Outline of Roof Plan.

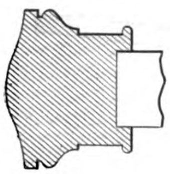


First Floor.

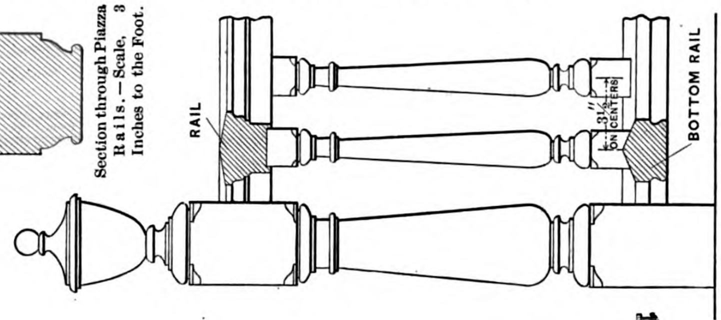


Second Floor.

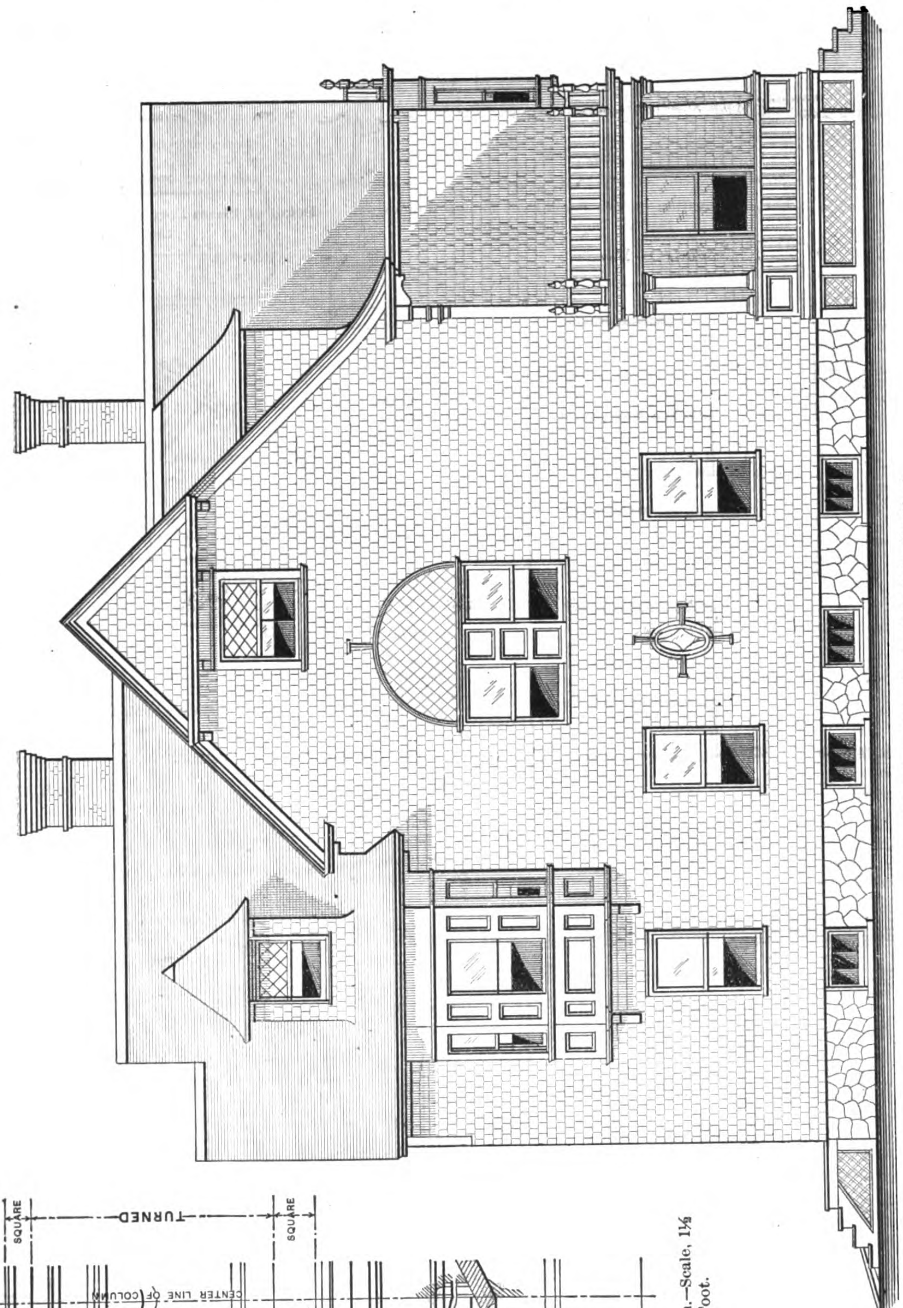
A House in Hartford, Conn.—Floor Plans.—Scale, 1·16 Inch to the Foot.



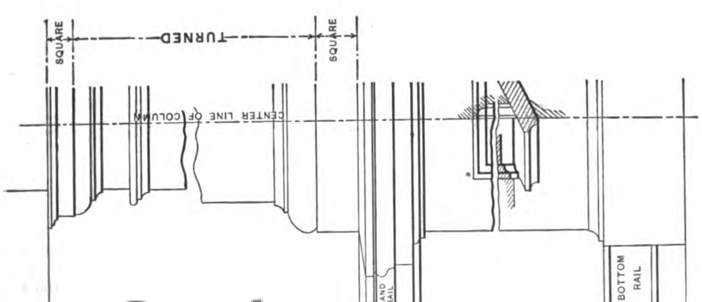
Section through Piazza Rails.—Scale, 3 Inches to the Foot.



Detail of Balustrade on Piazza and Bay Window Balconies.—Scale, 1½ Inches to the Foot.

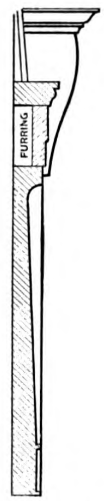


Side (Left) Elevation.—Scale, ⅛ Inch to the Foot.

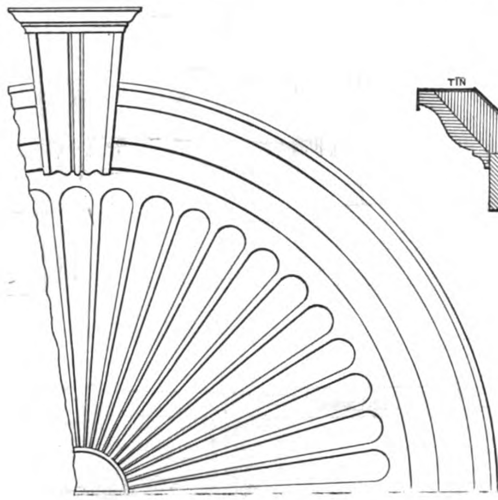


Detail of Piazza Column.—Scale, 1½ Inches to the Foot.

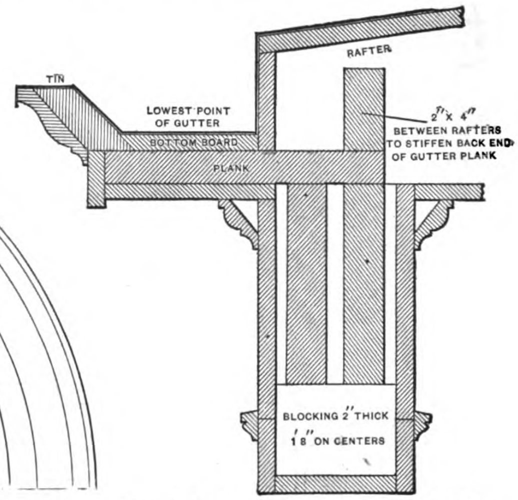
A House in Hartford, Conn.—Side Elevation and Miscellaneous Constructive Details.



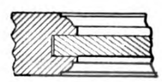
Vertical Section through Fan Panel.—Scale, 1 Inch to the Foot.



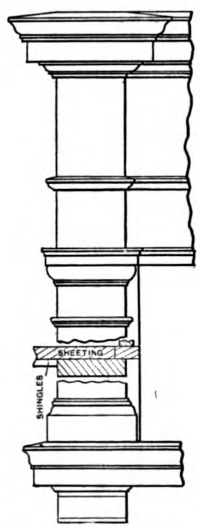
Partial Elevation of Fan Panel over Parlor Window.—Scale, 1 Inch to the Foot.



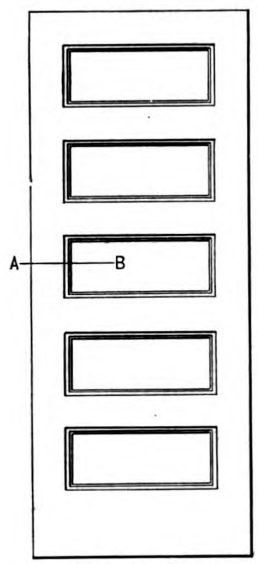
Detail of Piazza Cornice.—Scale, 1½ Inches to the Foot.



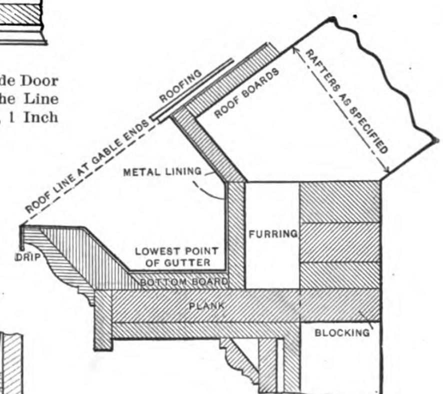
Detail of Inside Door taken on the Line A B.—Scale, 1 Inch to the Foot.



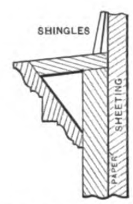
Detail of Outside Casing of Parlor Window.—Scale, 1 Inch to the Foot.



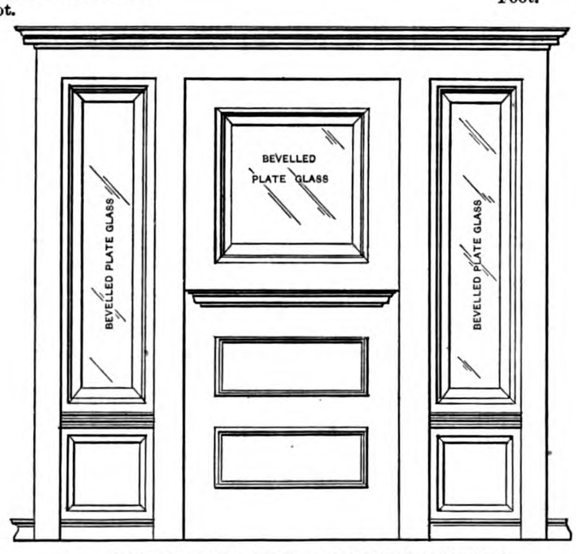
Inside Door.—Scale, ½ Inch to the Foot.



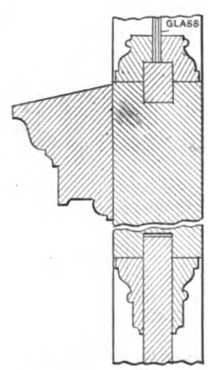
Detail of Main Cornice.—Scale, 1½ Inches to the Foot.



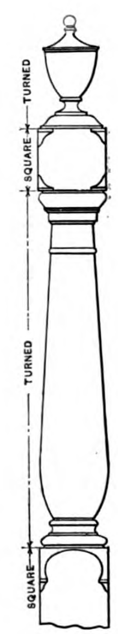
Detail of Parlor Window Cornice.—Scale, 1½ Inches to the Foot.



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



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



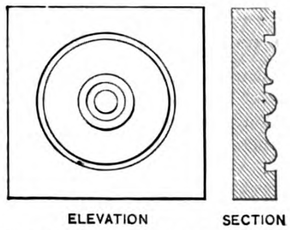
Newel of Rear Attic Stairs.—Scale 1 Inch to the Foot.

Miscellaneous Constructive Details of a House in Hartford, Conn.

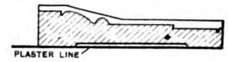
done by means of a hot air Thatcher furnace. The cost of the dwelling was a trifle in excess of $6300.

The mason work was done by Hills & Fox, the carpenters' work and painting by E. L. Barrows, the plumbing and gas fitting by George Mahl and the heating by N. A. Norton, all of Hartford, Conn.

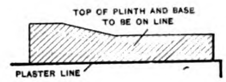
"It is a singular thing that many architects and builders do not understand the construction of chimneys," says James Spear, a well-known stove manufacturer of Philadelphia, Pa. "Many of them plan a flue which is but a few square inches in size to carry away smoke from an open fire place whose dimensions may be a yard or more. It doesn't take a very bright mind to understand that when the smoke from a roomy fire place rolls up against a flue which is only a few inches square it is not all going up the chimney. Part of it is bound to be rolled back, and yet year after year houses are constructed with chim-



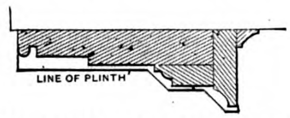
Details of Corner Block.—Scale, 3 Inches to the Foot.



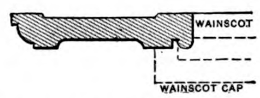
Section through Inside Casing.



Section through Plinth Block.

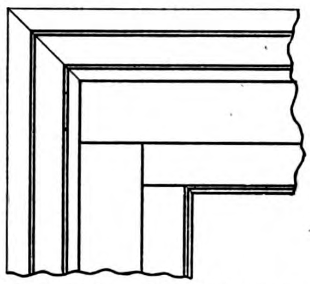


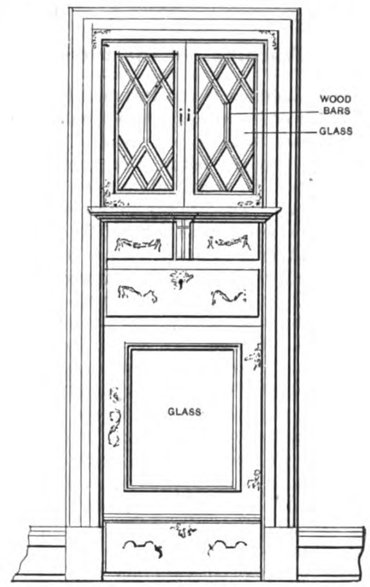
Horizontal Section of Door and Window Finish in Hall, Parlor, Library and Dining Room.



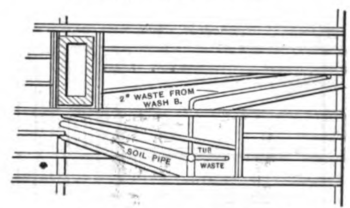
Door and Window Finish in Kitchen, Pantries and Bathroom.

Scale, 3 Inches to the Foot.


Detail of Corner Finish in Rooms on Second Floor.—Scale, 3 Inches to the Foot.

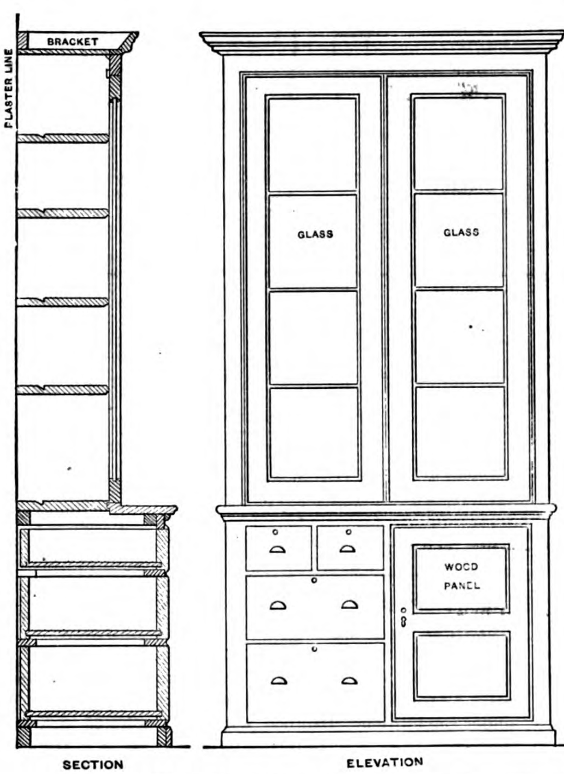


Elevation of China Cabinet in Dining Room.—Scale, ½ Inch to the Foot.

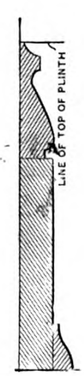


Framing in Bathroom, showing Waste and Soil Pipes.—Scale, ⅛ Inch to the Foot.

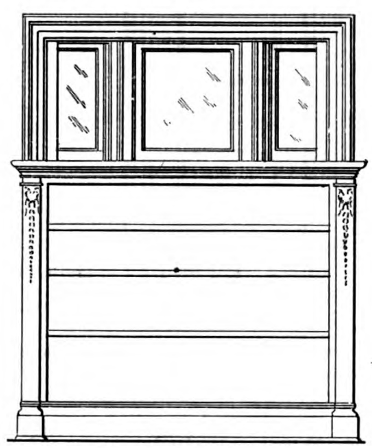

Horizontal Section through Wainscoting.—Scale, 3 Inches to the Foot.



Section and Elevation of one Section of Cases in Butler's Pantry.—Scale, ½ Inch to the Foot.



Base in Principal Rooms.—Scale, 3 Inches to Foot.


Elevation of Bookcase in Library.—Scale, ⅜ Inch to the Foot.

Miscellaneous Constructive Details of a House in Hartford, Conn.

neys built in this fashion, and they often have to be torn out and reconstructed. A good chimney is one of the most necessary requisites of a dwelling, and too much care and thought cannot be given to its construction."

Teachings of the Pittsburgh Fire.

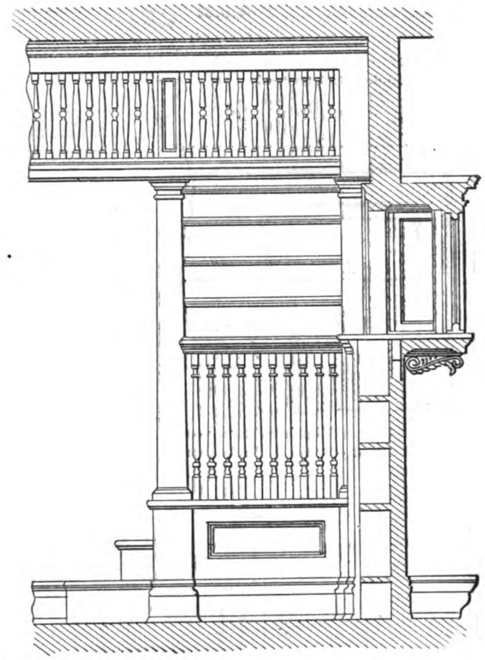
The teachings of the Pittsburgh fire, which destroyed a number of so called fire proof buildings in that city on May 3, have been dwelt upon at length by Corydon T. Purdy in a paper before the American Society of Civil Engineers. He recapitulates the most important points as follows : "The whole exterior of a building should be built of materials that will not be injured by heat. This fire would point to brick work as the most desirable material, and without question throws terra cotta under a cloud. This observation should cover the windows as well as the walls, and points to something new and better than has yet been used to any great extent in building operations. Large store buildings, open over entire floors and through all stores, must always be a dangerous fire risk, and if it is important that large apartment stores should occupy such quarters during business hours, the only way to give them any satisfactory security against fire must be in subdivision of departments with fire proof curtains or some other movable divisions that can be quickly and easily operated. As now manufactured porous tile or terra cotta fire proofing can be relied upon to protect the steel construction, while the hard burned material cannot be depended upon with the same certainty. Wood work covered with wire lath and plastering is not fire proof construction, and the efficiency of concrete in floors was not tested by this fire."

Maple Flooring.

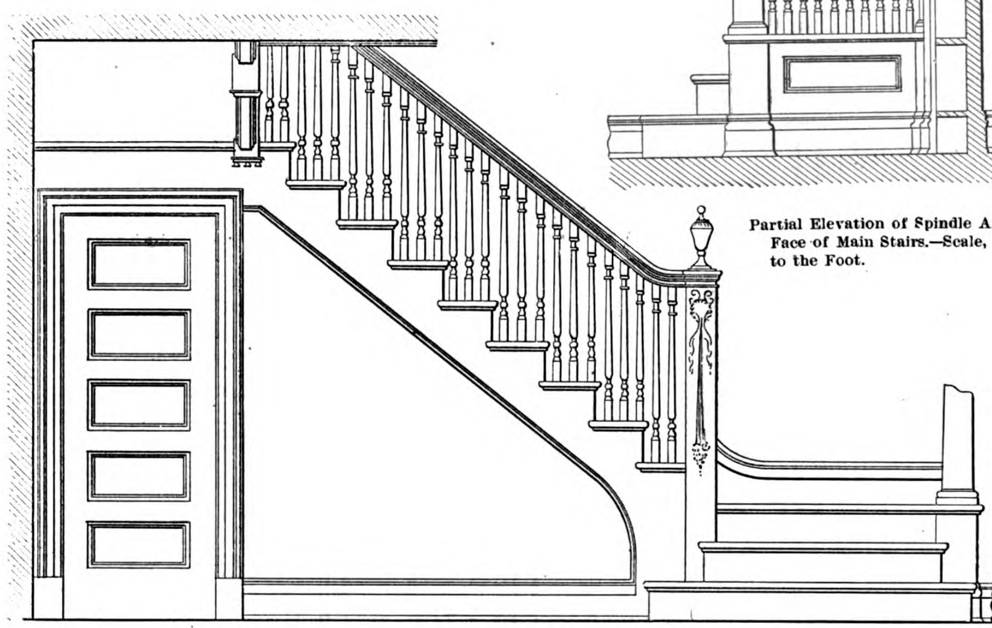
The National Maple Floooring Manufacturers' Association recently held a meeting in the parlors of the Hotel Cadillac, Detroit, Mich., and transacted business of interest to manufacturers of maple flooring. Manufacturers from New York, Illinois, Wisconsin, Minnesota and Michigan were present. President M. F. Rittenhouse of Chicago presided and J. W. Weston of Rochester, N. Y., acted as secretary. The Committee on Grades and Lengths decided upon a report that was discussed, and will be submitted at the annual meeting to be held the third Tuesday in January in Chicago. It is intimated that this report will advocate a uniform measure and uniform grades of maple flooring all over the country and probably a uniform price.

The Value of Bamboo as a Building Material.

The great strength of bamboo poles is not at all understood by the majority of persons, says the Chicago *News*. It is stated on excellent authority that two bamboo poles, each of them 1 7-10 inches in diameter, when placed side by side, will support a grand piano slung between them by ropes, and that they will neither sag nor break under the burden. Bamboo will form poles 65 to 70 feet long and from 8 to 10 inches in diameter. A derrick, 26 feet high, made of 4-inch bamboo poles, raised two iron girders weighing together 424 pounds. The wonderful lightness of this material in proportion to its strength has excited comment of late, and new uses are constantly being made of it. Scaffoldings of bamboo have the advantage of lightness and strength. It is predicted that this material will come into general use for such purposes. An additional advantage is that bamboo resists decay in water as well as in the earth, that the older and drier it gets the more solid it becomes, and that it can be grown for an incredibly small sum.



Partial Elevation of Spindle Arch and Face of Main Stairs.—Scale, ½ Inch to the Foot.



View in Hall Looking Toward Main Stairs.—Scale, ⅜ Inch to the Foot.

A House in Hartford, Conn.—Details of Main Stairs.

Barn Framing in Western Pennsylvania.—XII.

By Martin Danforth Smiley, Pittsburgh, Pa.

In speaking of "Proportion in Timbers for Barn Framing," I made note of the fact that in some instances the balloon frame had taken the place of the timber frame, and I propose now to illustrate some methods of construction in vogue here where the use of hewn or sawed timber has been displaced either in part or altogether by "built up beams" of ordinary planks or by a combination of the balloon frame with the timber frame. Fig. 52 shows the methods used in the construction of

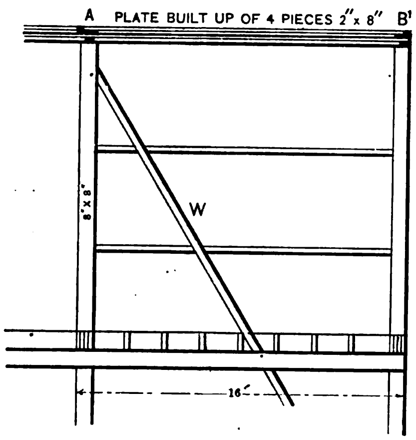


Fig. 52.—Elevation at Eave.—Scale, ⅛ Inch to the Foot.

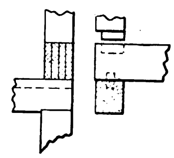


Fig. 54.—Method of Construction at H of Fig. 53.—Scale, ¼ Inch to the Foot.

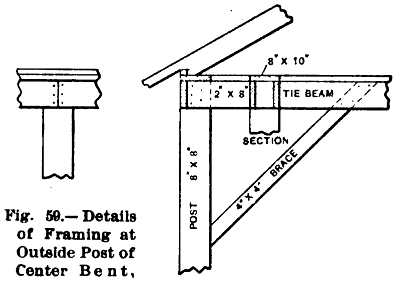


Fig. 59.—Details of Framing at Outside Post of Center Bent, with Tie Beam at Top of Post.—Scale, ¼ Inch to the Foot.

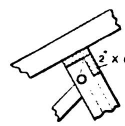


Fig. 55.—Construction at Purlins.—Scale, ¼ Inch to the Foot.

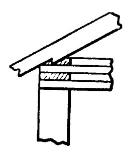


Fig. 56.—Construction at B2 of Fig. 53.—Scale, ¼ Inch to the Foot.

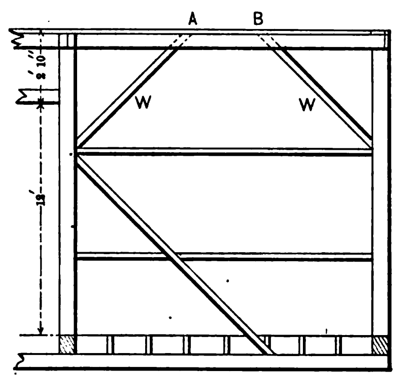


Fig. 60.—Partial Elevation.—Scale, ⅛ Inch to the Foot.

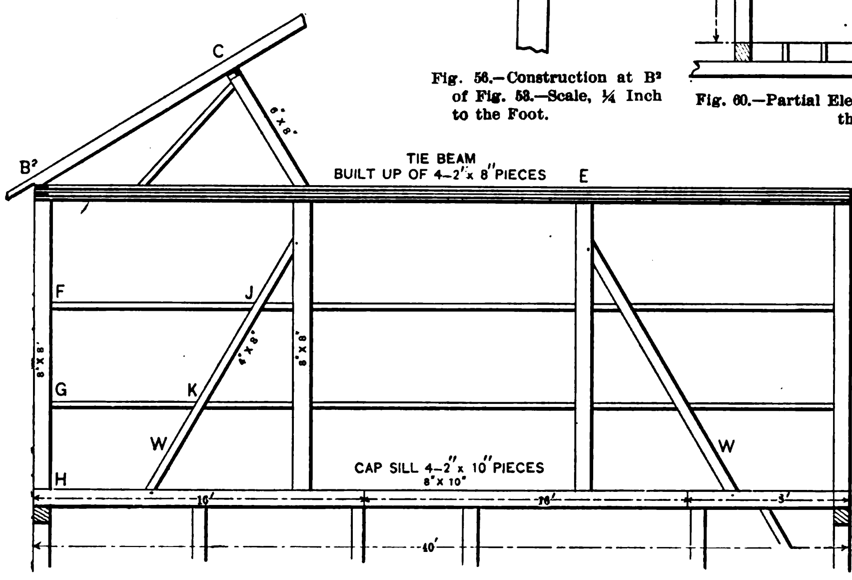


Fig. 53.—Elevation at End.—Scale, ⅛ Inch to the Foot.

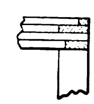


Fig. 57.—Detail of Construction at B1 of Fig. 52.

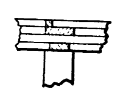


Fig. 58.—Detail of Construction at A of Fig. 52.

Barn Framing in Western Pennsylvania.

a 40 x 50 foot bank barn, where in the under frame the ordinary sized timbers were used and the framing done in the usual way. In the upper frame, however, the string timbers were built up of four thicknesses of 2 x 8 inch planks of suitable lengths. In this frame, instead of mortise and tenon, the short braces and railings are all cut square and spiked in place—the railing being boxed or housed into the posts ½ inch, as at F and G of Fig. 53, and cut close at the braces, as at J and K.

The frame sills were built up of 2 x 10 inch by 16 foot pieces, in four thicknesses set on edge, Fig. 54 showing the manner of construction at H of the elevation. The frame sill was secured to the cap sill at this point and at all similar bearings by a 2-inch dowel pin. All the under frame posts, as well as the upper frame and purlin posts, had 2-inch tenons; but, instead of being draw pinned, were spiked as the frame was raised.

In Fig. 55 is shown the construction of the purlin plate. The face of the post is cut away to receive a 2 x 6 inch piece, and on top are laid lengths of 2 x 8 inches, well spiked through into the top of the post and the edge of the front piece. The lateral braces for the purlin (4-foot run) are set in on the purlin post 2 inches, to line with the point or angle O, formed by the two parts of the plate, and well spiked.

The method of joining the posts, plate and tie at B1, B2 and A in the elevations is shown in Figs. 56, 57 and 58. Here I show regular coffins, cut into the top plank of the plate for the rafter heel. The tops of all upper frame posts are cut square; and it seems evident that by properly breaking joints in plate and tie and lapping alternately at the points A B' B² we will have a good strong frame.

The 4 x 8 inch long braces are here shown to be joined by mortise and tenon, and pinned, with railing cut between ; but in the original frame, from which most of these details were copied, this brace was set on edge on the inside of the 8 x 8 post, leaving a full 4-inch space on the outside for the railings. This is, perhaps, the better way to frame at this point, being equally strong, and some advantage is gained by saving of time in framing and setting the railings.

In raising a frame of this character I should advise to begin in the center—the center bents first and the center of outside bents next. You can readily see that the long braces with lintels between, or railings as the case may be, will settle at once into their proper position; and,

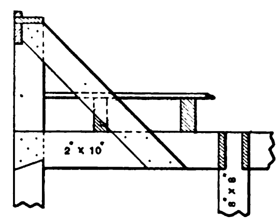


Fig. 61.—Construction when Tie of Middle Bent is Framed Down for Joist Beams.—Scale, ¼ Inch to the Foot.

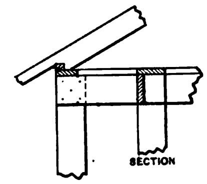


Fig. 62.—Detail of Construction at Outside Bent.—Scale, ¼ Inch to the Foot.

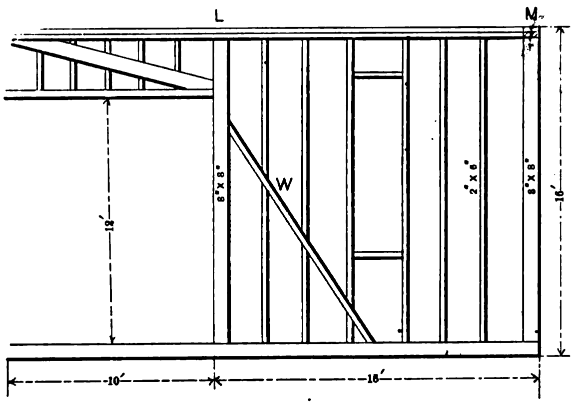


Fig. 63.—Partial Side Elevation of Frame of Barn, 48 x 52 feet.—Scale, ⅛ Inch to the Foot.

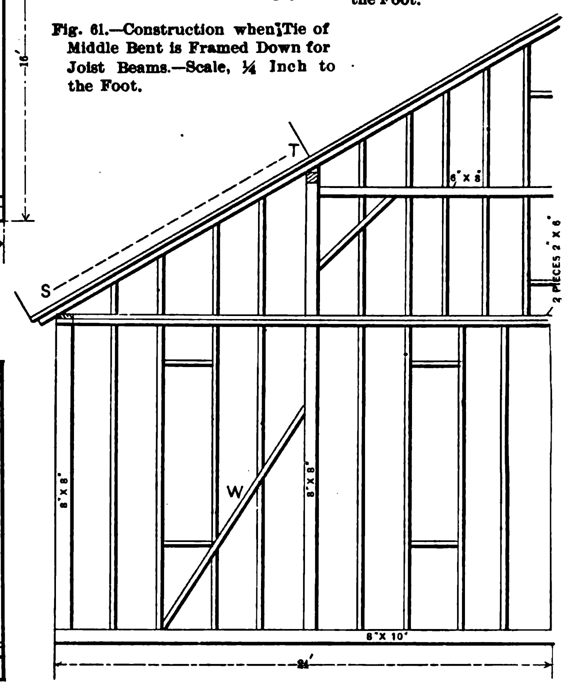


Fig. 64.—Partial End Elevation of Frame of Barn, 48 x 52 Feet.—Scale, ⅛ Inch to the Foot.

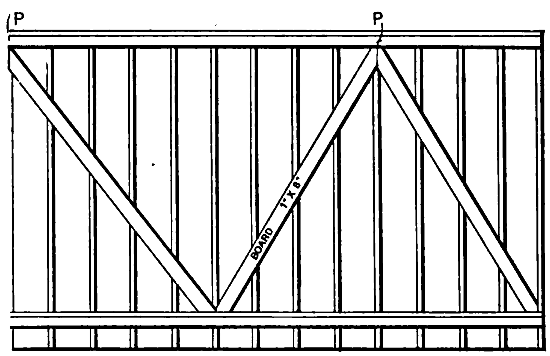


Fig. 65.—Under View of Section of Roof S T of Fig. 64, Showing Method of Bracing.

Barn Framing in Western Pennsylvania.

being plumbed up and stayed, you will have all your points to which to build.

The illustration from Figs. 59 to 62 show another style of construction where less material is required, and which, if carefully executed, makes a substantial frame. Fig. 59 shows how the connections are made at the outside post of center bent where the tie is framed at the top of post, and Fig. 61 shows the construction when the tie is framed down for the joist bearer, in which case, however, the space or points between centers of posts should not be over 12 feet, so as to safely carry the possible load of 110 pounds per square foot. In Fig. 62 is shown the construction at the outside bent. In this detail, we use, instead of coffins, a piece 1 x 2 inches for the heel rest of rafter. Fig. 60 is the elevation of the frame of one bay at the eave. The braces W W give support to the plate at A and B. In this style of construction no mortise or tenon is used in the upper frame except in long braces and at lower end of long posts. The elevations, Figs. 63 and 64, are sufficient, I think, to show the construction of a sort of combination frame, part balloon and part the ordinary frame. In this instance it was required of the builder to produce a substantial frame with a finely finished exterior, and the result was:

The under frame, constructed in the usual way with outside cap sills and frame sills, all framed flush, or on the same plane, as the water table was used in finishing. The center bents of the upper frame, with the long posts of the end bents (except the end ties), were also framed in the ordinary style for a "straight roof stool," including also the long braces W W. The other parts of the exterior frame, except the 8 x 8 corner posts, were built up of 2 x 6 inch by 16 foot pine studding, boxed in to the cap sill or frame sill ½ inch and cut close or crippled over the 4 x 6 inch braces. As slat or "Louver" windows were to be used in the finish, the studs were spaced and trimmed to the proper openings.

In this case, as in the construction shown in Figs. 52 and 53, the short posts were cut square at the top, and with a gain of 3 x 4 inch cut at the corresponding point on the long posts of end bents, the plate and tie were built up of two thicknesses of the 2 x 6 inch pieces, as in a balloon frame.

In order to insure against too great a thrust of roof against the light plate, the style of brace shown in Fig. 65 was employed. An 8-inch board was set close at the plate and rafter (shown here for the opposite side), the points corresponding to L M of Fig. 63, and meeting at the point P, at the purlin and on the under side of rafters, all being well nailed. The frame was then finished, using D. S. 12-inch pine boards, with strips for the under frame, with water table at center of frame sill; the upper frame was sided with 6-inch patent weather boards, and trimmed in the usual way with corner strips and cornice.

SCHOOL HOUSE PLUMBING IN COLD CLIMATES.

IN cold climates where the thermometer registers a temperature of several degrees below zero and remains there for several days the designing of a plumbing system that will prove equally satisfactory under such temperatures and also those of summer is a matter of some importance and attended with difficulty. We are enabled, through the courtesy of A. R. Brink, to present an illus-

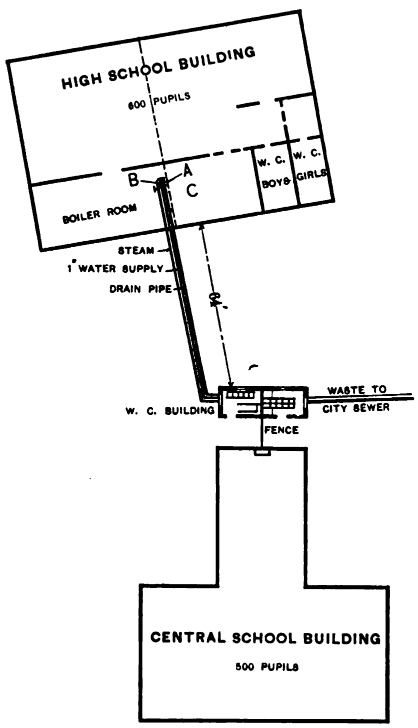


Fig. 1.—Plan of School Grounds, Showing Closet Building.

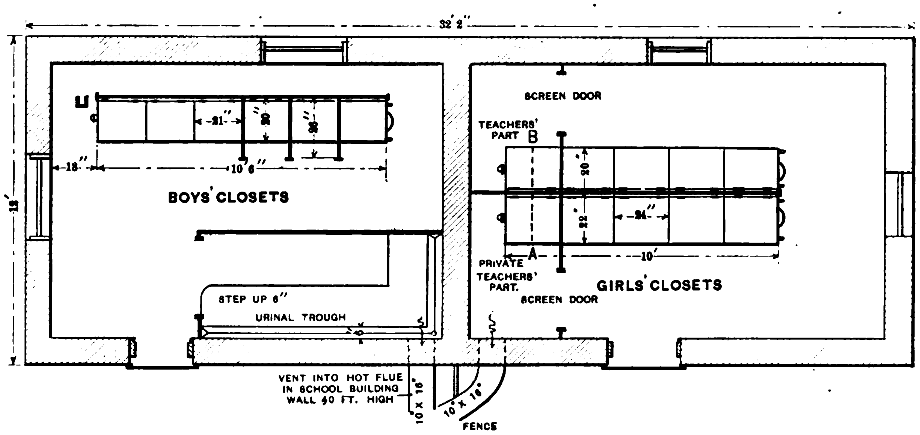


Fig. 2.—Plan of Building, Showing Location of Closets and Urinal.

School House Plumbing in Cold Climates.

trated description of a system to meet all conditions of weather, devised and installed by him in a school house at Red Wing, Minn. In Fig. 1 we present a plan of the school house grounds. The original intention was to install the plumbing system in the basement of the central school building, but the objection to the insanitary conditions that might be possible with the best of care disposed of this idea, and a non-freezing system has been put in an outhouse building, located as shown, which has a vault 7 feet deep. At the time the alterations were being made to the school buildings, before the present closet system was installed, the steam heating system was planned for heating all the buildings on the lot and thus enable the use of the basement, which had been intended for the water closets, for other purposes.

The outhouse building is made of brick, with 12-inch walls, and the closets have been in use by over 900 pupils. The feature of the system is the Kenney flushing valve, made by the Kenney Sanitary Mfg. Company, 47 Dey street, New York City. Fig. 2 is a plan of the closet building, with the girls' closets separated by a partition wall from the boys' closets and urinals. Fig. 3 is an elevation showing the arrangement of the closet troughs, the flushing valves and the method of draining the entire piping system so as to leave no water in them to freeze.

The building is heated during the hours when school is in session. At the close of school the steam and water to the closets and the building are shut off by means of valves at A, B and C in the boiler room, as shown in Fig. 1, the steam, water and drip pipes being run inside of a 15-inch tile pipe packed with mineral wool. When the valve A, in Fig. 3, on the water supply is closed the drip cocks C and B are opened and all the water drains out of the closet building, the steam being shut off at the same time. These water pipes need only be drained in severe cold weather. There is no water at all in the closet vault above the pit or below the floor, except when the flush chain is pulled. The water closet troughs are made of No. 16 galvanized iron, 9 inches deep at the flush end and 14 inches deep at the outlet end. They are coated with two coats of pure red lead and boiled linseed oil, after which two coats of enamel paint are applied. There is a water spray the whole length of the trough on each side, as shown in Fig. 4, which is an elevation on the line A B of Fig. 2, the galvanized iron trough being shown under the seats, and up near the seats are perforated copper pipes used for spraying and washing the sides of the trough. The discharge from the closet troughs is made through 4-inch extra heavy cast iron waste pipe which runs to the sewer, a 4-inch trap being placed between the flushing trough and the sewer, as shown. No vent pipes have been placed on the sewer side of these traps, as is usually done, because there is enough water running after the flush to fill the traps. In case the flush water does siphon from the trap outlets provision has been made for attaching the vents, but after using the closet for a month it has been found that the vents are not needed.

In order to prevent the freezing of the traps they are inclosed in a double brick chamber having a 4-inch air space between the inner and outer walls, both chambers being covered with a wooden cover. The back and trough of the urinal in the boys' closet, an elevation of which is shown in Fig. 5, is made of No. 22 galvanized iron, coated with three coats of enamel paint; also the guard S at the top, which incloses the water spraying pipe. The back is bent up at the bottom, so that there will be no iron that is uncoated exposed to the action of the urine. A step 6 inches high is placed along the urinals, so that those who use it will be as close to the back as possible. The iron back is supported by cleats riveted to it and resting on supports furnished in the wood work. The board B is fastened on the top of the step to the urinal by means of brass screws, so that it can be removed when it becomes worn or saturated. A ½-inch pipe is brought up from the main water service to the top of the urinal back and behind the guard S, where it connects with a perforated pipe which continually washes the surface of the back. The water service from the street is connected with the two Kenney valves, as shown, and with the urinal spray and the seat spray, located as shown in Fig. 4.

The water service carries a pressure of 90 pounds and the pipe B as soon as the valves close. The valves being located below the surface of the ground in a comparatively warm chamber, and as there is no water in them, there is nothing to freeze, but in ordinarily cold weather there will be no danger from freezing even if not drained. All provision is made, however, so that when the janitor

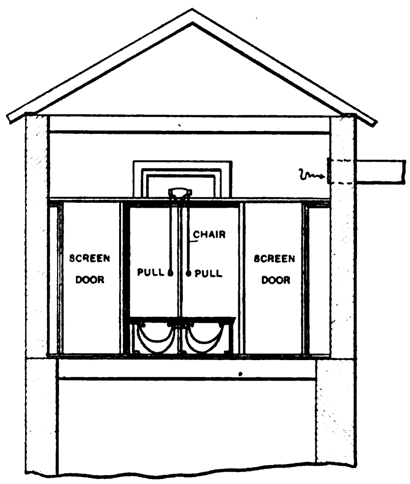


Fig. 4.—Elevation on Line A B, Fig. 2.

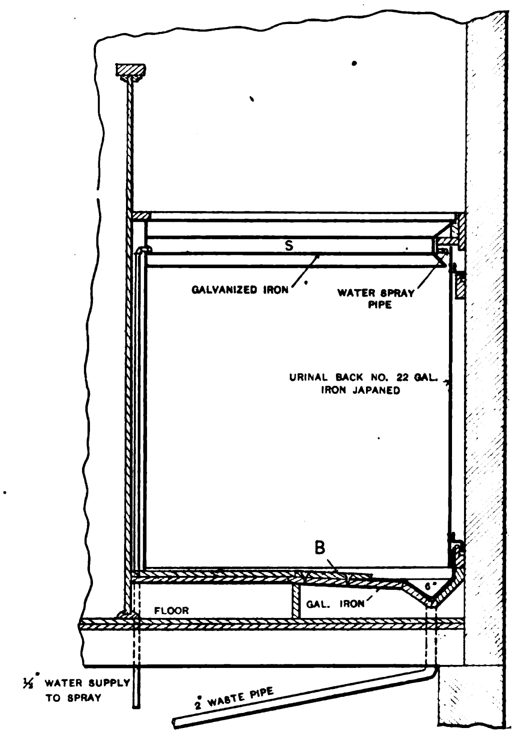


Fig. 5.—Sectional Elevation of Urinals.

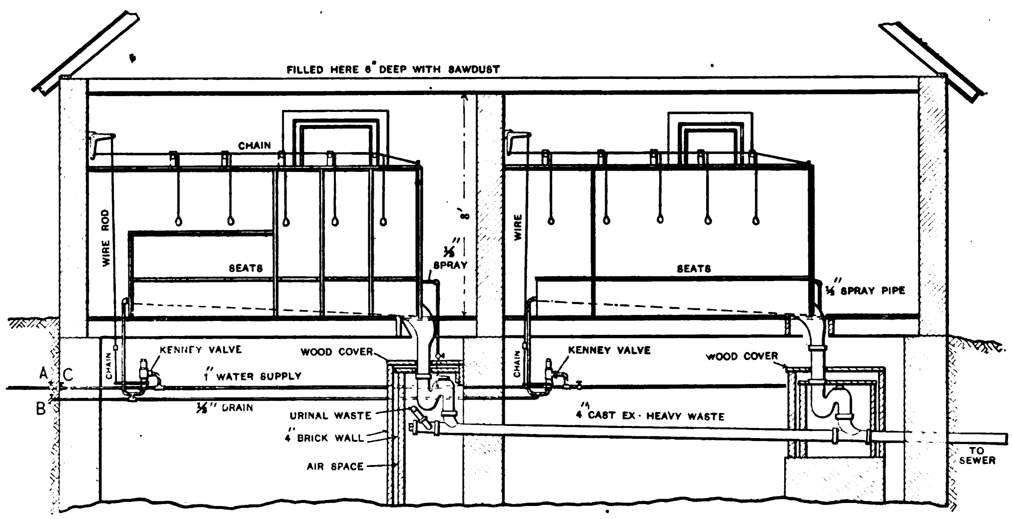


Fig. 3.—Elevation, Showing Flush Troughs, Valves, Trap Chambers and Method of Draining.

School House Plumbing in Cold Climates.—Sectional Views, Showing Arrangement of Fixtures.

the Kenney valves are regulated to operate under this pressure. The levers operating the valves are connected by means of cranks with a shaft on which arms are provided, so that the valves can be operated from any closet, chain pulls being connected with the crank arms for this purpose. It will be seen from this arrangement, shown in Fig. 3, that below the floor line of the closet room is an air space in which the valves are located, and that except when the valve lever is operated there is no water in the valves or the piping to the closet, all being drained off by makes his rounds of the school building after school is dismissed in the afternoon it is a simple matter for him to manipulate the valves so that every drop of water will be drained out of the system at the same time that he shuts off the steam. The local vent for each of the closet rooms is connected with a large vent flue which is located at the back of the central school building. This flue is used only for ventilating these closet rooms and is warmed with steam pipes from the mains which supply the school buildings.

WHAT BUILDERS ARE DOING.

THE city of Atlanta enjoyed a prosperous year in the building line during 1897, the record surpassing that of any corresponding period in its history. Up to November 21 the amount of capital invested or being invested was $1,750,920, and Building Inspector Frank A. Pittman expects the figures to reach at least $1,800,000 by December 31. This is largely in excess of the record for 1896. Among the important buildings already completed and in course of construction are the new county jail, estimated to cost $175,000 ; Commercial Building, $200,000 ; Grant Building, $325,000; Markham site block, $80,000; Atlanta Paper Company building, $30,000 ; and the Farlinger Building, $42,000. Mayor Collier is much gratified with the showing made during the year in the matter of building improvement, and he will lay stress on this matter in his annual message.

Baltimore, Md.

Member-elect Philip H. Lenderking is preparing a bill to be presented to the Legislature concerning building construction in Baltimore. The bill will seek to do away with cheap and unreliable construction, and also with speculative building, which, he claims, causes the overproduction now evidenced by 7000 vacant houses in the city. Mr. Lenderking believes in making the ground on which buildings are to be erected responsible for their proper construction and safety.

W. H. Sayward, secretary of the National Association of Builders, was the guest of the Baltimore Builders' Exchange at its quarterly meeting on the evening of Tuesday, December 7. About 80 members of the exchange sat down to a banquet in the evening, after which the business of the meeting was presented.

Secretary Sayward made an address of about an hour and a half, to which closest attention was paid, and which all present admitted could not but prove of benefit to the association. He enlarged upon the true function of the organization of builders and urged that the association set up the highest ideal for the guidance of its members. He argued at length upon the great value of the National Association in binding the local organizations together and in defining the principles which should guide and govern all. He referred particularly to the "Directory of Builders," which it is proposed to publish in connection with the "National Bulletin," and made arrangements for subscriptions to the same through Secretary Miller of the Baltimore Exchange.

Boston, Mass.

The new store of Houghton & Dutton, at the corner of Beacon and Tremont streets, is nearing completion. This has been a feat of engineering, as will be readily understood when it is stated that the structure has been erected upon the site of the old stand of this firm, and with practically no interruption in the business. Some idea of the size of the building and the magnitude of the operation may be gained from the following details : The excavation of the sub-basement caused 600,000 cubic feet of dirt to be removed. The bottom of the sub-basement is 42 feet below the sidewalk on the Pemberton square side. The bottom of the boiler pit is 52 feet below the level of the street. The underpinning consists of 75,000 cubic feet of granite, weighing 13,000,000 pounds. The steel employed in construction was 4,000,000 pounds, while 3,000,000 brick were used. The hight of the building on Tremont street is 125 feet above the sidewalk and 25 feet below, making a total hight of 150 feet. The floor space is between 6 and 7 acres.

Woodbury & Leighton of the Master Builders' Association of Boston are the builders who have engineered this undertaking.

According to the *Herald* there has been an increase up to date in the number of building permits in this city for both frame and brick buildings amounting to 232 of the former and 87 of the latter, making a total increase of 319 buildings. The total number of buildings up to date for 1897 is 2547. The month of November, as compared with the same month last year, showed a decrease of 64 permits for brick structures, while there was an increase of 72 permits for wood construction, giving a total increase of 38 in building permits.

Thomas W. Lawson will erect a fine new residence at Winchester, Mass., and expects to expend about $350,000 upon house and grounds. The former will be of steel and fire brick construction, and a novelty in architecture, it is stated.

Chicago, Ill.

Contrary to general expectations, the building statistics for the month of November make a very gratifying showing. There were permits issued for 432 buildings, involving an expenditure of $2,250,600, this showing an increase of 68 in the number of buildings and $570,580 in the estimated cost as compared with the corresponding month of last year. Taken in connection with the month of November, 1895, there is a falling off of 109 in the number of permits granted, but an increase in the estimated cost of $464,030. The general feeling is that the next year will witness increased activity, this belief being based upon the enterprises which are now under way or in contemplation. The major portion of the operations now under way are in the nature of apartment houses and private dwellings, the bulk of these being located on what is known as the South Side. It is estimated that the connection of the Alley Elevated with the Loop has had much to do with the increased activity along that line. There is also considerable building under way along the main line of the Metropolitan, which has, since its operation, opened up a new residence territory on the West side.

Mayor Harrison has appointed a special committee, of which Joseph Downey is chairman, for the revising of the building ordinances of the city.

Suit has been brought by several firms of contractors and builders against the Cut Stone Contractors' Association of Chicago, on account of alleged boycott against non-members of the above association.

It is said that the tall Masonic Temple Building is slowly sinking, and already at its roof it is 16 inches out of line.

Cincinnati, Ohio.

The Cincinnati Chapter of Architects recently listened to a paper by Mr. Carlisle on the subject of plumbing. The history of the art of plumbing was considered, and the reader afterward made a plea for the requirement in specifications of a guarantee by the plumber that shall cover his work for a given period. He considered that this would produce a better general class of work.

The *Enquirer* reports that at a meeting of the Cincinnati Chapter of the American Institute of Architects a new form of contract between architects and owners was adopted. It will hereafter be used by the chapter, and many architects outside the chapter. The object of the contract is to maintain a general uniformity and lessen the chances of general misunderstandings.

At a recent meeting of the Builders' Exchange the committee appointed to find means of reducing the expenses brought in a report. The committee consisted of Messrs. Blair, Mendelhall and Pease. They suggested the appointment of officers be made by a board of directors to be chosen by the members at the regular election, which arrangement will involve an amendment of the constitution. The question of suspending the annual dues for the remaining three months of the fiscal year to all new members went over for a month.

Cleveland, Ohio.

The report of Building Inspector Thomas for November shows that 204 permits for new buildings were taken out, the estimated cost of the structures being $191,873. For the same month of 1896 there were 171 permits, but the valuation of the buildings was put at $50,000 more. The next preceding year also shows a lead of about $50,000 in estimated value, and 212 permits.

The evening of November 30 was enjoyed by 100 members of the Builders' Exchange, when a "Smoker" was held. Several serious addresses were interspersed with music and recitations.

The Cleveland Architectural Club has recently been holding its second annual exhibition, which has largely been for the purpose of instructing the public in the elements of good taste in building design. The attendance has been good, and much interest and enthusiasm have been shown among the more cultivated. A feature of the exhibition has been the special evenings or afternoons during which special bodies have attended the exhibition. On Tuesday evening, November 16, the Builders' Exchange was the guest of the Architectural Club. The Reception Committee for the evening consisted of Louis Rohrheimer, A. N. Oviatt and Geo. W. Andrews.

The exhibition closed on November 27. The club members have selected by ballot 23 exhibits, which will be sent on to Philadelphia, there to be shown at the exhibition of the T Square Club on January 19 and 20.

The Builders' Exchange has published an attractive handbook which should prove very useful to all architects, builders or others in any way connected with the building trade of the city.

Evansville, Ind.

The contractors and carpenters of Evansville recently held a joint meeting in which the matter of low prices was the principal matter discussed. The meeting was marked by a friendly feeling, and it is proposed to hold similar joint meetings every two weeks.

A great deal of building is said to have recently been in progress, but at low prices for labor. Several contractors admitted that prices received by them for building were too low. In view of the low wages and prices it was proposed that the contractors employ union carpenters in all cases as an assistance to both.

Hoboken, N. J.

At a meeting recently held in Hoboken the Builders and Material Men's Exchange was organized, with temporary officers as follows: William V. Stevens of Lee, Stevens & Co., president ; Charles F. Muller, secretary. The exchange is organized with a view of securing a more harmonious co-operation among the builders and material men throughout the county, and also of affording them means of protection against unscrupulous contractors who fail to pay for supplies. Thirty-four firms throughout the county have signified their intention of joining the exchange.

Indianapolis, Ind.

It seems to be the opinion that the opening of the spring season will see an abundance of building of all kinds, as many contracts have been let for the erection of residences at that time, and the open season this fall has seen the improvement of properties undertaken. In the next two or three years a number of building blocks will probably be constructed, and it is thought that the city is at the beginning of an era of modern office buildings. The erection of these improved buildings will result in corresponding improvements and alterations in the old blocks. A real estate man says: "I confidently expect within the next three years, taking the new and the improved old office buildings together, to see the city of Indianapolis provided with as well equipped office structures as any city of its size in the United States."

Carpenters and carpenter contractors are recently reported as being in conference together concerning the matter of wage scale and hours of work per day for 1898. While generally agreed upon the subject of eight hours' work per day, the matter of wage scale was not wholly determined upon and definite results of the conference had not been arrived at as late as November 30.

State Factory Inspector McAbee has issued a bulletin to the contractors and builders of the State, in which he suggests that in constructing new buildings they take care to conform to the new law, which defines a legal fire escape and provides that doors shall swing outward. While the new law does not include public buildings, such as school houses, theatres, hotels, &c., the inspector suggests that in constructing such buildings architects and builders follow the law, as the next Legislature will probably amend it so as to include buildings of this class.

Milwaukee, Wis.

It is stated that more than $4,500,000 has been expended in building construction in this city for the year 1897. Over $2,700,000 has been invested in new buildings, more than $1,000,000 having been expended in the putting up of factories, shops, stores and office buildings. The present year exceeds the last by $100,000 in amount spent in building.

Nashville, Tenn.

One of the regular semi-monthly meetings for November of the Builders' Exchange was held November 18 in the Chamber of Commerce, President H. W. Buttorff presiding. The question of admitting material furnishers to membership was discussed and referred to a committee consisting of T. L. Herbert, J. P. Fulcher and Thomas Matterson, who are to report at the next meeting. The exchange also decided that standing committees representing all the trades of the exchange be appointed for the purpose of increasing membership.

Current subjects will receive treatment by papers to be read at subsequent meetings, P. Morrison reading on "The Lowest Bidder" at the next meeting.

New Haven, Conn.

Architects are reported as having generally been pretty busy, and although much cheap building has been going on prospects are reported as favorable for considerable building in the near future. Architects express much dissatisfaction with the cheap tenements being erected.

New fire limits are established in the new building ordinances, and this will put a stop to the erection of flimsy tenement houses in certain regions where they were being erected. No special permits can be allowed within these limits. A new office of inspector of buildings is established by the new ordinance.

President S. E. Dibble of the Builders' Exchange is using every effort to increase the interest in the meetings held by the builders at noon every day.

New York City.

During the past month building operations have been comparatively small, the business of the Department of Buildings having been less than usual at this period. The cause is understood to be the withholding of plans until the new building law goes into effect and the new administration installs a new Commissioner of Buildings. Architects seem to expect that they will be more liberally dealt with under the new law in the Greater New York charter, especially in regard to tenements and flats. The light shaft clause in the new law cuts down the dimensions from 2 feet 8 inches to 2 feet 4 inches, a saving which means much to the architects as well as to the owners. The total number of buildings which had been projected up to December 2 was 3465, estimated to cost $81,115,660, as against 3172 buildings, estimated to cost $72,379,820, for the corresponding period of 1896.

There have been a few minor disturbances in the building trades during the month under review, one of the latest being a strike of the housesmiths on the new 29-story syndicate building in Park row. The bricklayers, who do not join in sympathetic strikes, were rendered idle because the hod hoisting engineers struck. The trouble, however, was only temporary.

Omaha, Neb.

There has recently been a strike on the Liberal Arts Building, of which W. H. Parrish is the contractor. This is one of the buildings of the Trans-Mississippi Exposition, which is to open in 1898. The Carpenters' Union ordered the strike in the hope of getting the contractor to pay the union scale of wages to every carpenter. Mr. Parrish had been paying wages that varied according to the workman, and he was unwilling to pay 30 cents an hour to all, as he believed there were men in the union who could not earn that sum.

After about a week the strike came to an end, great difficulty being had in supplying the places of the strikers with adequate workmen. An agreement was reached between Parrish and the representatives of organized labor whereby Parrish agreed to pay carpenters 30 cents per hour, but he is conceded the right to discharge any man whom he does not consider worth that rate.

Philadelphia, Pa.

A special meeting of the corporate members of the Master Builders' Exchange was held December 14. The question of increasing the mortgage indebtedness of the exchange and the nomination of seven directors to fill vacancies on the board were the objects of the meeting.

Wm. H. Sayward, secretary of the National Association of Builders, was the guest of the Master Builders' Exchange on December 6. Mr. Sayward addressed the exchange at its rooms during the 'change hour, and spoke upon the National Association, its work and purposes. He laid stress upon the importance of organization and called for continued interest in both the local and national bodies.

The meeting was also addressed by Messrs. Stacy Reeves, George Watson and John S. Stevens. The meeting was unusually large, and received Mr. Sayward's address with close attention. Many of the members of the exchange expressed themselves as being greatly benefited by the talk, and expressed the hope that Secretary Sayward would visit Philadelphia oftener than he had in the last two or three years.

It is the intention of the secretary to visit the various constituent bodies of the National Association more frequently than in the past few years.

In the evening a banquet was given Mr. Sayward at the Bellevue, under the auspices of the local members of the Board of Directors of the National Association—Messrs. Stacy Reeves, George Watson and John S. Stevens. The arrangements for the banquet were in the hands of S. P. Shields, who managed the affair with his usual good taste, every detail being most attractively arranged and carried out.

About 30 sat down at the banquet, and speeches were made by almost every person present. It was altogether a most delightful affair, and gave as much satisfaction to the Philadelphians as to their guest.

The Master Plasterers' Association of Philadelphia at its monthly meeting renominated its present officers, who will be re-elected at the annual meeting. They are: President, William H. Albertson; vice-president, A. G. Buvinger; secretary, J Turley Allen; treasurer, Charles H. Reeves; measurers, Messrs. Albertson, Buvinger, Allen, Charles B. Noblit and Charles H. Reeves.

Pittsburgh, Pa.

The number of buildings projected during the year (those for December being estimated) were 1612, estimated to cost $6,295,118.

Alterations and repairs, amounting, probably, to nearly $250,000, are not included in the table.

Superintendent Brown of the Bureau of Building Inspection states that Pittsburgh for the present year is ahead of all other cities in proportion to its size as regards building enterprise. November was an exceedingly active month for that season of the year, the total cost of building operations being $983,302, over $500,000 in excess of the amount of operations for November last year.

The month of October showed even a greater activity, 176 permits being granted for buildings costing $1,177,087, exclusive of alterations and repairs.

Activity has been especially noteworthy in the East End. There never has been a time in the history of the city when there were so many and important building enterprises under way or projected. It was recently stated that probably 2000 houses were in process of construction, and as many more had been finished during the year. With very few exceptions the houses are said to be of a high class.

San Francisco, Cal.

The following officers were in nomination at the election held by the new Builders' Association December 13: President, Robert Smilie, James McInerny, F. W. Kern: vice-president, J. W. Saunders; recording secretary, S. R. Doyle, Andrew Wilkie, Jr.; financial secretary, John Furness; treasurer, Jeremiah Mahoney; Executive Committee, P. Griffin, D. Powers, G. G. Gillespie, W. B. Anderson, F. W. Kern, J. McInerny, D. Francoeur.

Vicksburg, Miss.

A favorable report is had from Vicksburg, the building trades being reported as busy, although at present the activity is mostly confined to jobbing. The overflow and the fever scare are thought to have caused many to put off building. It is believed that the outlook is very favorable because of the great demand for cottages renting at from $15 to $25 per month.

The improved business outlook and additional confidence from the large crop, following the overflow, it is thought will result in much investment in real estate, homes and tenements.

Worcester, Mass.

At a recent monthly meeting the Builders' Exchange nominated the members below mentioned for officers of the exchange. The names will be voted upon at the annual election in January: For president, C. A. Vaughn, J. H. Pickford and O. S. Kendall; for vice-president, A. F. O'Gara, B. W. Stone, B. C. Fiske, J. H. Pickford, W. E. Griffin and Roscoe Norwood; for treasurer, Frank H. Goddard; for trustees for two years (three to be elected), H. A. Desper, T. J. Hennessey, Roscoe Norwood, B. C. Fiske, George Hatch, B. W. Stone, E. B. Ricketson, F. A. Stenberg, T. A. Pellett.

Chester, Pa.

Bricklayers employed on the new lace mill at Chester recently struck for higher wages. The men agreed to work for 30 cents per hour at the time the contract was made. The contractor says he cannot pay the advance of 5 cents demanded, as he figured the contract on the basis of 30 cents per hour.

Notes.

The official records show that Birmingham, Ala., has had quite a boom during 1897, the impovement comprising dwellings and business houses.

Montreal is agitating the subject of a Builders' Exchange, many contractors and building supply men being interested in the project.

The buildings at Lewisburg, N. C., destroyed by fire the latter part of the summer are rapidly being replaced by brick and stone structures.

Seabright, N. J., has been enjoying the greatest building activity in its history. Contracts mount up to nearly $250,000.

Carpenters' Union No. 394 of Memphis, Tenn., recently reported few if any union men out of employment, but work was said to be comparatively dull.

It was recently stated that architects and builders were to consider the matter of new building ordinances for Toledo, Ohio., on the basis of ordinances in operation in other cities. A report will be submitted to the City Council Committee.

Much activity in stucco manufacture is reported from Kansas. One mill has enough work to last till March and a second is running overtime. The cause of the rush is said to be the activity in the building trades.

VIEW IN DINING ROOM LOOKING TOWARD STAIRCASE HALL.

STAIRCASE HALL AND LIBRARY IN RESIDENCE OF C. B. HASKELL, HARTFORD, CONN.

F. R. COMSTOCK, ARCHITECT.

RESIDENCE OF MR. CHARLES B. HASKELL, WEATHERSFIELD AVENUE, HARTFORD, CONN.

F. R. COMSTOCK, ARCHITECT.

SUPPLEMENT CARPENTRY AND BUILDING, JANUARY, 1898.

HINTS ABOUT ROOFING.

FELT and gravel roofing is adapted to great extremes of climate, and is found in successful use from New Orleans to the frozen north; and yet we find, here and there, poor roofs of this kind, just as we find poor tin, slate and galvanized iron roofs. The writer has often met the query, "What is your opinion of a certain kind of roof?" Well, every kind of roofing has its champions, and some possess commendable features not found in others; but, without discussing the merits or demerits of each, it is clear, says "Oliver Twist" in a recent issue of *The Metal Worker*, that to obtain desirable results there must be good materials, good workmanship, and the shape of the roof must be suited to the covering.

If you wish a house roofed with British Columbia shingles, then you would give it a fall of 9 or 12 inches to

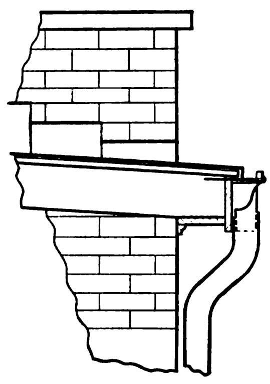


Fig. 1.—Section through Gutter.

plied. The roof is steeper than it should be, to begin with, and the felt is lapped 1 inch where it should have 2 or 3 inches, and, being put on with nails and tin washers, it happens occasionally that a few are driven between the joints of the sheeting.

The chimneys and skylight give a little trouble, but by and by the job is complete, yet the very next summer it needs fixing. The sun caused the protecting covering of tar and sand or "paint" to run off owing to the excessive amount of fall, and the felt withered up, the top layer "crawled" away from its neighbor, leaks were plentiful, and after being fixed and fixed without avail had to be removed.

Experience has taught that in severe wintry climates (for dwellings, stores, &c., having a flat roof) it is preferable to drain through a conductor pipe placed within the building. Fig. 1 shows the eave of a felt roof, which has a continuous fall from front to rear of building, with an ogee eave trough spiked to the rafters and a conductor outside of building.

The great trouble with this type is that a ridge of ice will be sure to form along the eaves, which will dam back the water and form a miniature lake. Fig. 2 shows a method which was designed to overcome this. A galvanized trough was made 6 inches wide, extending across the roof more than two-thirds of its width, and supported between the joists as in Figs. 2 and 3 by being nailed to wood strips in such a way as to admit a current of warm air from ceiling around the trough and out, as shown by the arrows. The roof has a fall toward the gutter C from both ends equal to ⅜ inch to the foot. The conductor pipe and trough were by this means kept free from ice throughout the winter.

The finish along a fire wall is often a cause of trouble.

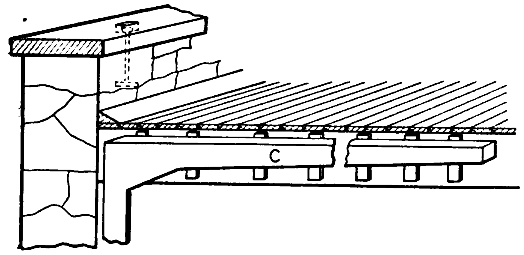


Fig. 2.—Section Across Roof.

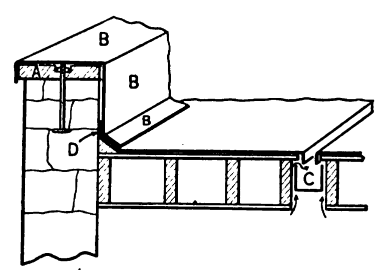


Fig. 3.—Showing Finish Around Fire Wall.

Hints About Roofing.—Sectional Views Showing Method of Construction.

the foot; if you would have a roof almost flat, then wood and metallic shingles, slates, &c., are out of the question, and something must be chosen whose component parts may be so joined as to form one continuous water tight piece, not liable to become broken at any seam or any other point through changes of temperature, wind storms, &c. If a client or architect desires a certain shape of roof he must select a material which can in every way conform to that shape with satisfactory results. If he will have a specific material, then the shape must be subservient.

Very good. These are only elementary principles, you say. But apply them to the poor roofs and it will be found that it is in their violation that the trouble began. This man has used rough, undried, unplaned lumber for a basis, when he should have had it with a tongue and groove joint, planed and dry. "It's cheaper, and I don't know that it makes much difference," he says. However, it does make a difference, as he finds later on; more so, perhaps, with some materials than others.

Here again we find one who has invested in a new kind of ready roofing, and the men who are working in the roofing business at that place have had no previous experience with it, or he may think himself capable of doing the work with a little help, as it is said to be easily ap-

In Fig. 3 is shown a stone wall of a building used as an engine house. A hardwood plank 3 inches thick is bolted to the stone work, its inner face flush with wall, its outer edge projecting 2 inches. A triangular strip of wood is placed in the angle of wall and roof, and the felt well secured there with hot pitch. The coping is covered with galvanized iron, extending down the fire wall and over the triangular strip, which thus protects the felt from the direct rays of the sun and throws the water away from the wall. In Fig. 3, A is the wood cap or coping, B the galvanized iron covering, C the trough in section, and D the felt behind the iron.

SPEAKING of a recent visit to Russia, a well-informed correspondent thus sums up the building materials of various countries he has visited: "Krasnoe Selo Theatre is all wood, special precautions being taken against fire. Wood is the raw material par excellence of Russia, in handling which the Russians are unrivaled. England is the country of iron and steel, Holland of brick, France of stone, Italy and Greece of marble, and Russia is the country of wood. The theatre of Krasnoe Selo is quite small, with room for perhaps 300 persons, but it has wide lobbies, spacious balconies and a veranda in front, where officers smoke cigarettes during intervals."

CORRESPONDENCE.

Setting "Batters" for a Frame Building.

From JAMES F. HOBART, *Brooklyn, N. Y.*—The matter of setting adequate batters for the foundations of medium or small buildings does not always receive the attention it demands from builders, and as the subject has recently been brought up in the Correspondence department, a few further remarks may not be out of place. A great deal of time can be saved and better work done by giving a few minutes' additional time to the setting of batters. The leveling "does itself" when batter boards are set level to begin with and there is no danger of getting things wrong—something against which a close lookout must be kept of the foundation walls. For batter stakes I prefer to use the stakes with which the lumber was kept in position on the cars. In my section of the country these stakes are of spruce 4 x 4 inches and about 8 feet long, making excellent batters for ordinary work. Car stakes not being at hand I would suggest the use of fence rails, say 3 x 4 stuff, or anything which can be obtained strong enough to stand up in the ground and hold nails. It will be observed from an inspection of Fig. 4 that the batters are shown set in ground that is not exactly level. In such cases it is necessary that the batter stakes be long enough to cut off level at the top of the underpinning, and therefore some of the stakes must be long while others are short.

In laying out a building first establish the grade or hight of bottom of the sill. I always use an engineers' level

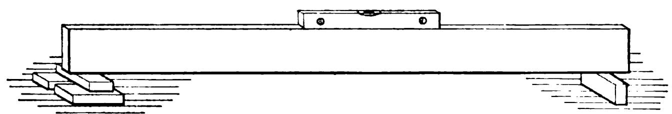


Fig. 1.—Method of Leveling for a Foundation.

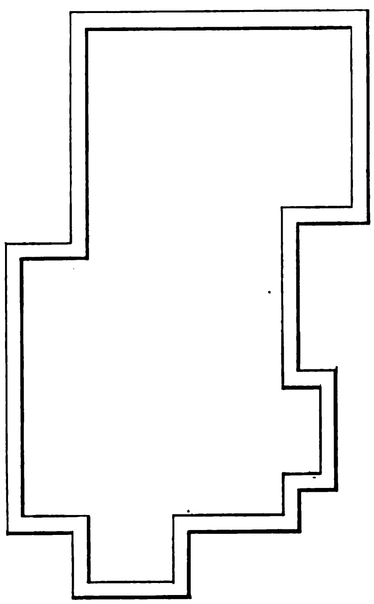


Fig 2.—The Foundation Plan.

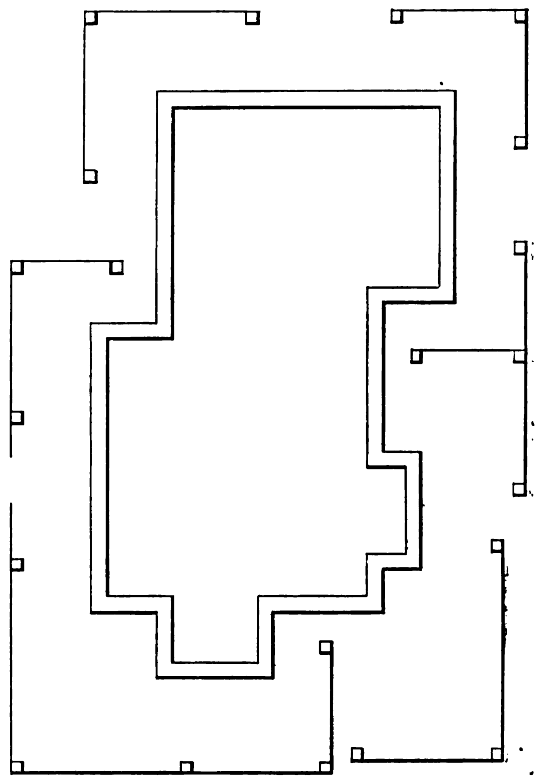


Fig. 3.—Foundation Plan, Showing "Batters" Laid Out.

Setting "Batters" for a Frame Building.

when batters are angled or only half set. Take, for example, the matter of leveling. The average builder will level a foundation or the trench for a foundation wall in about the manner illustrated in Fig. 1 of the accompanying sketches. If a good straight edge is at hand it is used; if not, any old board is laid hands upon, and if decently parallel and straight is blocked up on stones or bricks as shown in the engraving, and the level, or its approximation, run through in some manner. The result is ofttimes discouraging. The writer's method of laying out a country building is indicated in Figs. 2, 3 and 4. The cellar plan is shown in Fig. 2, and this having quite a number of angles and corners would be hard to build without a good system of batters. In Fig. 3 is shown a plan view of the method in which the batters are laid out, this drawing serving as a guide for setting the batter stakes. In Fig. 4 is presented a perspective of the excavation for the foundation walls, and gives an idea of the appearance of the batters when set in position. The illustration also clearly shows the value of the batters as a check upon the leveling with telescope for laying out a building, and it will pay a man to purchase one of these if he has no more than three buildings to lay out in a year. In my estimation there is nothing like the level for this sort of work. Still many a building has to be laid out with nothing but a carpenters' level and a man must be competent to work with this instrument. The next thing to do is to nail up a frame of boards about 20 inches square and joint one edge out of wind. Pile up some stones, brick or other material and carefully level the top of the frame by bedding it in sand on top of the pile just mentioned. Once carefully leveled, sights can be taken to the lowest part of the ground and the length of the batter stakes quickly ascertained. Set the stakes firmly by making a hole with a crowbar, and then drive straight with a sledge hammer, and a big one at that. Don't try to get along with a slim stake half set in the ground. Put them down to stay and the batters will be of some use. They have to be stiff to stand up against digging and stoning the cellars and sometimes putting on a stone underpinning as well.

Drive the stakes far enough from the wall to allow of digging without undermining the stakes, also to allow room for the material to be handled inside of the batter boards. Never less than 6 feet should be allowed inside of the batters, and 8 or 10 feet is necessary when the cellar is a deep one. Having set all the stakes, sight across the leveled board, and make a chalk mark on each stake where it is cut by the line of sight. Let two men hold up a board fair with the chalk marks, while a third man places a straight edge on the boards and the leveled plate. When one end of the board is right, tack in a nail and arrange the other end, tacking that also. If an engineers' level is at hand it may be set up anywhere and a stick cut for each man who is holding the board. Each end of the batter can then be sighted into place and nailed fast, but when putting the batters up with the carpenters' level all the boards should be tacked with a single nail at each end and receive a final leveling before being nailed fast.

Any batter that stands 4 feet from the ground should be braced. This may be done with common shingle strips, or a board may be employed and nailed on, as shown in the foreground of Fig. 4. Be very careful to put up the batters in a firm and substantial manner, for on the accuracy of this work depends the ease with which all future work on the foundation and even the frame will be brought square and true. So arrange the batter boards and stakes that lines may be drawn to both face and back of the walls without coming off the boards. This is necessary in order to get the lines where they are wanted for both the cellar wall and the underpinning A very little measuring on the plan of the house before laying out the stakes on the ground will show just where the stakes should be located. This is the office of Fig. 3. The stakes can be laid out directly from it, and the lengths of boards wanted can be checked off and procured. After the stakes are put up stretch a line across the batter boards, and after this line has been arranged parallel with the street line and at the right distance from it, make sure that it is correct in every particular and cut the notches *c* and *d* so that the line may always be readily put back in place after it breaks or is removed. Next stretch a line the other way, and after squaring it by the "6, 8 and 10 method" and locating it in the right place otherwise, cut notches for it at *a* and *b*. These two lines form the bases for laying out the whole of the other markings. This had best be done by actual measurement with a pole on which the distances have been marked. In this way there is less chance of making a mistake than would be the case if the readings were taken from a tape or a pole with the feet and inches marked thereon. As each line is laid out mark it in pencil as being the inside or outside, as the case may be, locating it by cutting notches large enough to be readily seen. A saw cut run down 1 inch and chiseled off each side makes an excellent and accurate notch for this purpose.

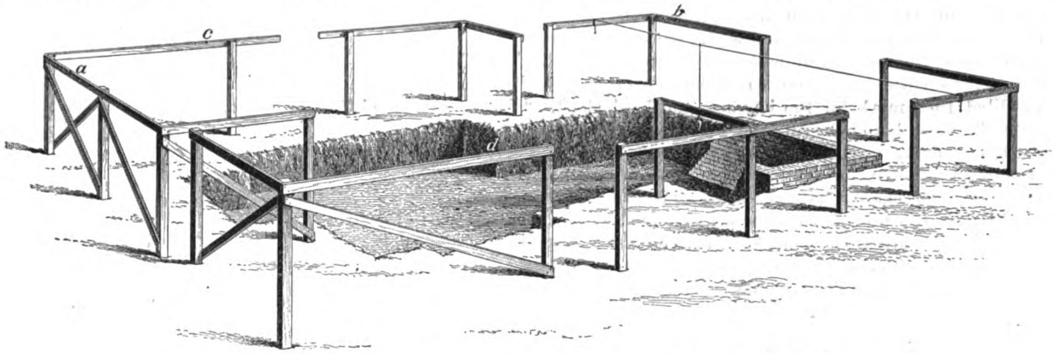


Fig. 4.—Perspective of Excavation for Foundation Walls, Showing "Batters" in Position.

Setting "Batters" for a Frame Building.

Building a Plank Frame Barn.

From J. C. B., *Hickory Corners, Mich.*—Some time ago a correspondent signing himself "T. N. McP.," Hickory, Pa., presented a request regarding the construction of a plank barn. I inclose two newspaper clippings which briefly describe the system. The authors of the construction, I believe, are State Lecturers to the Farmers' Institute of Ohio, and are well known through that State. I forward the clippings thinking that the items may be of service to your correspondent and perhaps you may see proper to use the matter in your own way.

Note.—The clippings inclosed by our correspondent refer to the system of plank framing as advocated by John L. Shawver, who has given a great deal of attention to the subject. The matter seems to be of such general interest that we have secured from Mr. Shawver an illustrated description of his method of plank barn framing and commence its publication in another column. We trust that readers who are interested will feel free to discuss the system and ask any questions concerning points about which they may feel in the least in doubt.

Setting Sash Doors.

From D. C. M., *Carleton, Minn*—In answer to the inquiry of "C. E. F.," Big Springs, Texas, I will say, though I do not claim to be one of "those who know," that the puttied side of a door should be out, for this reason: When a door is slammed shut (and what door is not ?) the putty tends to break the shock more than the wood, and thus a glass may sometimes be saved. This is another case where every one has his own idea of things, and the outside may be inside or the inside outside, and it makes no difference to any one but the owner.

From J. W. W., *Allanson, Mich.*—In the November issue of the paper a correspondent in Big Springs, Texas, asks which is the right way to set sash doors. I would say that if the door is under a porch the putty side should be on the inside, but if there is no porch and the door is exposed to the weather the putty is placed on the outer side. This is the correct way to hang such doors, more particularly in this section of the country.

Weather Boarding a Circular Window.

From O. P. G, *Elkader, Iowa.*—Will some one tell me how to put 6-inch siding on a circular window of 6 feet radius without kerfing the material ?

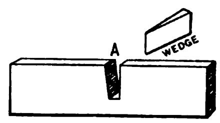
Note.—Several methods of doing work of this kind were presented in the issue of the paper for April, 1896, and it is possible our correspondent may find among them many suggestions of value relative to his own particular case.

Design for Oak Writing Desk and Bookcase Combined.

From D. C. M., *Carleton, Minn.*—In answer to the request of "A. M. H.," Wilkes-Barre, Pa., for a design of desk and bookcase, I would suggest that he send to some of the furniture houses for a catalogue, for which a small charge is generally made. From it he may obtain ideas without number, not only of desks and bookcases, but of all kinds of furniture. Failing to do that I will be glad to submit an "idea," if he will give more explicit details as to just what he wants. It is a hard matter to draw up plans to suit another person, especially in a case of this kind, for he may want it in a room where the dimensions are limited one way or another, or he may have certain books or articles requiring space of a certain size, and in that respect no one has a better idea of how it should be made than the maker.

A Convenient Door Clamp.

From John Treadrise, *Louisiana, Mo.*—A door clamp which is readily made and which will be found very convenient is shown in the sketches which I inclose. In order to make the clamp take a piece of 2 x 6 inch stuff,



A Convenient Door Clamp.—Fig. 1.—View of Clamp and Wedge.

cut a notch in it as at A, Fig. 1, make a wedge, place the door in the notch and drive the wedge in beside it. This, as shown in Fig. 2, holds the door for planing and gaining in hinges, while at the same time it can be moved around at will. It is much better than leaning against trestles, as the clamp holds the door rigid and upright. In fitting mortise locks make two wedges and wedge under the door from each side, this holding it wherever wanted. In fitting ordinary surface locks, first screw the lock on where it is wanted, then mark for the key hole and knob shaft. Unscrew the lock, bore holes and the lock goes back to its proper place, saving both time and trouble. When there are a number of doors of the same hight to hinge, the hinge on one door may be gained in, then take a rod and letting it pass the top of the door by 1-16 inch, mark where the hinges are to be placed. Use this rod in the rabbet of the door to mark for the hinges and also use it on all the other doors. This insures ease and speed and makes a regular job of hinging.

A Carpenters' Trestle.

From H. T. W., *Crawfordsville, Ind.*—I inclose a sketch of a trestle which may be interesting to some of the carpenter readers of the paper. Its uses are varied, and it is so constructed as to give a place to saw off short pieces, also a place to lay small tools, a firm footing upon which to stand, and can be employed for other things. The sketch which I send is to a scale of 1½ inches to the foot.

Finding the Cuts of Valley Rafters.

From T. J. D., *Cherokee, Iowa*—In looking over the December issue of the paper I notice in my answer to "F.

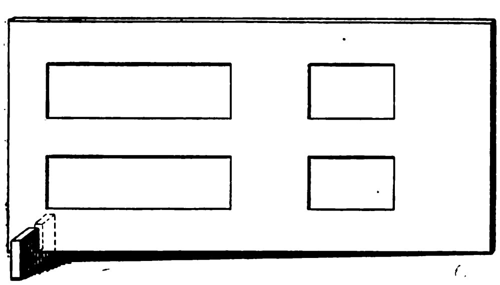
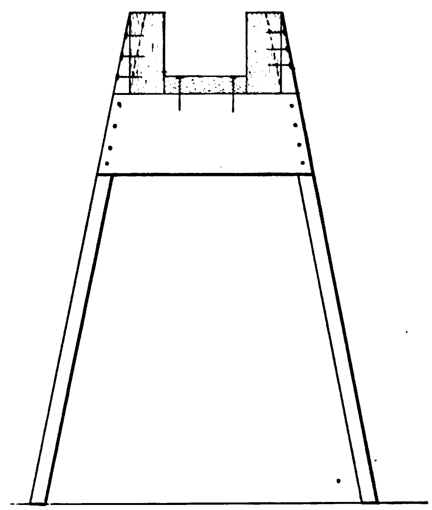


Fig. 2.—Showing How a Door May be Held.

R.," in describing the cuts for valley rafters, that there is a slight error. At the top of the second column on page 302 it reads "take 15 on the blade and 12 on the tongue of the square, place it on the rafter as shown, and the tongue will give the desired bevel, marking along the blade." This should read "the blade will give the desired bevel, marking along the blade." Please correct this in the next issue, as it may be misleading to some of the readers of your valuable paper.

From E. E. B., *Monroe, Ore.*—In reply to "F. R.," San Francisco, who wishes to know the proper cuts for valley rafters, I would suggest that the correspondent take the length of the rafter on the blade of the square and the run on the tongue, or proportionate parts, and the bevel on the blade will give the side cut. The plumb cut for a half pitch roof is 12 and 17, the short side giving the cut.

From E. E. W., *Bozeman, Mont.*—I have taken *Carpentry and Building* for the past two years, and would not do without it. I have a method of getting the cuts of hip and valley rafters which I will give in answer to "F. R." of San Francisco. I take the hypotenuse of 1 foot, which is 17 inches, for the run and the rise of common rafter for the rise of hip or valley. For example, take a roof of one-third pitch or 8 inches rise to the foot run. I take 17 on the blade and 8 on the tongue, the blade giving the plate or level cut while the tongue gives the top or plumb cut. I then take the hypotenuse of the run and rise of the common rafter, 8 and 12, which is 14½. Take 14½ inches on the blade and 12 inches on the tongue and the blade will give the miter pitch to which to cut the hip and valley rafters at the top; also the miter of the cripples against the hips and valleys. Using the tongue instead of the blade will give the cut for the sheeting or



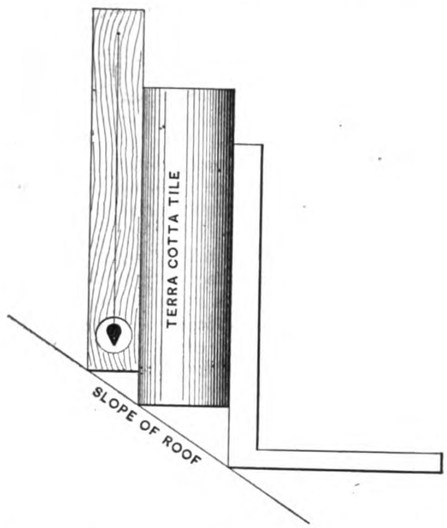
A Carpenters' Trestle.

planceer. If the rafters are 2 feet on centers the difference in the lengths of cripples will be twice 14½ inches, or 29 inches; if 16 inches on centers, two thirds of 29 inches, or 19⅓ inches. The above rule works on any pitch of roof by using the different hypotenuses of differently pitched roofs for the side cuts or miters.

From C. G., *Enfield Falls, N. Y.*—I beg to submit an answer to the inquiry of "F. R." relative to the proper cuts for valley rafters. Gauge a line along the middle of the upper edge of the valley rafter of sufficient length to admit of the application of the steel square. Then take a scale measurement, by which I mean proportional measurement, of both the length and run of the rafter; place the square on the gauge line in such a manner that the blade shall be toward the top of the rafter, and with the scale measurement of the length of rafter on the blade and the run on the tongue mark along the blade, which will give the cut for the miter on one side of the line, while a similar position of the square on the other side of the line gives the miter cut on that side. For the plumb and level cuts take the rise of the rafter on the tongue and the run on the blade, using the tongue for the plumb cut and the blade for the level cut, the same as for common rafters. The cut of miter is the same as that of a hopper, the side of which has the same width as the length of the valley rafter, and the length of whose side is the same as twice the run, or the flare equals the run.

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

From JULIEN A. HALL, *Morotock, Va.*—I submit the accompanying sketch showing a simple and practical method of cutting a hole through a roof so that a circular pipe of any diameter, standing perpendicularly, will fit it. Set the tile to be used on the roof at the point where the hole is to be cut; plumb it with a level or plumb, and place a square alongside of it as is shown in the sketch. Keeping the blade of the square in contact with the pipe, move it around the circumference of the pipe, touching the roof at points about 1 inch apart and making a mark on the roof at each point of contact. When the entire

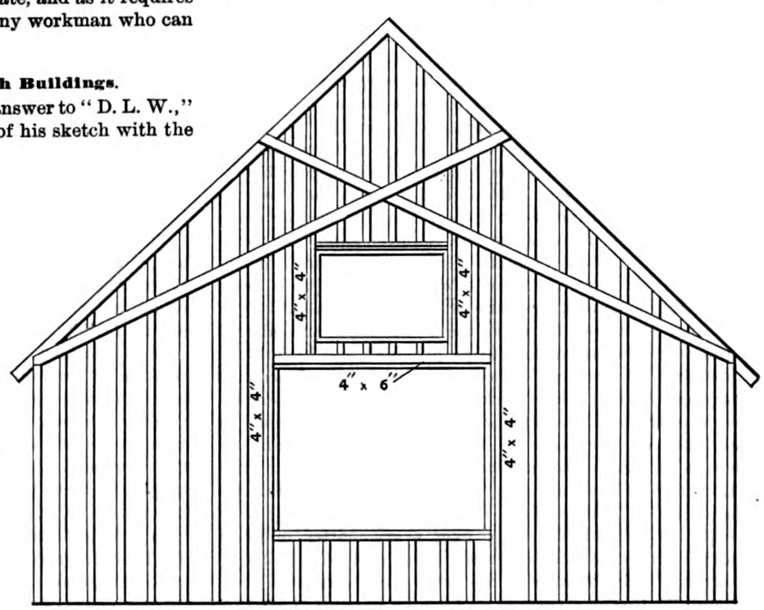


Cutting an Opening in a Roof to fit a Round Pipe.

circumference of the pipe has been traveled join the points marked on the roof, and the figure outlined will be a perfect ellipse and of exactly the size required. Nothing remains but to cut the hole, and if this is done correctly the pipe will be found to fit it exactly. This method is simple and perfectly accurate, and as it requires no calculation, it can be done by any workman who can handle the tools and pipe.

Setting Studding in Church Buildings.

From C. N. C., *Decatur, Ind.*—In answer to " D. L. W.," West Elkton, Ohio, I inclose a copy of his sketch with the studding drawn in place. In this locality we put up the rafters for the gable end without any braces, and then stud up to them, using temporary braces to hold them in place until the end is sheeted. Then if any of the braces form the ceiling we spike them on the studding. This does away with a large number of cripples and makes a stronger wall.

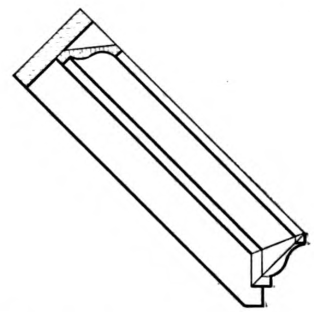


Setting Studding in Church Buildings.

Brick Veneer Construction.

From VENEERS, *Wakefield, Mass.*—I notice in regard to brick veneered buildings that one correspondent recommends this form of construction for small buildings, but not for large ones. Now what would be the objection to veneering a three-story structure? Is the shrinkage in the timber at that hight too much for the brick work? Another correspondent suggests leaving a space for ventilation under the sills into a 1-inch air space. I think a mason could not lay the brick in a case of this kind without dropping enough mortar over the back to fill the air space a number of inches at the bottom. Veneered buildings are not common here, and if some builder will give his experience with large structures I would consider it a favor.

Note.—It may be of interest to our correspondent to refer to some of the communications which have appeared in previous issues of the paper bearing upon the general subject of veneer construction. An article written by a well-known Southern architect and accompanied by a section through the wall showing the construction employed appeared in the issue of *Carpentry and Building* for February, 1894. Another article appeared May, 1895, and still another in November, 1896. There seems, however, to be a diversity of opinion as to the merits of veneer construction, and as the subject has been by no means exhausted we shall be glad to have those experienced in constructing this class of buildings express their views through the columns of the Correspondence department.



Sketch Submitted by " T. A. J.," Showing Method of Making the Returns in Connection with Rake and Level Moldings.

Rake and Level Moldings.

From T. A. J., *Rock Springs, Wyoming.*—I have been a silent reader of *Carpentry and Building* since 1888, and have been greatly interested and instructed since that time. I have noticed a great many inquiries about rake and horizontal moldings, and send herewith a sketch showing a method of making the returns which does away with two sizes of moldings. This may perhaps be something new to some, if not all, of the readers of your worthy journal. I would like to hear what they think of the scheme.

RESPONSIBILITY OF ARCHITECTS.

THE following views concerning the responsibility of architects are to be found in a recent issue of the London *Building News:* Considerable doubt exists among many in the profession as to the question of responsibility of architects. Frequently correspondents write for information—as, for example, whether an architect is responsible for any defect in workmanship or materials discovered in a building which he has certified. It is, of course, impossible, in the absence of circumstances and details, to give any definite answer to these questions ; but it is well that the younger members of the profession should be acquainted with certain legal principles and decisions by which general conclusions may be formed. We may first suppose a case of this kind. A building is intrusted to an architect in the usual course to superintend. Something is done wrong. The drains are improperly laid, or the roof is not water tight, and the client looks to the architect. Is he responsible if he employs a clerk of works, or delegates the details of the work to another ? We may imagine a case where the architect has many works on hand, and that he can only give a general superintendence to any of them. It is unreasonable, if not impossible, to expect him to see to all the work—the laying and jointing of drains, the mixture of the concrete, and to look after the courses of the footings. At the same time, according to one decision, he is liable to his employer for defects, whether he delegates work to another or not. According to one ruling he is not entitled "to put implicit trust in a clerk of works appointed by the employer," for if he passes inferior work he is liable in damages. These decisions are, it must be confessed, a little hard on the busy architect, who cannot inspect every part of a foundation, or see that every brick or slate is laid properly, or that every load of bricks that comes to the work is according to specification standard. If he engages a clerk of works, surely this ought to exempt him from such labor, and it does as a rule. We do not believe a clerk of works entitled to the name would allow any default of this kind to pass. But it may occasionally happen that a clerk of works has something else to engage his attention just when the concrete is being put in or the drains laid.

Delegation of Duties.

Official interpreters of the law are not all the same in their opinions. What is called "an ordinary and reasonable degree of skill" may mean very different things, as shown by the way various judges have expressed this rule. The skill of the architect need not be extraordinary : he must bring to the exercise of his profession an "ordinary degree of skill," says one judge. In a recent case, another judge said an architect could not be held responsible for the defective joints in a drain, and if we extend the principle, it is unreasonable to expect him to see that every brick or stone is equal to the requirements. As to the delegation of the architect's duties, an authority on the law writes : "An architect's or engineer's duties being personal, he cannot delegate or transfer them entirely to another ; but he may make use of the skill and labor of others in performing his duties, provided that he does not abdicate his general duties as to superintendence and supreme control of the work." And this more reasonable view of the architect's responsibility has been upheld. In the case of Clemance *vs.* Clarke a very important decision was given which seems to have set at rest the question as to superintendence. Therein it was held that the architect's "duties could not be performed if he were expected individually to go over every matter in detail, and it cannot be that his certificate should be held bad by a court of law because he has not himself gone into every detail." Recent decisions in America have supported the same view. In the measurement and estimation of work it is unreasonable to expect that the architect can do the work entirely himself. If he deputes an assistant to measure, and revises himself, he is carrying out his contract. As regards estimates, a reasonable degree of accuracy is expected. It has been said that a man should not estimate a work at a price at which he would not contract for it—a healthful principle if it can be obeyed.

Limited Responsibility.

There are occasions in which the architect's responsibility is limited, as when the employer orders alterations and supersedes his architect's instructions. Let us suppose a not infrequent case. A house is being built according to plans and specification by a contractor. In the absence of the architect, and unknown to him, the employer orders casements to open inward, and without specifying the right kind of joint to keep out the rain. These are found very defective, and allow wind and rain to blow through. The architect cannot be held answerable if the work is done without his knowledge. But if the architect follows his client's orders, without pointing out the consequences of this altered construction or giving proper details, he may be held liable for any defect. An experienced architect would not hesitate to point out the consequences of any alteration made by his client to him, as by so doing he holds himself harmless in case of any accident or defect.

Sometimes a professional man is required to carry out the plans of another architect—say in the case of the decease of the latter. In such a case he ought to carefully examine the plans and specifications of his predecessor, for if he neglected to do so he could be held liable for any error or defect that may be discovered. An employer may wish his own plans carried out by an architect who may be led into a trap unwittingly if the plans turned out impracticable or defective. No doubt, if any mistake arose which had not been pointed out to the employer, the architect might be held liable.

Test of Liability.

The test of liability in all these and similar cases is to be found by proving that the architect has not used reasonable care and skill. Whether any men in the same profession would have done the same thing in like circumstance, or come to the same conclusion, is one means of discovering the liability or otherwise of the architect. The responsibility of the arcnitect depends largely as to his use of usual and skillful means. If he neglects to employ them, he is liable for any damage resulting to the employer. It would be neglect on his part, for instance, if he failed to exaimne the site and foundations, the rights of support, of light and other easements, before making his plans ; if he failed to comply with statutes and by-laws as to buildings ; and he would also be liable if he neglected to test by his own skill plans made by others, which he undertook to carry out.

French Employers' Liability Act.

The Employers' Liability bill which has just been adopted by the French Chamber of Deputies is of a drastic character. It imposes upon the employer the payment of an indemnity to workmen who are accidentally disabled, if they are made idle over four days. If a workman is disabled for life the employer must pay him a pension of two-thirds of his wages lost, and in case of partial disablement the employer must also pay him two-thirds of the wages thereby lost. In the case of temporary disablement the employer must pay half the wages the workman loses, and in case of death by accident the employer must pay a pension to the workman's widow amounting to 20 per cent. of the wages he earned in addition to 15 per cent. for a single child, rising to 40 per cent. for four children, until they reach the age of 18. In the case of orphans the pension to be paid by the employer is 20 per cent. of the wages formerly earned by the workman, for each child, up to a total of 60 per cent. In the case of bachelors supporting their parents the indemnity goes to the parents. In order to secure these payments, even in the event of the employer's insolvency, the bill compels employers to insure their workmen against accidents.

CONSTRUCTING A PLANK FRAME BARN.

BY JOHN L. SHAWVER.

THE growing interest in the plank frame barn, as manifested by inquiries which have emanated from many quarters, calls for specific information which will enable every builder and farmer to avail himself of the many advantages offered by this system of construction. The system has been in use in Central Ohio for the past 14 years and has been rapidly growing in favor wherever people have had an opportunity of investigating its merits. During these years the system, which was at first somewhat crude and undeveloped, has been gradually improved, until to-day, after many of the most severe tests, it is believed to have reached very near perfection as regards economy of material and labor, strength of frame, convenience of arrangement and durability of structure. The advantages offered by this method of construction are:

1. A saving in timber of from 40 to 60 per cent.—a no small item in many localities where timber for building purposes has become a scarce article.

2. An opportunity to employ for the building of barns timber that could scarcely receive consideration if solid timber mortise and tenon frames were to be built.

3. A saving in the cost of sawing, cutting and hauling of about one-half of the timber.

4. A saving in cost of framing, ranging from 50 to 90 per cent., according to the plan of the building and the efficiency of the builders.

5. In cases where farmers' wives are expected to board and lodge the builders, a saving in labor and vexations of two or three weeks' unnecessary time for framing old style barns.

6. A riddance of practically all of the interior timbers which are usually an interference with the use of the horse forks and hay slings, as well as a sort of constant vexation at threshing time and all other times when the barn is in use.

7. The full benefit of the self supporting arch roof, a construction of combined triangles, long braces and perpendicular timbers.

8 Durability arising from the fact that there are no mortises in which moisture may accumulate and cause the tenons to decay.

9. The strongest possible support for the track of the hay fork or sling

10. Ease of addition to the main building should any ever be required.

Changes and variations in plans need cause no loss of timber, as is certain to be the case where a bill of materials has already been placed on the ground. If a piece of timber is too long the piece cut off is used at some point, though perhaps not over 18 inches in length and containing only 2 or more feet of stuff. Suppose we cut off 18 inches of an 8 x 8 and we have lost 8 feet of lumber which is worthless for any purpose save for fire wood. If a given piece is too short it is spliced in a moment's time and no loss of strength is sustained. In old style framing if a piece was too short it required considerable labor to remedy the matter, and a loss of both timber and strength was sustained.

Herewith are illustrated two bents of a barn, Fig. 1 showing a plain gable barn with basement. Referring to it, 1 1 1 are posts of basement bent, consisting of five 2 x 8 planks, two of which are 8 feet long and three of which are 7 feet 2 inches. Upon these rest the joist bearers, marked 2 2 2, which consist of three planks 2 x 10, extending lengthwise of the barn. These basement bents are thoroughly braced by a method which will be illustrated hereafter. The braces 3 3 3 are made of two 2 x 4 inch stuff the required length, with a short piece of the same material forming a clamp brace somewhat similar in shape to a clothespin. The sill of the superstructure, marked 4, consists of two 2 x 8 inch plank, with 6-inch space between them. The posts 5 5 are made of two 2 x 8 inch plank, with intervening 2-inch space. The purlin posts 6 6 are made of two 2 x 8 inch plank, with intervening space; 7 7 are roof supports, consisting of a 2 x 8 inch plank. The collar beams 8 are two 2 x 12 inch plank, with intervening 2 inch space; 9 9 are sub-supports, made of a 2 x 6 inch plank; 10 10 are stays of two 2 x 4 inch plank, with intervening 2-inch space; 11 11 are the main ties of one 2 x 8 inch piece; 12, 13 and 14 are braces and ties of 2 x 6 inch plank; 15 15 are purlin plates, made of two 2 x 8 inch plank, with intervening 2-inch space into which couplings and braces enter.

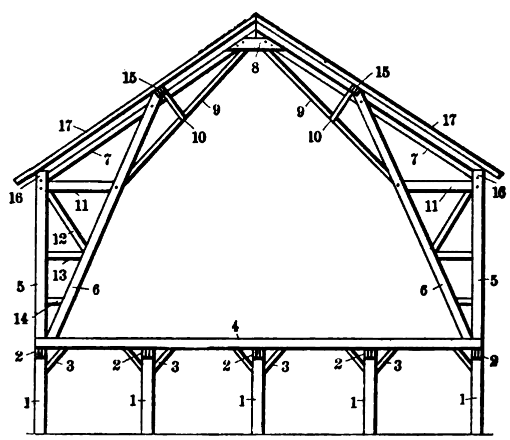


Fig. 1.—Interior Bent of Plain Gable Barn with Basement.

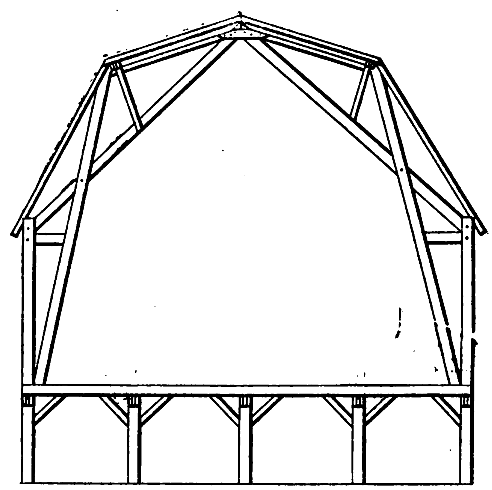


Fig. 2.—Barn Bent, Showing Gambrel Roof Construction.

Constructing a Plank Frame Barn.—The Shawver System.

At 16 16 the main plates, made of two 2 x 8 inch plank, are placed into a V trough and inverted over the top of the post. The rafters 17 17 may be spliced on the purlin plates. The topmost intersections are bolted, as shown by means of the dots. The upper ends of the purlin posts are cut down 4 inches, on a line parallel with the roof supports, and again at right angles with the first cut, forming a saddle into which are placed the purlin plates.

In Fig. 2 is presented a view of an interior bent of a gambrel roof basement barn, which is constructed on the same general principles as shown in the previous figure. Hip roofs, gothic roofs, &c., are as readily provided for as either gable or gambrel roofs, so any man's taste may be fully met in this respect.

(*To be continued.*)

ESTIMATING A BRICK HOUSE.—VIII.

BY FRED. T. HODGSON.

UNDER the head of cornice we will include the whole of the work on and about the eaves, the barge boards on the gables and the paneled fascias connecting the gable barge boards. I find by actual measurement 116 feet of cornice, running measure. This cornice consists of eight members, besides the three members forming the bed for the gutter, as shown in Fig. 10. The whole of the 11 members measure 4½ feet in girt, so that we have 116 x 4½ = 522 feet of material in the cornice. To put this in place properly, all the stuff being ready to hand, would take six days' labor and about 20 pounds of nails. This includes the bed for the gutter. As all this is straight work, the preparation of the stuff and its delivery on the ground would equal two and a half days' work and give the mill men a fair profit on their labor and machines. In these estimates it must be understood that the cost of building scaffolds and moving them is included.

Barge Boards and Fascia.

The barge boards as exhibited in the elevations, Figs. 1 and 2, in June, 1897, are simply plain boards, 16 inches wide, with a small molding broken on it into panels of such lengths and widths as suit the length of the board. This is topped off with a cap molding, over which the edges of the shingles project. The horizontal fascia is similarly made, with the exception that the bed mold of the regular cornice is continued under it and the cap on top is heavier than that on the barge boards. Running up the gables is a soffit 16 inches wide, so that we have a girt line over barge board, moldings, bed mold and soffit of 36 inches, and as we have 148 feet of barge boards the stuff required to make it will be 148 × 3 = 444 feet. For the paneled fascia, of which we require 80 feet, the girt measuring 2 feet, the material wanted will be 160 feet, making a total required for barge boards and fascia of 604 feet. It will take four days' labor to put this in place and five days to prepare the work ready to put in place, and fully 20 pounds of nails will be required to mold and fasten this work. If the barge boards and fascia are framed together, as they ought to be, and molded, the labor of preparing will be nearly doubled, but less nails will be required to do the work. If framed, the work will be put up in sections and fastened on properly prepared grounds with "feathers" grooved in all butt joints, but the caps and all running moldings will, where possible, be made the whole length of the board, or so arranged that their butt joints will break all joints in the barge boards.

We now come to the cornice on the main building, including the belt dividing the brick work from the shingling of the gables. Of the latter there is, by actual measurement, 81 feet in length, covering four gables. The belts are 18 inches wide, including band and bed moldings, and, as will be seen by examining Fig. 1 in the June number of *Carpentry and Building* for 1897, these beltings are paneled. As the kind of paneling is not specified, I will assume that it is framed, with panels sunk and molded, and that the cap molding is formed of two pieces—namely, a beveled cap with wrought nosing, made to project over the top rail 1 inch or more and having a cove or ogee molding under it as a sort of bed molding. Below the belting there is a cluster of members, forming a bed mold and finishing against the brick work. To make these belt courses, including all the moldings, will require about 3 feet of good material for each running foot, or, say, 300 feet of stuff. Preparing it in the factory, with the aid of machinery, will take 2½ days for one man. This includes framing, molding, cleaning and getting out stuff. To put it in place, erect scaffold and leave the work ready for the painter will take two men two days each, and will require, to fasten and leave complete, about 20 pounds of nails, including what may be required for building the scaffolding.

Main Cornice.

The details of the main cornice, drawn to scale, are shown in Fig. 10. The combination consists of furring, frieze, bed molding, sheeting, fascia and crown mold, the whole having a girt of 4 feet in round figures. The cornice, including the four gables and barge boards, measure 240 feet in length, which multiplied by 4 feet—the length of girt line—makes 960 feet of material (say 1000 feet) to make the main cornice and barge boards for the gables. To make this stuff in the factory, using machinery, and completing it ready for putting in place, taking the stuff from the rough, will occupy two men three days each. This, of course, includes paneling and molding the eight barge boards. To put this 240 feet of cornice and barge boards in place will take two men four days each to complete the work. I say two men, because on a piece of work of this kind less than two men would be useless, and there would not be much gain by having a third man in the same gang for this kind of work, though an apprentice boy, to hold and handle stuff, pass nails, &c., makes a paying accompaniment.

We have now about completed the outside of the building, with the exception of the ridge boards and the bracketing for the roof gutters. The ridge boards seem to consist of two pieces of 1-inch stuff 6 inches wide, nailed together so as to form the same angle as the roof. This is surmounted with a roll made from 3-inch stuff and having a V-cut in it to suit the angle of the ridge. This is nailed on over the joint formed by the joining of the ridge boards. If a first-class job is desired, the V in the ridge pole should be well painted with white lead paint and oil before it is nailed in place. To make and put in place ridge boards and roll as described, and furnish all materials for same, where good working lumber costs on the average $25 per 1000 feet, will be worth from 5½ to 6 cents per running foot.

Windows, Doors and Frames.

In the basement there are 14 windows and frames, the windows consisting of a single sheet of glass each, 12 x 26 inches, and are built partly in the stone and partly in the brick work. The sash are hung at the top and fastened at the bottom with snap catches. The frames are made of sound 2-inch plank, having sill and subsill, and 2¼-inch blind stiles and cambered head outside. The cost of frame and sash, with interior trim, will average $2 or $2.40, finished inside and out, and this without painting or glass. This includes fitting and hanging sash and furnishing bolts and other materials. These prices will vary, and are only given as a sort of starting point. In the basement are two doors, these being heavy panel doors with strong hinges, locks and heavy bolts. The jambs of these doors will be fully 17 inches wide, and should be framed and paneled. The cost of the doors will depend on their style and on the character of the hardware employed. Knowing the number of doors, the price of each, also of the frames and hardware, all the estimator has to do is to discover the cost of trimming the inside, the hanging and putting on of the furniture. This may be put down under ordinary circumstances at about half a day for each door, this including everything.

In the main story there are 13 windows, all of which are double hung box frames prepared for folding shutters and paneled splay jambs. They are, with the exception of one, all two-light sash, but they vary somewhat in size. Three of these windows have bent glass, with sash made to suit. The prices of these frames, ready to place in the wall, and the sash to go with them, can be obtained at any factory. In order to give the estimator an idea of what the cost of a frame suitable for the purpose may be when lumber averages $25 per 1000 feet and labor $2.50 per day, I may say that $3 would be a fair price. This would, of course, include sash, axle pulleys, molded sill and subsill and outside casings—plain, with hanging stiles plowed to receive inside finish. The circular frames and sash would cost double this amount. It must be remembered that this price is only an average one. In some localities it will be more; in others less.

There are five outside doors on this floor, the front entrance door having beveled glass in the upper part and a fanlight on top. The frame is simply paneled and has a molded transom. The frame, door and fanlight, delivered, will cost about $6.50. The other four doors will average about $5.10 each. These prices do not include hanging or finishing frame inside.

Up to the present I have made no reference to the "setting" of the frames. This is quite an item, and should not be lost sight of, as in a building containing a large number of windows and frames the "setting" would amount to quite a sum if time and material were considered. I have found that it costs about 25 cents to set a frame in the lower or main story, and 5 cents additional on each frame in the second story, and 5 cents more in third, and so on to the top. These figures are based on actual experience from five different operations.

In the second story there are 15 windows, all of them having the same width as those on the main floor, but they are somewhat shorter. The cost for each would be the same as for the lower story, with the exception of the French window or glass door over the front veranda. This will cost about $1 more.

In the attic are seven windows, four only of them being double and double hung. These four will cost $2.20 each. The three single ones may be put down at $1.50 each, complete. Altogether there are 49 windows in the building, 32 of which are supplied with double sash and are double hung. To fit and properly hang a pair of sash, adjusting weights, attaching hardware and properly balancing, will take a man from three to four hours' time, and occasionally, if things do not go right, a full half day will be used on one window the size of the ones in the building being estimated, so that the contractor can only be sure of his ground by charging a half day for each window. This, of course, includes fitting in stops, cording and leaving sash in good working order. To this cost must be added the price of cord, weights, lifts, pull downs and sash locks. These may be obtained from catalogues and price-lists. This completes all the estimates of costs for the walls, floors, partitions, roof, plastering, and all outside work, with the exception of the painting.

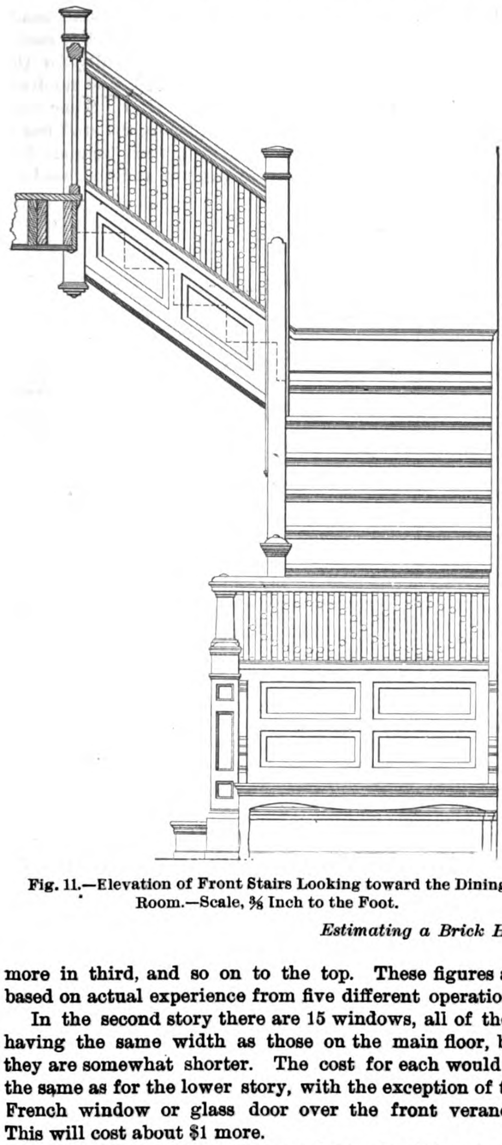


Fig. 11.—Elevation of Front Stairs Looking toward the Dining Room.—Scale, 3/8 Inch to the Foot.

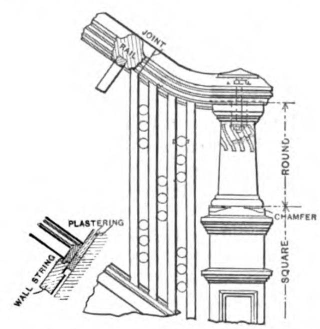


Fig. 12.—Detail of Main Stair Balustrade and Top of Newel Post.—Scale, 3/4 Inch to the Foot.

Estimating a Brick House.—Details of Main Stairs.

Inside Finish—The Hall.

The plan of the main floor shows a reception hall with a paneled screen, newel, rail and balusters, projecting from the side wall 5 feet into the room. Against this, with the front toward the entrance door, is a seat, abutting the wall at one end and the newel at the other. Beyond this screen rise two steps and a platform, from which the main stairs spring, as shown in the detailed drawing, Fig. 11. The stair is of the dog-legged type, and turns square to the left after a lift of eight risers from the first platform, the top flight having a lift of five risers. Altogether there are four newels, and the balusters are square with turned balls between them. The rail is straight and heavy, with a ramp running into the newel cap, as shown in Fig. 12. The strings are closed strings, paneled and molded, and the whole stairs are built of hardwood, cherry, birch or ash, and finished in hard finish. The lower newels are turned at the top, carved and molded, and are 5 inches square at the base. Taking these stairs as a whole, with hardwood, suitable, costing $50 per 1000 feet and stairbuilders' labor costing $3.50 per day—for it is usual to engage a professional for this work, whose charges are high—the cost of the stairs will average about $4.50 per tread, including platforms, each of which count the same as a tread. The seat, with ends and front and moldings, made in the same wood as the stairs, placed in position, will cost $3.50. I am presuming the hall to be wainscoted in hardwood paneling 4 feet high, in same style as paneling in the screen, panels molded, and the whole finished off with an appropriate cap molding. It may be broken into more panels if necessary without adding much to the cost, but as we are dealing with the plan before us the cost must conform with it, and will be 65 cents a foot running measure. This means the cost of work and materials left in the wall ready for the finisher. The contractor under this estimate is entitled to half the doorways and the full length of paneling in spandril of stairs, and no reduction for the lowering of the work to meet the window stools or other drops in the hight of the paneled work. The number of feet around the hall, less half the openings, multiplied by 65 cents will give the cost of wainscoting in the reception hall.

There is one pair of sliding doors leading into the parlor, and an arch leading across the passage to dining room. The arch is finished in plaster and has a grille across the top, with pole for drapery. The cost of grille and pole will depend altogether on the style of the work, and the former may cost from 40 cents to $5 per foot. Catalogues and price-lists may be obtained from manufacturers. The opening leading into the parlor from the hall is closed with a pair of sliding doors, provided with the best door hangers and hardware furniture, the prices of which must be obtained from catalogues or otherwise. The doors are "built up" and veneered on both sides on a pine core, the veneering being in wood similar to finish in the rooms in which they show. A pair of sliding doors, 3 feet by 7 feet 6 inches, 1¾ inches thick, built up, and veneered on both sides, properly put together and well made, will cost $20. The hangers and other furniture should be of the best, and will cost $10. The extra material required for lining, frame, casings and moldings will cost at least $3. Then, for labor, there will be:

Lining up partitions and adjusting track	$8.50
Setting jambs and casing frame	4.50
Hanging doors and adjusting same	4.00
Putting in lock and shields	1.50
Cutting in stops, molding frame &c	2 00
Total for labor	$20.50

This will make the doors, complete, cost as follows :

Doors	$20.00
Hangers and other furniture	10.00
Extra materials	3.00
Labor hanging doors &c	20.50
Total cost of pair first-class sliding doors	$53.50

In this estimate I have supposed everything to be the best of its kind and to be in keeping with the character and style of the house, and I know from experience that the figures given are not a whit too high. To make, finish and trim a pair of sliding doors, furnish all materials of every description, such as would be required for this style of a house, and do all the work properly and in a substantial manner, will cost in every case from $50 to $60 if the contractor does justice to himself and the owner.

In the original design it was not intended to place doors in these large openings, but for many reasons I thought it better to make provision for doors between the hall and parlor, but we will omit putting doors in the openings connecting parlor with sitting room and sitting room with dining room, as we now know what the cost of sliding doors would be if placed in these openings. The window in the hall looking out to the veranda is, like the inside of the front door, finished in the same style and with the same kind of material as the finish on the sliding doors. To hang, trim and finish front door, putting on hardwood casings inside, the cost will be, exclusive of material, locks, hinges, &c., $3 50. The hardwood casings, moldings and turned ornaments will cost $1.50, thus making the hanging, trimming and completing the front door, exclusive of cost of door and furniture, $5. The cost of the furniture will depend altogether on style and quality.

As we have already estimated on the sash, window frames, hanging and fitting, we have only now to consider the cost of properly trimming the inside, and this one window will be the gauge for all the other hardwood finished windows in the house, excepting the circular ones in the sitting room.

Each window takes two upright architraves or casings, 7 feet long and 6 inches wide, and a headpiece 5 feet long and the same width. This, with cap and fascia required,

Will cost, finished	$1.00
Stuff for stool, splay jambs paneled, &c	3.00
Egg and angle molding on fascia	.60
Putting in splay paneled jambs	1.00
Casing and molding	1.00
Setting in stool and cove	.50
To 15 feet super. inside blinds @ 20¢	3.00
Hanging blinds and furnishing back flaps	1.25
Total cost of finishing inside of window	$11.35

Preventing Drafts Around Windows.

If sash frames and sash were always properly made from good material there would be no need for any special appliances to keep out the wind and rain, but it is practically impossible to find windows so made, says a writer in one of our English contemporaries. The only thing to be done therefore is to make the best fit, and a simple way to do this effectively may be of interest to many readers. In all badly fitting windows the worst draft will be found at the sides. To remedy this take out both sash and run a groove up each stile ¼ inch wide and the same in depth. The grooves must be on the outside of the top sash and on the inside of the bottom one. A strip of hard wood 3-16 inch square must now be tacked on the inside of the projecting part of the outside lining of the sash frame against which the top sash runs, so that, when the sash is in position, these strips will fit easily in the grooves. The strips must run from top to bottom of the frame, and if fixed straight and true they will in no wise interfere with the working of the sash, but will effectually stop all wind and wet from finding a way through. This finishes the arrangement for the top sash. The bottom one is done slightly different. In the grooves already made on the inside face of the stiles must be fitted a hardwood tongue, which can be either nailed or glued in. These tongues should project beyond the face of sash fully ¼ inch, and in the inside edge of the staff beads must be run a groove so that the tongues will slide easily in them. This will be found to act as effectually for the bottom sash as the former does for the top, and no draft will be felt at the sides of the window after. Some care will be required in removing and replacing the staff beads to rehang the window when fitted with these tongues, but if the bottom sash is run up to the top and the bead re-

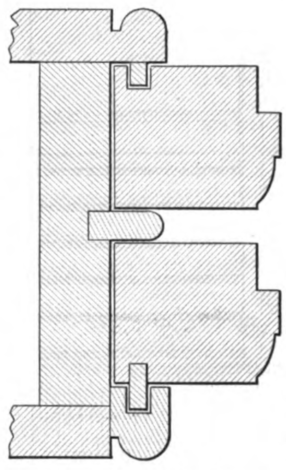


Fig. 1.—Section Showing Arrangement of Top and Bottom Sash.

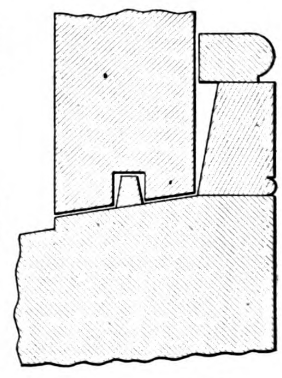


Fig. 2.—Arrangement for the Bottom of the Window.

Preventing Drafts Around Windows.

moved bottom end first, it can be managed easily enough, and replaced just as easily by following the same procedure. The above method will be readily understood by referring to Fig. 1, which shows the horizontal section of a sash frame fitted with tongues as I have described. Should the wind come in at the bottom of a window, an easy remedy is show in Fig. 2. It is simply a strip nailed on to the sill and a groove plowed in the bottom rail of sash to fit over it. There is no need for the sill to be grooved, as is sometimes done, as it only makes a receptacle for the wet and hastens the decay of the sill, whereas if the strip is simply nailed on the wet is only on the surface. Nothing is required at the top of the frame, as any fresh air which enters there can safely be considered as ventilation and will do no harm, but it is often the case that the meeting rails fit badly together so as to cause drafts. In such a case plane off the bevel, or rebate, as the case may be, where the two meeting rails come together, and nail a strip the thickness of the parting beads and half the thickness of meeting rails in width on each of the meeting rails flush with the top and bottom of the bottom and top sash respectively. These two strips will make a close joint, and if the fastener is put on so as to pull the two sash tightly together the entrance of fresh air will be effectually stopped at this point. The above remedies for drafty windows may not be as simple as tacking on weather strips, but they will be found a great deal more effective, and when once done are practically everlasting.

The Builders' Exchange

Directory and Official Announcements of the National Association of Builders.

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Organization Among Builders.

Members of the building trades in cities where no well-established and efficient exchange exists are urged to devote some of their leisure between the close of the busy season of 1897 and the beginning of renewed activity in 1898 to the consideration of organization as an aid to the transaction of business and a means of protection to all concerned.

The vital principle which underlies every recommendation of the National Association of Builders in relation to organization is protection—protection from faults and misconception within and injustice from without. Organization among builders as advocated by the National Association of Builders is eminently practical; the strength of its recommendations lies in their feasibility—in the simple and practical manner in which they can be applied to the conditions which the builder meets in his every day business affairs.

In urging builders who are not familiar with the operation and results of careful and efficient organization, to investigate the subject the National Association of Builders recommends the consideration of the following conditions which tend to demonstrate the beneficial possibilities of proper organization:

The primary purpose of union (organization) being strength, it is obvious that there are other features of strength besides numbers to be considered. Organization to be efficient must be voluntary, because enforced membership is, in reality, equal to compelling the enforced member to some action against his will. The effect of such an attitude destroys any value that such a member might otherwise possess as a factor in the welfare of the whole. If all members of the building trades in any given city should join an organization similar to that advocated by the National Association, no benefit would be likely to ensue unless every member fully lived up to the principles of the organization. The reliable and unreliable men would be in the same relation to each other that they were before the organization was established. Numbers alone do not make strength in organization; strength can only result from real unity of purpose and action.

Members of new organizations often argue that contractors who are tricky and unfair in their methods of dealing with their competitors, in their treatment of bids, &c., can be best controlled by admitting them to membership. This conclusion is theoretically correct, and is sometimes practically correct in cases of well-established organizations. In new organizations, however, the theory seldom if ever works, because it is seldom if ever that a member can be found who has sufficient moral courage to complain against the tricky member (should he continue to practice his questionable methods) and have him expelled in disgrace from the organization. As a natural result the tricky member conducts himself exactly (though a little less publicly, perhaps) as he did before he was admitted into the organization, and he becomes a sore and an object by which the methods of every other member may be judged.

Why Exchanges Are Discredited.

The reason why many builders' exchanges are of no value to their members and are held in contempt by architects, owners and reputable contractors is because they have among their members men who are not a credit to their calling and whose presence is accepted as an indication that crooked methods are tolerated, if not actually approved of and protected. In many cases where exchanges have been hastily formed, and where any one connected with the building business who had the price of admission was admitted to membership, the organization has struggled along for an indefinite period and then languished in innocuous desuetude, a mere semblance of organization and a seeming proof to many of the futility of organization, however established.

An organization of builders hastily and carelessly established in the heat of an enthusiastic belief that its simple creation will of itself wipe out all the evils in the building business is foredoomed to failure.

An organization of builders that is carefully founded upon the knowledge that something more than the simple announcement of a set of principles and an election of officers is required to bring about any radical reforms or obtain any permanent benefits and improvements, may look forward to a career of increasing usefulness and strength. One of the fundamental necessities of such an organization is that a rigid selection shall be made from the whole fraternity in the city where such an organization is to be set up, and that no person or company shall be admitted to membership whose methods are questionable or whose reputation for square dealing is not clean and above reproach. Such a body will draw to it the best men in the trade and will be an institution of strength and significance to the general public.

These and many additional phases of the subject of organization in the building trades have been presented in these columns and in reports and other publications by the National Association of Builders, a full supply of which will be gladly furnished to builders anywhere who contemplate the establishment of organizations or who desire to investigate the subject. Application to Wm. H. Sayward, secretary, 166 Devonshire street, Boston, Mass., will receive prompt response.

New Public School Buildings.

A short time ago we briefly referred to the fact that additional school buildings were soon to be erected in New York City, in order to provide accommodations which are at present greatly needed. One of these buildings is to be erected near Second avenue on the north side of 119th street, running through to 120th street, the plot fronting 151 feet 8 inches on the former street and 150 feet on the latter.

The structure is planned to bring the assembly room in the center of the block, and the wings on the party lines, thus giving it substantially the form of the letter H. The building will be of fire proof steel skeleton construction and five stories in hight. The materials of the exterior will be granite, limestone, gray brick and gray terra cotta with a red tile roof. The first story will be divided into boys' and girls' play rooms, which are to be wainscoted with glazed brick and floored with asphalt. The second, third and fourth stories will be divided into 16 class rooms, each making a total of 48. The wardrobes are to be placed outside of the class rooms and so arranged as to be easily accessible. They will be thoroughly ventilated, each having a coil of steam pipe to dry the clothing when damp and to maintain at all times a circulation of air. The fifth story is designed to provide for manual and physical training, library and reading room. The contract price of the building is said to be $307,000, and it will be heated by a system which provides for each scholar 30 cubic feet of warm, fresh air per minute.

New Publications.

THE UNIVERSAL CARPENTER AND JOINER AND WOOD WORKERS' ASSISTANT.—PART I. Compiled and edited by Fred T. Hodgson; complete in five parts; size 7 x 10 inches; 108 pages and over 240 illustrations; bound in paper covers. Published by the Industrial Publication Company. Price, $1.

This work, as indicated, is comprised in five parts, of which the one issued is the first. It deals with practical geometry as applied in carpentry and joinery, showing how to obtain and work difficult cuts and pitches. The matter is presented in such form as to cover simple methods of describing moldings, Gothic arches, turned work, ornaments, &c. It also embraces the care of drawing instruments, the proper use of scales and various methods of copying drawings, the latter being a subject in which architects and builders who often prepare their own drawings are especially interested. The method of making blue prints as well as what is known as the "black process" is described, while colors used by draftsmen are presented, together with a few extra hints to young wood workers and draftsmen. Reference is also made to waxing and the use of the pantagraph, which is employed for copying drawings to either a larger or smaller scale than the original. The remaining parts of the work, we are informed by the publishers, will deal with architectural and isometrical drawing, the designing of moldings with examples of ornamental tracery and lathe work, the construction of roofs, bridges, balloon framing, stairs, hand railing, joinery, ornamental finish, &c., in connection with a number of tables, rules, recipes and other matter suited to the every day wants of the practical wood worker.

Law in the Building Trades.

WHEN CONTRACTOR MAY SUE.

When work has been done substantially in accordance with the terms of a contract, or when there has been an acceptance of the work, the contractor may, notwithstanding defects in such work, recover the contract price, less the cost of correcting such defects. But where contract work has been done on the interior of a building, its continued use by the owner is not necessarily an acceptance of the work.—Fitzgerald *vs.* LaPorte, Ark., 40 Southwestern Rep.

BUILDING LAW IN OHIO.

The Ohio statute giving sub-contractors a lien without regard to the state of the amount between the owner of the building and the principal contractor, or the character of the contract between them, is an unconstitutional interference with the liberty of contract.—Jones *vs.* Great So. Fire Proof Hotel Co., U. S. Cir. Ct., 79 Federal Reporter.

WHEN CONTRACTOR IS NOT LIABLE FOR DEFECTIVE SCAFFOLD.

A contractor is not liable to a workman who was injured by the breaking of a scaffold in consequence of defective materials or workmanship, where the construction of the scaffold from materials furnished was part of the workman's duty, and he had furnished a sufficient quantity of proper materials; but he is liable for injuries so received only in case he furnished the workmen with a complete scaffold as an appliance to be used in the work.—McCone *vs.* Gallagher, 44 N. Y. Supp. Rep.

CONTRACT WITH SURETY ASSUMING COMPLETION.

A contract between an owner and one of the sureties on the bond of a defaulting contractor, of which the other surety on the building contract became the guarantor, by which such contracting surety, in consideration of receiving the unpaid part of the contract price of the building, is to complete it and discharge liens filed upon it to the extent of the amount so received, in addition to the amount for which he was liable as surety in the first contract, is independent of such former contract and supported by a sufficient consideration to require its enforcement by the court.—McHenry *vs.* Brown, Minn., 68 Northwestern Rep., 847.

ORDER ON OWNER BY CONTRACTOR.

An order drawn by a contractor for a building on the owner, directing the payment of a specified amount due the payee for materials furnished for the building, but without any direction for its payment from a particular fund, does not operate as an equitable assignment, or entitle the payee to maintain an action against the owner, unless such order is accepted by the latter.—Bradley Currier Company *vs.* Bernz, N. J. Ch. Ct., 35 Atlantic Rep., 832.

WHEN ARCHITECT'S CERTIFICATE CANNOT BE REQUIRED.

Where a builder's contract provides that for all payments a certificate signed by the architect, as the owner's agent, shall be obtained, a discharge of the architect excuses the contractor from furnishing such certificate.—Fitts & Co. *vs.* Reinhardt, Supreme Ct. Iowa, 71 Northwestern Rep., 227.

AMOUNT OF DAMAGES MUST BE PROVEN.

Though an owner has been put to extra expense on account of failure of contractor to finish his work as required by the contract, yet if the evidence fails to show how much he had to expend to complete such work he cannot have same offset as a counter claim.—Fitts *vs.* Reinhardt, Supreme Ct. Iowa, 71 Northwestern Rep., 227.

CONTENTS.

CARPENTRY AND BUILDING

WITH WHICH IS INCORPORATED
THE BUILDERS' EXCHANGE.

DAVID WILLIAMS COMPANY, - PUBLISHERS AND PROPRIETORS.
232-238 WILLIAM STREET, NEW YORK.

FEBRUARY, 1898.

Local Building Operations in 1897.

The year which has just been brought to a close witnessed a degree of activity in building operations in New York City which, with one exception, was without a parallel in the history of the metropolis, so far as regards the amount of capital invested. It is true that there have been a few instances when the number of buildings projected was greater than during 1897, but the total estimated cost of such structures fell far short of that for the past twelve months. An interesting feature in connection with the structural development of the year was the average cost per building, which was, with one exception, the highest in the history of the city, this being doubtless due in some measure to the expensive character of the office buildings, hotels and business blocks erected. An examination of the statistics available shows that during the past year there were 3516 buildings projected, estimated to cost $83,668,840, as compared with 3149 in 1896, estimated to cost $71,889,765, and 3838 buildings in 1895 involving an estimated expenditure of $84,111,033. The importance of the figures for 1897 will be more fully appreciated when it is remarked that 1895 was the banner year for the city in building operations, and from the figures presented it will be seen that as regards the amount invested 1897 falls less than half a million of dollars behind the record.

Buildings Classified.

A very large percentage of the total amount expended in last year's operations went into structures intended for office purposes and flats and tenements. There were 250 office buildings, hotels, stores, churches, &c., projected, estimated to cost $35,826,485, these figures comparing with 287 structures of the same class in 1897 involving an outlay of $33,820,855. The bulk of the operations in this class of structures, as might naturally be expected, was below Fifty-ninth street, where 145 buildings were either commenced or contemplated, to cost $28,120,980. The next important class of buildings erected was flats and tenements, for which permits were issued for 1597, to cost $35,536,800, as against 1178 in 1896, involving an expenditure of $25,322,250. There were also 1327 private dwellings projected during the twelve months of 1897, estimated to cost $10,084,220, these figures comparing with 1255 houses, costing $8,391,685, in 1896. In miscellaneous structures, embracing stables, shops, &c., the record for the past year does not make as favorable a showing, there having been granted permits for 322 buildings, estimated to cost $2,221,335, while in 1896 there were 429 buildings projected, costing $4,354,975. The greatest activity was in what was then known as the Twenty-third and Twenty-fourth wards, lying above the Harlem River, but which now form the Borough of Bronx, one of the five divisions of the Greater New York. Here 1636 buildings were projected, involving an outlay of $12,297,970, of which 568, costing $7,382,800, were flats and tenements, and 836, costing $2,792,120, were private dwellings. The most active quarter of the year was the second, when permits were issued for 1040 structures, estimated to cost $28,058,295, and by far the most active month was April, when permits for 441 buildings were granted, involving an estimated outlay of $14,304,900. In the previous year May held the record for the number of permits issued, while March was the banner month as regards estimated cost.

Employers and Workmen.

The causes which are prolific of strikes, lockouts and other disturbances between employer and workmen in the building trades are the disagreements between the two on questions the avoidance or settlement of which is of equal interest to both. Whatever may be the difference between the two, it is obvious that it must and will be settled, at least temporarily. Strikes are settled or cease to exist in various ways. They succeed or fail, or the differences are compromised with a loss to the weaker side, which compromise is in itself a threat that the weaker side will seek to recover the lost ground as soon as possible. The question as to whether the damages suffered in a strike or lockout are worth the gain to the winning (?) side more often than not remains unanswered at the cessation of hostilities. Both employers and workmen are thoroughly familiar with the fact that differences natural to their respective points of view are bound to arise, in their relations to each other, and both are equally aware that such differences, brought to open breach, result in money damage, personal enmities and oftentimes in untold suffering. In spite of this knowledge the two go on from day to day without availing themselves of the simple and honorable means of preventing nearly all, if not all, of this disturbance—arbitration. If strikes or lockouts are begun they must either be abandoned in defeat or settled in the manner cited, and oftentimes there is no more serious disaster than victory. The form of arbitration and rules for creating and governing a joint committee of employers referred to in the Builders' Exchange department of this issue offers a tested method of preventing strikes or lockouts and setting up permanently harmonious relations between employers and workmen. All concerned are earnestly recommended to investigate the merits of the plan mentioned.

The 1897 Fire Losses.

The past year was one of the most satisfactory from the point of view of the fire insurance companies that they have ever experienced, for a combination of increased rates and reduced losses made their profits more liberal than in several years past. The increased efficiency of urban fire departments and improvements in fire fighting appliances, together with the better precautions taken against fire in modern buildings which have come in during the past few years, are reflected in a steady decline in losses from this cause, notwithstanding the growth of population and the increase which has taken place in the number of buildings. According to the figures published by the New York *Journal of Commerce*, the total fire losses of the United States and Canada for 1897 amounted to $110,319,650, a large enough sum, it is true, but smaller by $5,000,000 than the losses for

1896, and $19,500,000 below the 1895 figures. Several very large fires swelled the total for last year, there being no less than 22 cases where the loss exceeded half a million dollars. Otherwise the figures would have been more favorable than they are. But the fact that the losses in smaller fires were very much less in amount than in previous years is gratifying, and speaks well for the improvement which is taking place in the matter of fire protection. The most notable fires of the year were the burning down of a dry goods store and a number of business houses in Pittsburgh, Pa., with a loss of $2,300,000 ; the destruction of railroad piers and shipping property at Newport News, Va., involving a loss of $1,500,000 ; of a large dry goods store at St. Louis, Mo., with $1,300,000 damage; of several business buildings at Knoxville, Tenn., at a loss of $1,000,000, and a destructive fire at Windsor, N. S., which did a damage of $1,250,000. Besides these, seven large conflagrations at Philadelphia, Harrisburg, Pa.; Hoboken, N. J.; Washington, D. C.; Detroit, Mich.; Grand Forks, N. Dak., and Chicago, each accounted for a loss of $750,000 or over. Among the notable structures destroyed by fire last year were the Pennsylvania State Capitol Building at Harrisburg, the Coliseum Building at Chicago and the Immigration Bureau buildings at Ellis Island, New York City. Two fires of extraordinary destructiveness occurred abroad during the year, one in London, England, and the other in Melbourne, Australia, each involving many millions of dollars of loss, and each destroying a large area in the business centers of those cities. The antiquity and inefficiency of the fire fighting methods in both London and Melbourne, as compared with the systems in vogue in this country, were strikingly illustrated in these disasters.

Architectural Club of Springfield.

Some of the leading architects of Springfield, Mass., have recently perfected an organization which is called the Architectural Club of Springfield. The objects of the association are to promote the interests and advance the standard of the architectural profession locally, any architect of recognized standing being eligible to membership. The officers consist of chairman, secretary and a treasurer, which officers also constitute the Executive Committee. Among the men associated together are E. C. Gardner, the well-known writer and church architect ; G. Wood Taylor, George C. Gardner, George R. Pyne, Guy Kirkham, B. Hammett Seabury, F. R. Richmond, Edwin J. Parlett and Thomas O'Connell. The association meets on the first Tuesday in each month.

An International Health Exposition.

It is announced that an international health exposition will be held at the Grand Central Palace in New York City, beginning April 25 and continuing for a period of five weeks. It is stated that there will be a display covering more than three acres of floor space of practical apparatus and appliances of all kinds. Among the features of interest will be modern systems of house heating, ventilation, plumbing, &c ; comparative exhibits of new and primitive hospital arrangements, systems of sewerage for cities and villages, a model school room and the other kind, model tenement houses, health food, &c. The exhibits, however, will not constitute all the features of the exposition. The management intend to provide a course of popular lectures for every day discussion by various societies, representatives of Boards of Health, &c., so that the whole affair in its full development will be in the nature of an educational congress. Another interesting feature will be the Department of Electricity, showing its applications not only to health and sanitary matters, but as an aid in household economics.

New Buildings of the University of California.

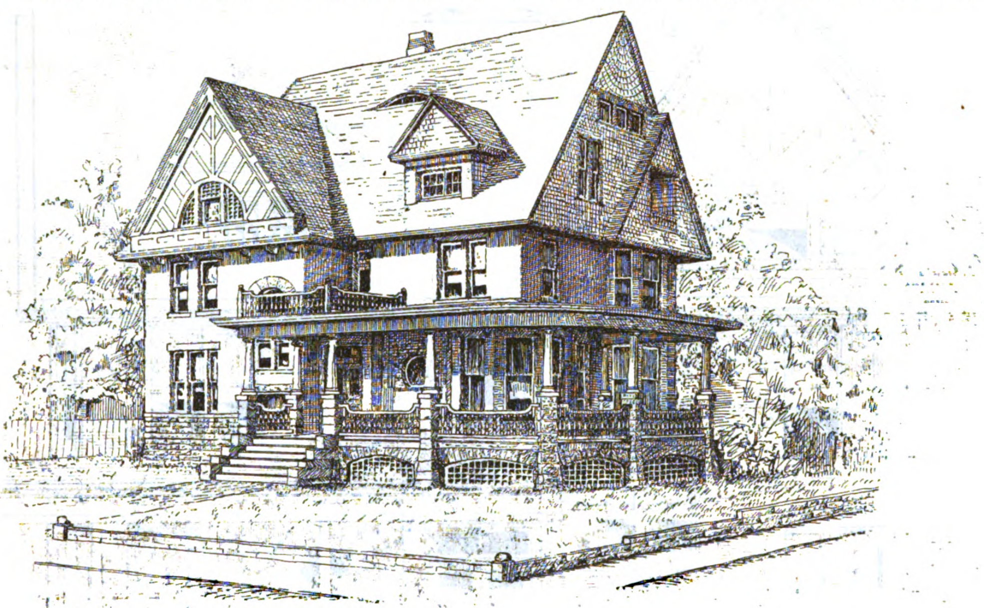
The programme for an international competition for the Phebe Hearst plan of the University of California, reference to which has previously been made in these columns, has recently been issued, the invitation of the trustees to the architects of the world to co-operate in the preparation of a permanent general plan of the buildings and grounds being in the form of a handsomely printed pamphlet of 40 pages. From it we learn that the competition is to be double—a preliminary and final. The preliminary competition is open to the world, while the final will be limited to those whose work in the preliminary is decided by the jury of award to be of such worth as to entitle them to be considered in the final competition. The jury for the preliminary competition will be international, being composed of Messrs. R. Norman Shaw of London, J. S. Pascal of Paris, Paul Wallot of Dresden, Walter Cook of New York City and B. Reinstein of San Francisco, Cal. For the final competition four architects will be added to this jury, who will be chosen by its members, aided by lists of names submitted by successful preliminary competitors It is stated that the various buildings now standing on the grounds need not be taken into consideration, nor need present paths or roads be considered. The general grouping of requirements includes a library having a capacity of 750,000 volumes, a gymnasium with separate halls and appurtenant accommodations for men and women students, separate swimming baths for each, two auditoriums, one of which shall have a seating capacity for 5000 people, dormitories, club houses for students and faculty, an elaborate military establishment, an infirmary and all suitable structures and provisions for the 15 departments thus far contemplated by the university. It may be interesting to state that a total sum of at least $20,000 will be devoted to premiums for the best plans in the final competition, and of this at least $8000 will be awarded to the plan classed as No. 1. The preliminary plans retained will be publicly exhibited at the Mark Hopkins Institute of Art. While there are no limitations on the materials to be used, it is stated that California abounds in beautiful and durable building stones. The programme closes with a scientific abstract of climatic conditions at the University of California for the past ten years. Those who are interested in the competition can obtain all desired information by addressing the trustees of the Phebe Hearst Architectural Plan, University of California, 217 Sansome street, San Francisco, Cal.

Pittsburgh's Public Bath House.

The public bath house that is being erected at the corner of Penn avenue and Sixteenth street, Pittsburgh, will be completed and opened to the public about November 1. The structure, with its completed arrangements, is the gift of Mrs. William Shaw, Jr. The building is fire proof throughout, the only wood used in its construction being the door and the interior of the waiting room. The bath house proper, which runs back along Sixteenth street, is only one story high. It has two apartments, each containing 12 bathrooms, 11 for shower baths and one with a tub. The partitions are all highly polished marble slabs. Each bathroom has a furnished dressing room in connection. This bath house is being erected under the direction of the Bath Committee of the Civic Club, of which Dr. Thomas Turnbull of Allegheny is chairman. It is especially intended for the working people who have no means of bathing in their homes or elsewhere. The nominal low sum of 5 cents will be charged for the use of a bathroom, thus bringing their use within the means and reach of the poorest people. Dr. Turnbull states that if profits will be made at this rate the price will be reduced to 4 or probably 3 cents for the use of each bathroom. The only object for charging admission is to defray the operating expenses. The building will probably be open from 7 a.m. to 9 p.m.

A BRICK VENEERED HOUSE.

THE subject of the illustrations presented herewith is the brick veneered residence of J. W. Flad of Easton, Pa., the building covering an area of 47 x 41 feet, not including the projection of the front veranda. The foundation, veranda inclosure and piers, as well as the veneering of the first story to the window sills, are of pitched face stone work. The house is of frame and the first and second story are veneered with hand made red brick. The gables are shingled, and the roof is covered with slate. There is a cellar under the entire structure. The hight of the first story is 10 feet in the clear, the second story 9 feet and the third story 8½ feet. The main floor of the house is divided into a large reception hall, parlor, library, dining room, sewing room and kitchen, besides numerous closets, pantry and other conveniences essential to a well appointed dwelling. The second floor has four good sized sleeping rooms, bathroom and a central hall. The third story is at present unfinished, although the area is sufficient to give three or four rooms if necessary. The principal feature of the interior is the hall and staircase, which is trimmed in oak. The ceiling is heavily beamed, forming deep panels. The stairs are lighted by a large mullioned window with stained glass transom over it, shedding a soft and pleasant light through the lower and upper halls. The parlor and library are also trimmed in oak. The library is fitted with shelves, cases and cabinets, the small circular stained glass window in the front room opening through the bookcases. The balance of the first floor and the entire second floor are trimmed in pine, natural finish. The kitchen and pantry contain all the modern improvements, and opening from the side porch near the kitchen is a small room containing a frost proof water closet for outside use. The house, which was erected at a cost approximating $5000, is heated by hot water. The drawings were prepared by Architect E. A. Payne of Carthage, Ill.



Perspective View of Residence of J. W. Flad, at Easton, Pa.

A Brick Veneered House.—E. A. Payne, Architect, Carthage, Ill.

Dustless Buildings.

At the New York meeting of the American Society of Mechanical Engineers, held the latter part of last year, a paper on the above subject was presented by C. J. H. Woodbury of Boston, Mass., from which we take the following:

The increased hight of office buildings, rendered possible by what Otis Tufts patented as the vertical railway, while bringing to their occupants relief from the noise of the streets and affording comfort by extending above the fly belt, which is as well defined as the snow line on a high mountain, also exposes the occupants to the fine dust which pervades the whole structure and which the other salutary conditions of the building render more prominent. The modern method of heating and ventilating such a building is by means of a blast of air drawn down a flue, warmed and forced through the building in such quantities that four times the volume of the building is frequently circulated through the rooms each hour.

This method of heating, although a more efficient application of radiating surface for heating the air than by direct radiation in rooms, can be managed with far less expense for attendance, repairs and fuel, and provides the sanitary requisite of ventilation without cold drafts, yet this apparatus distributes large amounts of dust through such a building, and in a city using bituminous coal under the average conditions there is a fine carbon dust which is especially obnoxious, impairing drawings, books, delicate mechanism and whatever may be injured by the shower of fine, impalpable dust, which produces black indelible smooches whenever touched. This carbon dust is always an annoyance and at times a serious matter.

The writer undertook to abate the difficulty of dust in a building of nearly 500,000 cubic feet capacity, through which 26,000 cubic feet per minute was usually blown, for heating and ventilation. The outside air used for this purpose was drawn down a flue 37 square feet in cross section and reached a velocity of 700 feet per minute. The means taken to remove the foreign substances from the air was by use of cotton cloth filters so arranged that the air should approach the fabric at an acute angle by which the momentum would carry these particles beyond a point where the element of air under consideration would pass through the filter and the particles of dust would be carried by the place and, striking the cloth at a lesser angle, tend to glance off and be carried to the bottom of the filter, rather than to clog the interstices in the fabric. The area of the filters being larger than that of the flue, the rate of filtration was inversely slower than the velocity of the air down the flue.

The means by which this was accomplished were very

simple. A timber frame, divided by partitions into fine rectangular openings, was placed at the top of the flue, and under each opening was placed a bag whose top was attached to a light wood frame slightly larger than the opening, making a tight fit, so that the air entering the flue must pass downward into these bags, which were over 30 feet in hight. An arrangement of guides, ropes and pulleys enabled the bags to be raised and lowered by a person at the bottom of the flue. The bottoms of the bags were made open, and closed with a drawing string, and hoops kept the lower portion distended. An arrangement of lines extending along the sides from end to end facilitiated turning inside out and back again when they were being cleaned. The whole of the mechanical arrangement is fully described in United States patent No. 589,772. These bags were square at the top, where their combined area equaled that of the flue, but soon diminished to a cylindrical section, occupying about 40 per cent. of the space, thus affording ample clearance for the exit of the air passing through the fabric.

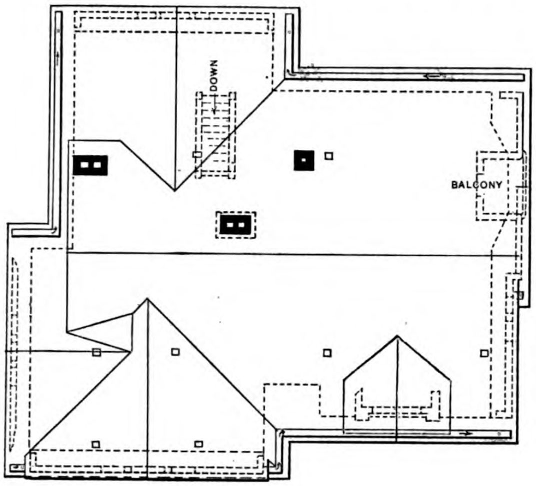
The area of the flue was 3¾ per cent. of that of the bags, and while the air passed down the flue at a velocity of 700 feet per minute, it passed through the fabric at 26 feet per minute. From ½ peck to 1 peck per month of fine dust was gathered from the bags. The efficiency of the device was tested by placing freshly painted boards at the bottom of the flue before the installation of the apparatus, and then giving another coat of paint after the apparatus was in service. In the first instance the fresh paint collected fine dust until it resembled fine sandpaper and in the second the paint dried with a smooth surface. In several of the offices split laps of absorbent cotton were placed in various parts of the building before and after the bags were in service, and one set was covered with fine particles and the other was free. The change was not a notable one at first, owing to the large amount of dust in the flues, but much of this was removed by running the blower at a very high rate of speed and afterward removing the registers and washing them and the flues as far as could be reached. The device has been solely under the care and management of the men employed on the engine and boilers, and has served its purpose in rendering a building free from dust caused by the ventilating system.

Front Elevation.—Scale, ⅛ Inch to the Foot.

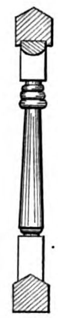
A Brick Veneered House.

THE custom of inscribing the name of the architect on buildings has become practically universal in Belgium, and not only the profession, but the public, regards the signature of the artist as being as desirable on a building as on a painting or a piece of sculpture, and it has even been suggested that it should be made compulsory.

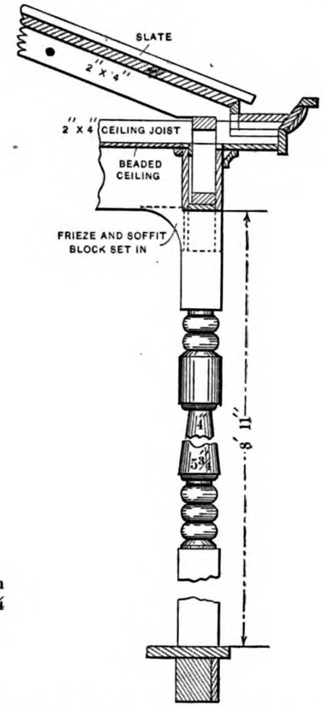
THE plans have recently been filed with the Bureau of Buildings for a combination hotel and apartment house, which will have a frontage of nearly 250 feet on Seventy-third street and 123½ feet on the Grand Boulevard, and will be 14 stories in hight. The structure will be of brick and stone coped with Vermont marble. The cost is estimated at $800,000. The architect is John R. Hinchman.



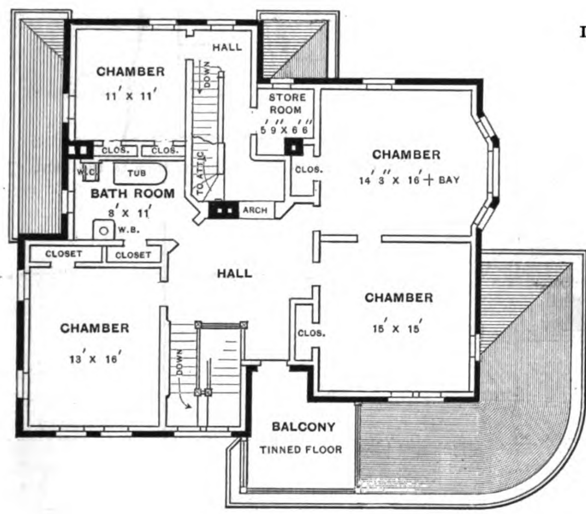
Roof Plan.



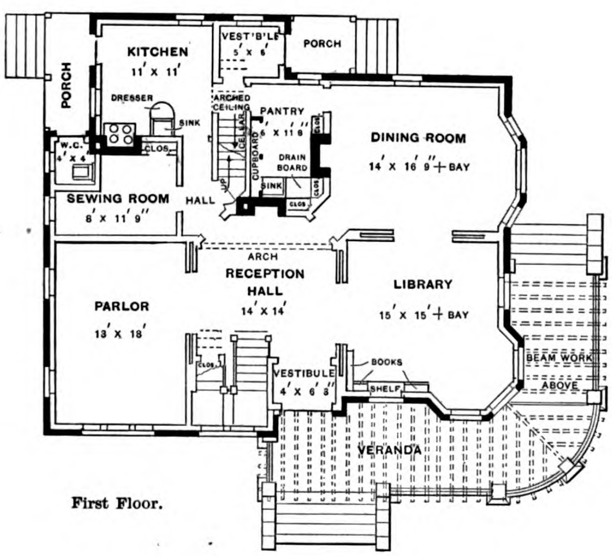
Detail of Rear Porch Baluster.—Scale, ¾ Inch to the Foot.



Details of Porch Column and Cornice. —Scale, ⅜ Inch to the Foot.

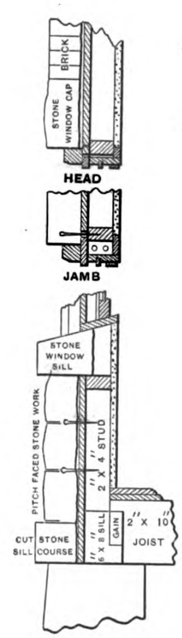


Second Floor.

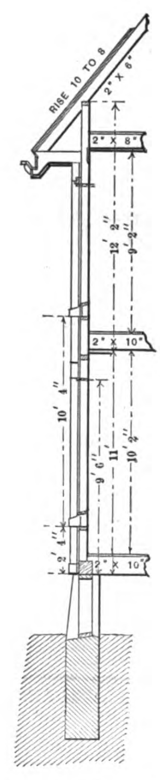


First Floor.

Scale, 1-16 Inch to the Foot.



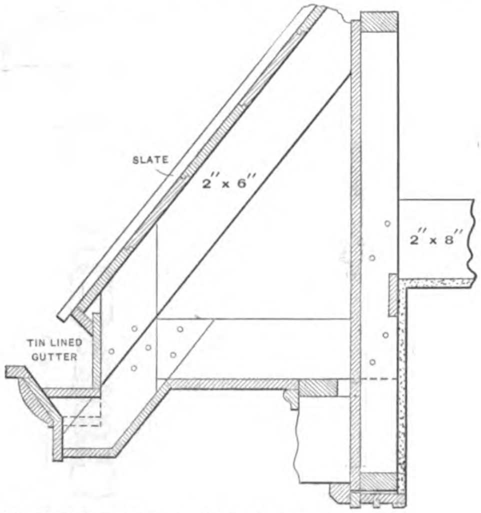
Details of Water Table and Windows.—Scale, ½ Inch to the Foot.



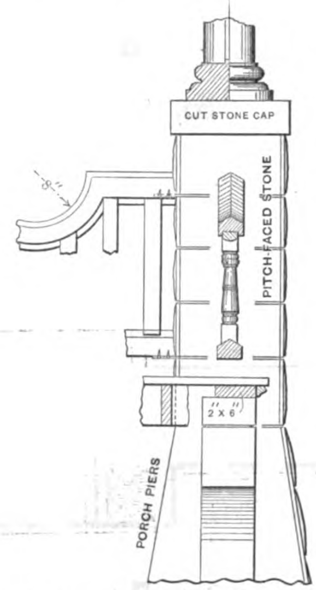
Section of Main Wall.—Scale, ⅛ Inch to the Foot.

A Brick Veneered House.—Floor Plans and Miscellaneous Constructive Details.

Veneering.



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

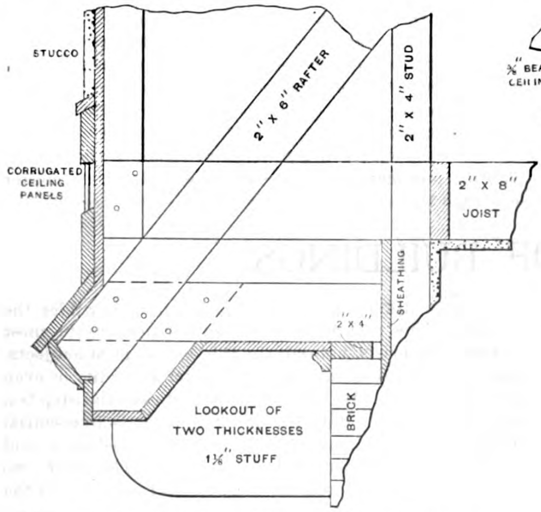


Details of Front Porch.—Scale, ½ Inch to the Foot.

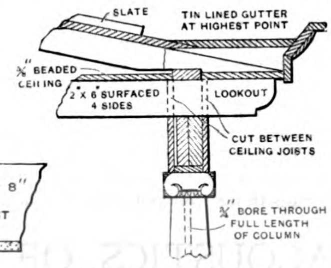
Side (Left) Elevation.—Scale, ⅛ Inch to the Foot.

A Brick Veneered House.—Side Elevation and Miscellaneous Constructive Details.

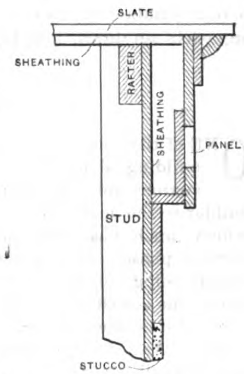
The art of covering a table, bench or any piece of furniture with a thin layer of wood is technically termed veneering, the wood made use of fcr this purpose being cut into very thin slices or veneers, so thin, in fact, that from 14 to 18 are often obtained from the thickness of an inch. The foundation upon which the veneer is to be laid should be constructed with as much firmness and solidity as possible in order that no ill effects may occur after the work is completed. Great care should also be taken to have the wood thoroughly seasoned, and it should be allowed to dry in some place where it is not likely to be exposed to either heat or dampness. In making the foundation a wood of too close a grain or too smooth a surface should be avoided, for the reason that the glue does not take so well as when it is fibrous and porous. A toothing plane should also be applied to it in with the toothing plane; we say lightly, as it is essential that the sizing be not cut through. The veneer is then cut to the required shape, and it should be ¼ inch larger than the foundation. Dampen the side it is desired to



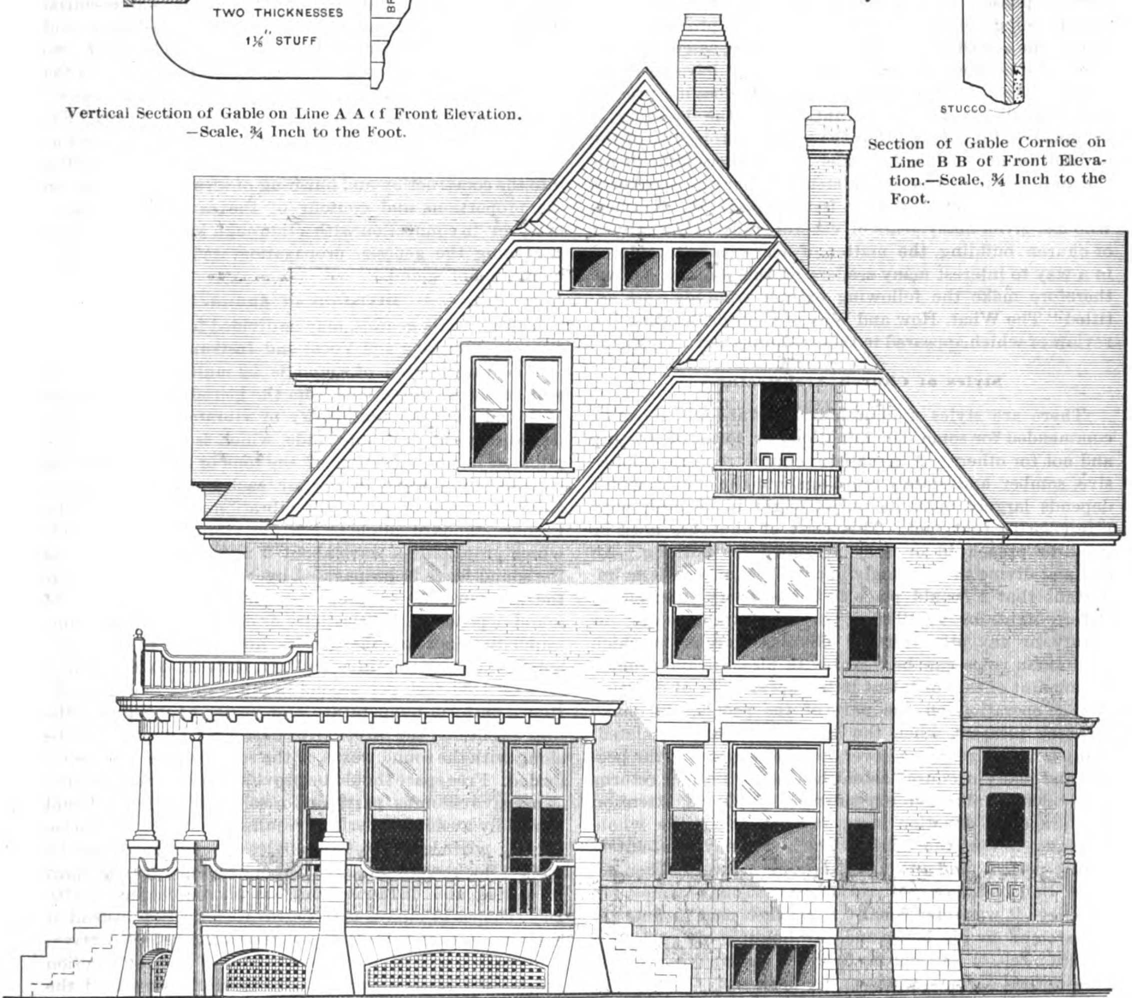
Vertical Section of Gable on Line A A of Front Elevation. —Scale, ¾ Inch to the Foot.



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



Section of Gable Cornice on Line B B of Front Elevation.—Scale, ¾ Inch to the Foot.



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

A Brick Veneered House.—Side Elevation and Miscellaneous Constructive Details.

every direction, this not only leveling the surface, but causing it to be sufficiently roughened to properly take the glue.

The next step, says Charles J. Woodsend, is to size the foundation thoroughly with very thin hot glue and allow it to dry in a warm place. Then go over it again lightly have uppermost with warm, clean water. Wet it well if the veneer is thick. Reverse it upon the bench or board and leave it for 10 or 15 minutes. Take a smoothing iron, the same as a laundress would use, and make it very warm but not hot. The glue should be freshly made and boiling hot. Thin it down to the proper consistency, as up to a certain point the thinner the glue the stronger the joint. Now get a bowl of clean, warm water and a sponge. Glue the foundation and the veneer thoroughly, covering every part of the two surfaces that come in contact. Slide the veneer in place, pressing it down with the hands. Take a veneering hammer and work the glue all out, pressing firmly down and working in all cases from the center to the outsides, using the hot water and the sponge alternately with the veneering hammer, so as to prevent the outer surface of the veneer from drying too quickly. Draw the thumb nail over the work or tap it lightly with the handle of the veneering hammer in order to see if the veneer is down into its place. The difference in the sound will determine whether it is down or not. If there are any parts not down, take the smoothing iron and place it over the spot for a few seconds, just to warm the glue. Then move it slowly outward to the edge, following with the veneering hammer, and repeat the process as necessary.

If the veneer is thin—and some veneers are as thin as paper—glue a piece of thin, strong paper on the upper side, using very thin glue, and allow it to become nearly dry before putting the paper upon it. Then allow it to beome perfectly dry and proceed as before, omitting the dampening. After the work is properly dry the paper is easily removed with a scraper, after being slightly dampened with warm water.

Veneering should not be done in a shop with the temperature less than 70 degrees, nor in a draft, no matter how high the temperature may be.

ACOUSTICS OF BUILDINGS.

ONE of the points connected with the construction of a building about which there is often a great deal of anxious interest on the part of the architect and builder is the matter of acoustics. It is a subject about which much has been written without exhausting its various phases, and architects and builders are constantly being confronted with perplexing problems relative to the acoustics of some church edifice, assembly hall or theatre in the building of which they have been employed. As a general thing the problem does not present itself in all its perplexity until after the building is occupied and it is found that the acoustic properties of the auditorium are such as to render it extremely difficult for the audience to distinctly understand what the speaker is saying. In a work recently issued by G. W. Kramer, who has given many years of careful study to the subject of church building, the matter of acoustics is considered in a way to interest many readers of this journal, and we therefore make the following extract from his work entitled "The What, How and Why of Church Building," a review of which appeared in these columns not long since :

Styles of Church Architecture.

There are styles of church architecture which can be commended for some denominations or forms of worship and not for others. A ritualistic church requires impressive, somber and stately buildings, but the church which depends largely upon its pulpit ought to be built with reference to that fact. This class of churches must be good to preach in or they are good for nothing. An eminent divine thus strongly put it : "Acoustics is so important that I would place it before every other merit. Before light, or ventilation, or comfortable seats, or beauty, or any other virtue. Give us churches in which the human voice can be heard with pleasure and profit." No amount of tact or talent in the speaker, or of devotion and coöperation on the part of the people, will make listening pleasant when the laws of sound are violated. Many a man is perplexed over his failure to win the people, and many a church astonished at the meager returns that talent, unlimited expenditure, assiduous attention and prayerful devotion have brought, when the whole difficulty lies in the house. The house may be architecturally perfect, and a thing of beauty in every other respect, but so defective in acoustics that one is almost led to believe it was intentional. A speaker may in time get accustomed to his house and, by holding his voice to a certain pitch, or keeping his face in a certain direction, or some other device, manage to be heard. Successful oratory in such a case is out of the question. Churches should be built to help, and not hamper, the speaker. Music halls and theaters are built so that the voice is at home in them and the acoustical properties nearly perfect ; all of which demonstrates that our churches can be also, if properly arranged. There is an oft repeated statement that the acoustics of halls, theaters and churches are notoriously and confessedly a matter of accident ; this statement is erroneous ; there is no logic or truth in it.

Acoustics in architecture is a subject concerning which authorities differ to such an extent as to bewilder the student. The reason is this : authorities are in most instances theorists, not only in this but on most subjects, practice often demonstrating the utter absurdity of even accepted theory. In medicine, the first essential step is a correct diagnosis ; bear this in mind, as it is an essential in all investigation,—all theory should be based on it, and it should be demonstrated by practice. Therefore, we must first study the human voice, the human ear and the construction of musical instruments in harmony, ascertain the natural laws governing, and work in accord. Experience has demonstrated that acoustic results depend as much on the knowledge of the various materials entering into the construction and finishing of an auditorium as on the proportions and contour of the same, in all cases, however, in connection with a thorough knowledge of laws governing the genesis, propagation, reflection and augmentation of sound.

Divisions of Sound.

Sound, in its genesis, may be divided into three general classes : Speaking and Vocal and Instrumental Music.

The propagation of sound is by multitudinous waves sent out in all directions from the genesis. These waves of sound have an undulatory or vibratory movement of periodic extent and amplitude, which is governed by the pitch or initial vibration of the tone or note creating its corresponding wave in the air, each tone or note having a different rate or period of vibration ; for instance, the French standard pitch C has 512 vibrations per second, which propagates a wave about 2 2-10 feet in extent. As the sound wave is propagated by the air, it follows that the air must be in proper condition ; the velocity of sound depends on the elasticity or density of the medium ; impurities increase the density and reduce the velocity. Sound travels faster in warm air than in cold, and at a rate of 1130 feet per second in pure air at 70 degrees F. Hence uniform temperature and purity of the air are the first essentials ; the direction of currents, if any, should be along with the sound waves or the sound waves will be retarded. Free space should be provided. Obstructions such as massive columns, partitions or solid gallery front should be rigidly avoided if perfect results are desired ; also reflecting surfaces, curves of angles or ceilings cannot be such as look well, but must be determined by the hight of ceiling and distance from the phonic center ; faulty lines, shapes or curves may aggravate reflection instead of preventing it, and result in concentrating reflected waves in certain parts of the house. Echo is due to reflection and to the intensifying quality of the material of the reflecting surface. Injudiciously placed hard or smooth surfaces reflect more, and with greater force than rougher soft ones. Reflection is more powerful. Within certain limits, in an auditorium of small size, say, 60 feet, there will be a preponderance of sound over one of 120 feet ; it is therefore necessary to construct the smaller one differently, to reduce the resonance which in the larger must be augmented ; for an auditorium of extraordinary size powerful resonators may be necessary.

(To be continued.)

CONSTRUCTING A PLANK FRAME BARN.

By John L. Shawver.

An outside view of the end bent of the superstructure and an end view of all the basement bents are shown in Fig. 3 of the illustrations. The braces in the basement are permitted to extend up and between the sills of the superstructures, thus binding both basement and superstructure into one solid frame work. In the interior of the basement, where long braces will not interfere with the arrangement or convenience, they are to be preferred to short ones, but where short braces are necessary they are inserted in such a manner as to give greater strength than when mortised in as is usually done.

A side view of the frame, which is of such a character as to fully explain itself, is presented in Fig. 4. The plate is made of two 2 x 8 plank spiked together to form a trough and inverted over the tops of the posts. The manner of constructing the bents of the basement is indicated in Fig. 5. If the posts can stand on solid pillars of stone no sills are necessary, and the fillers extend down to the lower ends of the posts and up to the joist bearers. A side view of the purlin plates, which are made of two 2 x 8 or 2 x 10 plank with a 2 inch space between them, is shown in Fig. 6. The coupling or splicing block extends either way from the roof support *a* to the dotted lines *b b*. At *c* is represented a sectional view of the sub support to which the stays *d d* are secured and also the lower end of the braces *e e*. This arrangement gives sufficient strength to the purlin plates to sustain a slate or any other roof desired. Fig. 7 shows the manner in which the peak of the arch is constructed. The roof supports, which are usually of 2 x 8, are indicated by A A. The sub supports, usually of 2 x 6 plank, are indicated by B B, while the dotted lines represent the collar beams C, constructed of 2 x 12 inch plank, there being one on either side and bound together by ½-inch carriage bolts 6½ inches in length, their position being indicated by the small crosses.

Three posts of the end bent, shown in Fig. 3, are constructed of two 2 x 8 plank, one 2 x 4 and one 3 x 6, all as indicated by the cross section in Fig. 8 of the engravings.

It will be noticed that all of this work is easily and quickly done and that there is not only a saving in the timber, but also in the labor. As an example of the time required to erect a frame I would state that I was recently called to another county to assist in building a basement barn 40 x 80 feet in size—8 foot basement and 16 foot superstructure—with plain gable roof. With three carpenters we commenced work on Wednesday morning, and on Saturday of the same week we raised the barn complete. In other words, it took four carpenters three days to frame a barn 40 x 80 x 24 feet.

(*To be continued.*)

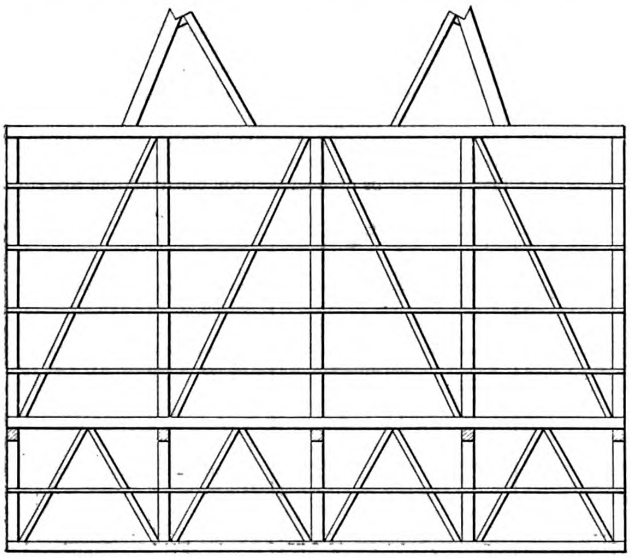


Fig. 3.—Outside View of End Bent of Superstructure and Basement Bents.—Scale, 3-32 Inch to the Foot.

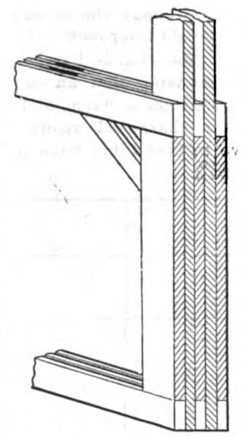


Fig. 5.—Detail Showing Section of Frame.—Scale, ¼ Inch to the Foot.

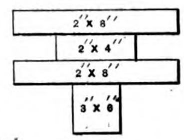


Fig. 8.—Detail Showing Construction of Posts in End Bent of Fig. 3.

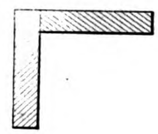


Fig. 9.—Sectional View of Plate.

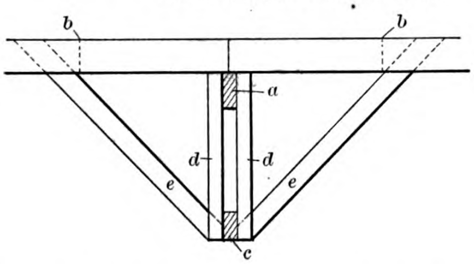


Fig. 6.—Section of Purlin Plate.—Scale, ¼ Inch to the Foot.

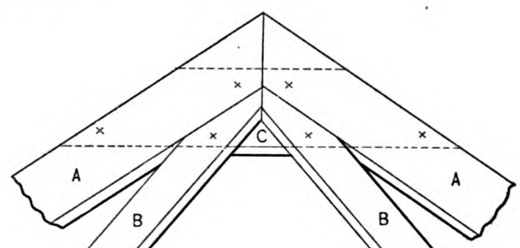


Fig. 7.—Detail at Peak of Barn.—Scale, ½ Inch to the Foot.

Constructing a Plank Frame Barn.

Changes in Carpenters' Tools.

In discussing the changes which have taken place during the past ten years in carpenters' tools, a dealer in this class of goods expresses the following views:

The decrease in the sales of carpenters' and edge tools which has taken place in the past decade is so very great that it is not realized save by those dealers who have kept accurate statistics. Indeed, in some leading lines the shrinkage is so serious that the output is scarce one third its former volume. The principal causes are the steady substitution of iron for wood, especially in buildings, and the large amount of fitting now done by mills that was once done by hand.

As might be expected, the change has been most marked in the large cities, where it has become so pronounced that the edge tool trade of the retail hardwareman is fast becoming a thing of the past. It does not seem probable that these conditions will prevail in the country to the same extent, but it is evident that a large and fruitful source of revenue to the hardware trade is fast drying up and that it can never again assume its former importance. One feature of this change, most unpleasant to the dealer, has been the falling off in the demand for the higher grades of tools, for as machinery displaced the skilled laborer there was no longer need for high grade implements. In the matter of detail, chisels and drawing knives seem to have suffered most severely, along with fancy planes, although the wood bench plane and the iron plane fairly hold their own.

Another incident of the change has been the somewhat common sense demand that an edge tool shall be so in something more than a name, and that it shall come to the carpenter sharpened ready for use, and that he shall not have to spend his time and labor in putting it in the necessary condition. This, in connection with the falling off in the sales of the tools, has brought about a serious decrease in the use of axe stones and oil stones. Axes themselves are evidently on the down grade, not alone because of the denudation of the forests, but likewise in consequence of the great use of cross cut and wood saws. These latter show an increase, though the hand saw business has fallen off very largely. Singularly enough, though there is no longer the demand for axes that once existed, there has, nevertheless, been a marvelous expansion of varieties and patterns until their name is legion. Neither hatchets nor hammers are so limited in their use as Axes, nor are they confined to as few users, yet they have both of them shared in the general decrease, in fact, to a most alarming extent. An exception, of course, must be made to machinists' hammers, which are steadily on the increase.

Braces, levels and squares are naturally feeling the gradual elimination of the carpenter, as are also augers. Auger bits, however, are things that the farmer and the householder use as well as the carpenter, and their decrease is not so great. The demand for ship augers and ship auger bits grows constantly because of railroad and boat use.

It would be a very puzzling thing, and would lead us to no certain conclusions, if we only compared one year with the previous one, or, indeed, with some particular year a little time back, for it would be found that the demand for edge tools necessarily varies with the amount of building in the country, and this is influenced entirely by good or bad times. Since '93 the falling off in these lines has been of the most serious and unusual character, and it is more than probable that the next two or three years will see an apparent revival in use and in demand. The true test is to take a long term of years and strike a fair average, and it will be then seen that the best that can be said of any carpenters' or edge tools in particular is that they have come somewhere near holding their own or that they have not actually decreased, but that they have not increased with the growth of the country. Any article that is stationary in its use while the country is growing is in reality going down hill, and it will naturally take a little time to make this apparent.

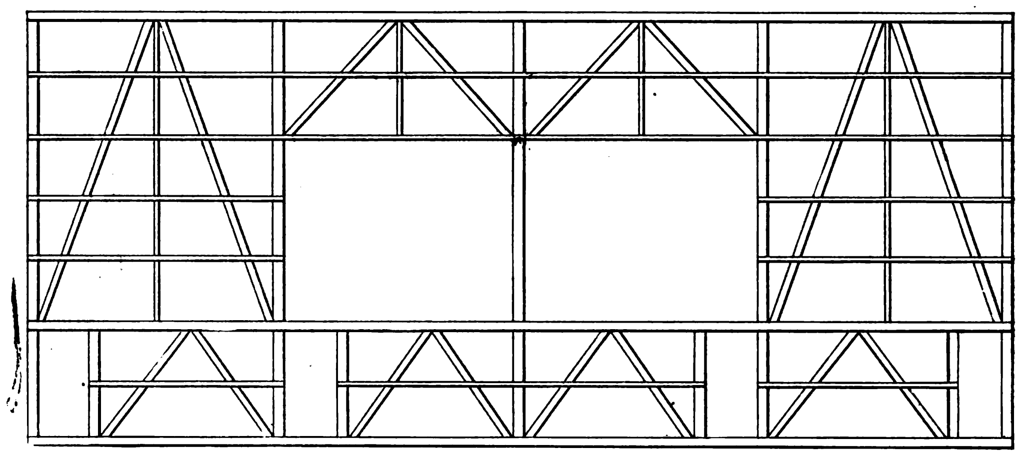


Fig. 4.—Side View of Plank Frame Barn.—Scale, 3 32 Inch to the Foot.

Constructing a Plank Frame Barn.

Another Public School Building.

The rapid increase in the population of the upper portion of New York City has rendered another public school building necessary, and the contract has been awarded for the erection of one on Audubon avenue between 167th and 168th streets. The structure will cover an area 176 x 64 feet, and will be of steel skeleton construction, five stories in hight, with a roof playground in addition. The materials of the exterior will be granite to the water table and limestone from that point to the label molding of the first story of the building, with light brick and terra cotta from thence to the roof, which will be covered on the street fronts with glazed Spanish tile. In the designing of this building particular attention has been given to the wardrobes, which are to be outside of the class rooms. The building will be heated and ventilated by what is known as the plenum system, which provides for each child about 30 cubic feet of fresh warm air per minute, while at the same time removing the foul and vitiated air. Each wardrobe has a coil of steam pipe which is used not only to accelerate circulation, but also to dry the clothing when damp. The first story is to be divided into boys' and girls' playrooms, the second, third and fourth stories into classrooms and the fifth story is designed to provide for manual and physical training, lecture and reading rooms. The contract price for the building is given as $203,900, and it will be known as Public School No. 169.

At the Pennsylvania State College a column has been erected which is said to be composed of 281 samples of building stones procured from 139 localities in the State. The base block is of conglomerate 6 x 6 x 2.5 feet ; the base of column is 5 feet square; the hight of column is 32.7 feet and the weight 53.4 tons. This forms a comprehensive display of the natural resources of the State in structural materials, geologically arranged.

WHAT BUILDERS ARE DOING.

BUILDING operations in Boston have been on an active scale during the year just ended, the number of permit granted for brick structures running far ahead of the year 1896. The figures for brick and wooden structures compare a follows for the past three years:

	1897.	1896.	1895.
Brick	643	536	538
Wooden	2 048	1,957	2,188

The seventh annual convention of the Society of Master House Painters and Decorators of Massachusetts was held in Boston last month. President A. R. Adams presided. Addresses were made by John Beatty, President Adams, T. B. Aiken, C. E. Forsberg, Geo. H. Brown, John D. Morton of the Paint and Oil Club, F. J. Thayer, and others.

In the afternoon a discussion on "Methods of Staining Woods" took place. The following officers were elected: President, Thomas B. Akin, New Bedford; vice-president, William A. Houston, Lawrence; secretary, William E. Wall, Somerville; treasurer, F. J. Thayer, Cambridge; Executive Committee: Charles Schneider, Carl Forsberg, J. B. Penault, M. A. Feeley, Charles Meissner.

The Master Builders' Association has enjoyed a prosperous year and starts the new year upon a good financial footing, with a membership of 250 firms. Several applications for membership have already been received since the first of the year.

It may not be generally known that the association is a member of the Boston Associated Board of Trade, an organization representative of the business interests of the city, made up of delegates from 24 constituent bodies. This affiliation has enabled the Master Builders' Association not only to derive much benefit itself, but has likewise enabled it to contribute its just share toward the advancement of the general welfare of the city, than which it can have no greater interest at heart, inasmuch as the prosperity of the builder is intimately bound up with that of the city.

On January 1, at 12 noon, the Master Builders' Association held a "jollification" at the exchange rooms. Light refreshments were served and several merry hours were spent by the members in youthful relaxation. Songs were indulged in and proved very popular, so much so that a glee club has since been organized among members of the association.

Bloomington, Ill.

At a fully attended meeting of the Builders and Traders' Exhange, held January 4, the following offiers were elected: President, E. L. Weaver; first vice-president, E. M. De Bruler; second vice-president, T. T. Greenlee; treasurer, E. Dunlap; directors, T. J. Cogan and Israel Root. The secretaryship is not an elective office, and the appointment will not be made until the next meeting of the Board of Directors. R. L. Berry, the present incumbent, will probably be chosen.

Buffalo, N. Y.

Secretary J. C. Almendinger of the Buffalo Builders' Exchange reports that upon information obtainable at the date of writing the volume of business for 1897 was estimated to run $1,500,000 below that of last year, which was one of the poorest years.

The outlook for 1898 shows little work in sight, and that, as a rule, is in low priced buildings. Everything has been quiet during the year, there having been no strikes, and nothing of interest transpiring.

The Builders' Exchange held its annual election of officers January 15, but at the hour of going to press the names of the successful candidates had not been received.

Cambridge, Mass.

The annual report of Superintendent of Buildings Gray shows a less number of permits for 1897 than for 1896, but a very considerable increase in cost of structures. Four new dormitories have largely helped to swell the amount this year. In 1896 the total value of new buildings was $1,978,080, while in 1897 it was $2,202,105, an increase of $224,025. The total value of additions and repairs in 1896 was $237,920, and in 1897, $175,545, a falling off of $62,375. This leaves the net increase in the value of new buildings and repairs over 1896 $161,650.

Chicago, Ill.

The figures covering building operations in the city during 1897 show comparatively little change from those of the year preceding, the change being a slight falling off both in the number of buildings projected and in their estimated cost. The greater portion of the operations were conducted in the southern division of the city, much of it being in the nature of apartment houses, which are growing in popularity. Considerable capital, however, was invested in business buildings in the heart of the city, and the outlook is good for more work of this kind the ensuing year. During 1897 permits were issued for the erection of 5279 structures, involving an expenditure of $21,690,230, as compared with 6538, costing $22,711,115, in 1896.

Secretary Scribner of the Building Trades Club states that at the recent election of the club the following officers were elected: President, D. V. Purington; first vice-president, Edward Kirk, ; second vice-president, Alex. McLachlan; treasurer, Chas. J. Gindele. Managers: Mathias Dencer, Geo. H. Fox, H. E. Horton, John Rawle, Chas. B. Sears. Secretary Edward E. Scribner continues in that office. The membership of the club is at present 122 and there is a considerable balance in the hands of the treasurer. The annual dinner of the club took place January 29.

Master plumbers and journeymen plumbers of Chicago are to be required by law to pass an examination before a board of three members, consisting of the Commissioner of Public Health, who shall act as chairman, a master plumber and a journeyman plumber. A fee of $5 for master plumbers and $1 for journeymen for examination and certificate will be required. In each case the certificate must be renewed May 1 each year.

Cincinnati, Ohio.

The season of 1897 is reported as less active than previous years as regards building operations, but the prominent architects state that the outlook for 1898 is very promising. Plans are drawn for a number of large office and apartment buildings, which will be erected in the spring.

The *Post* gives the following résumé of the annual report of Building Inspector Tooker: The total estimated cost of the improvements is $2,486,900, there being 273 brick buildings, the cost of which was $1,643,955, and 263 frame buildings, costing $394,900. There were 1738 buildings repaired and improved, at an expenditure of $441,005. During the year the department condemned and tore down 229 structures.

Cleveland, Ohio.

The annual report of Building Inspector Thomas shows a gain of 112 in permits and $262,202 in cost of buildings, the figures for 1897 indicating 3011 permits and $3,407,803 estimated cost. June leads the other months in cost, the amount being $535,837.

At a recent meeting of the Master Plumbers' Association the following officers were elected for the year: President, William Downie; vice-president, William Arnold; secretary and treasurer, A. Saxer. The following were elected to the Board of Directors: James Hayr, John Anderson and William H. Johnson. James Hayr and William Downie were elected delegates to attend the convention of the Association of Master House Painters and Decorators, which will be held in Philadelphia on February 11, 12 and 13. Members unite in the opinion that last year was a most unprofitable one.

Architect Barnum of the Board of Education is reported as being in favor of two-story school buildings. If another story is added more hallway is called for, and little room gained, and he considers the tax on pupils and teachers too great in three-story buildings. He regards the increased cost of two-story buildings as justifiable.

Columbus, Ohio.

The Builders' and Traders' Exchange held their annual reception and watch meeting at their commodious quarters in the new Mithoff Building, 71 East State street, on December 31. In the afternoon a reception to visitors was held, followed in the evening by a comprehensive paper by De Witt C. Jones on "Contracts and Specifications." After this the evening was devoted to social enjoyment. A "Dutch lunch" was served, and many watched in the new year. The hall was skillfully decorated with samples of building materials, such as ornamental stone, mantels, electrical devices, &c.

The affair was enjoyed by many, both afternoon and evening. The Reception Committee was composed of C. E. Morris, F. H. Nichol, E. L. Harris, G. L. Saunders, J. D. Drayer, Henry Reichenbach, Edward T. Bingham, William Brust, John Lee, G. W. Ochs, J. D. Hagerty, J. B. Coulter, Max Mohr, B. S. Stevenson.

Detroit, Mich.

Building operations in Detroit for the year 1897, while not quite coming up to the expectations of the early part of the year, were still in excess of those of 1896. The total number of permits was 2035; total improvements, $4,356,885. This is an increase of 114 permits, and $1,190,385 in value, as compared with 1896. This increase is due to the new county building to the extent of $1,200,000. With this excluded the total estimated value would fall below that of 1896. Apartment houses are on the increase.

At the annual meeting of the Builders' and Traders' Exchange, held on January 4, the following officers were elected for the year: President, Richard Helson; vice-president, John Finn; secretary, George H. Clippert; treasurer, James Meath; directors, John Lennane, Daniel Lane, Robert Hutton, Edmund Austin, Sr., and Albert R. Strachan; superintendent, Ben F. Guiney. The report of the treasurer was satisfactory.

Louisville, Ky.

Advices from Secretary Hutchison of the Building Trades Exchange show a membership of 145, distributed among 19 different trade occupations. The association members have been enjoying a rather prosperous condition of affairs recently, and it is hoped that the present exchange will prove a success despite the fact that several previous attempts at organization have proved failures. The secretary sees no reason why the exchange cannot in the future be influential in obtaining such legislation that the legitimate contractor may be encouraged to put forth his best effort, provided that the new officers work as diligently as their predecessors. The secretary ascribes the building up of the exchange to the two following sections of the constitution:

Section 2. Article 9. General Constitution.—No general or sub-contractors, members of this exchange, shall estimate on, nor receive or entertain, an estimate from, or do work of any kind, by contract or otherwise, for a general or sub-contractor not a member of this exchange.

Section 3.—Any member violating Section 2, Article 9, of the General Constitution, shall be fined not less than ($10.00) ten dollars nor more than ($200 00) two hundred dollars for the first offense and shall be expelled for the second.

The Builders' Exchange at its last annual meeting, which was very fully attended, elected the following officers to serve for the current year: W. T. Straw, president; J. T. Young, vice-president; Phil. J. Wert, Jr., recording secretary; Henry Justi, financial secretary; Joseph Bicker, treasurer, and A. Pecklenk, sergeant-at-arms. Sam. McGhee, W. H. Whitman and Arthur A. Will, trustees.

Minneapolis, Minn.

The report of Building Inspector Gilman of this city—three days of December yet to be reported—shows that while the number of permits granted exceeds the past year, the estimated cost falls below the average. The *Journal* states that the activity in regard to the construction of dwelling houses has been as great as ever, and that this is the most favorable feature of the report. Four hundred new dwellings, many of the better class, have been begun or completed, the average cost of which is a little over $1500. The falling off in total cost of construction is explained by there having been no erecting of big wholesale blocks, churches, office buildings, &c., and under these conditions the *Journal* regards the showing as a very satisfactory one.

The total number of permits, with three days yet to be included, is 2687, estimated to cost $1,591,330. This is exclusive of plumbing and electric wiring, which will mean about $700,000 to $800,000 more.

Memphis, Tenn.

The year 1897 presents a better record in regard to building operations than either of the two preceding years. The total valuation is placed at $476,299.50, exceeding the record for 1895 by $12,397.40, and that of 1896 by $39,734.75. July was the banner month, with $186,496.50 expended for building to its credit. The above figures would be largely swelled were suburban buildings included, but at present they are not within the limits where permits are required. A large number of handsome residences and other buildings have been erected there. It is estimated that were these included the amount would be over $1,000,000.

The members of the Builders' Exchange have conceded the eight-hour day to the carpenters of the city. Last year a strike and lock out took place in an attempt to obtain the day of eight hours. A compromise was then effected, the contractors promising to take the matter into consideration. The resulting concession is the outcome, the exchange voting to grant the demand at its November meeting.

Nashville, Tenn.

The city presents a good record for the past year in building affairs, 2247 permits having been issued by Inspector Klein, which was 105 in excess of the number issued for 1896. The report shows an estimated cost of $708,682, which is an increase of $101,623 over the year previous. It is thought, however, that the buildings are liable to underestimation by builders, and consequently the building operations are really considered to closely approximate $1,000,000 for 1897. April leads the monthly record.

A builders' exchange has been organized in the city with a membership of 51, and with good prospect of increase in the future. The question of admitting building material men to membership without vote has been under consideration. The exchange has expressed a desire to be represented at the next annual convention of the National Association of Builders, and the secretary, P. Morrison, has sent inquiries to the national secretary as to conditions and regulations for membership therein.

New York City.

The new year starts in with indications of an increasing activity in the building line as soon as the spring season opens. Architects report having more business in hand than heretofore, and the number of buildings for which permits were granted the first two weeks of January indicate a gratifying increase when compared with the corresponding period of last year. The estimated cost of these buildings aggregates $3,200,000, as compared with $1,900,000 for the like period in 1897. One thing which has contributed to the greater activity locally the past month has doubtless been favorable weather for carrying on building work. It is estimated that something over 25 per cent. more masons, stonecutters, painters and bricklayers are now employed in the city than were at work here a year ago.

The three commissioners who are the heads of the Department of Buildings for the Greater New York were appointed by Mayor Van Wyck on New Year's Day. They are Thomas J. Brady, commissioner for the Boroughs of Manhattan and Bronx (New York City) and president of the Board of Buildings; Daniel Ryan, commissioner in the Borough of Brooklyn, and Daniel Campbell, in the Boroughs of Queens and Richmond (Long Island City and Staten Island). Each of the three commissioners is a builder, two of them being masons and one a carpenter, and are qualified under the charter by having had ten years' experience in their respective lines.

The Builders' League of New York took possession of their new club house, 74 West 126th street, on Friday, January 14. The house, standing upon a lot 25 x 100 feet in size, is a substantial structure three stories in hight, built of brick with stone facings, and is equipped with all the essentials of a first class club house. The officers of the league are John P. Leo, president; Judson Lawson, vice-president; T. Barrington, second vice-president; Charles Dubois, secretary, and Clarence T. Smith, treasurer.

The annual meeting of the Iron League of New York, an organization composed of manufacturers of architectural iron, was held the latter part of December, when the following officers were elected: President, William H. McCord; vice-president, E. F. Milliken; secretary, B. E. J. Eils, and treasurer, W. E. Lyon, Jr.

The officers of the Employing Plasterers' Association for the ensuing year are James Thomson, president; H. W. Miller, vice-president; William Craig, secretary, and David D. Power, treasurer. The association meets on the first Wednesday of each month, at the Building Trades' Club, Broadway and Twenty-fifth street.

New Haven, Conn.

The annual meeting of the Builders' Exchange was recently held at its assembly rooms on Orange street. Reports of secretary and treasurer were read and addresses made by the incoming and outgoing presidents. The election of officers resulted in the following selection: President, Robert Morgan, vice-president, David H. Clark; secretary, C. Elmer Dibble; treasurer, J. Gibb Smith; trustees, E. H. Sperry and A. H. Buckingham. A banquet was served after the business meeting.

There are several new buildings going up in the city and vicinity, and the architects are reasonably busy completing present plans and preparing for early spring contracts.

Northampton, Mass.

Advices from Northampton show that building for 1897 has been less than any year since 1890. In 1896 the amount of building was estimated to be about $800,000, an exceptional figure, while this year the valuation is only about $250,000. While 58 house building permits were granted for 1896, and 1897 shows a record of only 38, in a number of cases those who asked for permits have not yet begun work. It is stated that the year 1898 promises more than ordinary activity in building and material development of the city.

Omaha, Neb.

The Builders and Traders' Exchange have elected the following officers for 1898: President, A. J. Vierling; vice-president, J. Fred Smith; treasurer, W. C. Bullard; directors, E. G. Hampton, C. W. Morton, Thomas Herd. The following directors hold over from year 1897 for one year: George C. Bennett, J. E. Merriam, John Rowe. The secretary will be elected by the Board of Directors.

Portland, Maine.

At the annual meeting of the Builders' Exchange the following officers were elected: President, George A. Willey; vice-president, A. K. Walker; secretary, Charles E. Snow; treasurer, Sylvanus Bourne.

Pittsburgh, Pa.

The report of Superintendent Brown for December shows that permits were issued for 133 structures, with an estimated cost of $278,510 for new buildings. Adding the cost for additions and repairs the total cost amounts to $293,544.

Reports on building industries of Allegheny County, which were presented at the annual meeting of the Builders' Exchange, point to a healthy revival in all lines of the business. The outlook for 1898 is considered particularly bright, and all members of the exchange are laying plans in anticipation of a big demand in the spring.

Officers and directors were elected as follows: President, John S. Elliott; first vice-president, Adam Wilson; second vice-president, W. B. Lupton; directors, J. P. Knox, T. J. Hamilton, E. R. Cluley, A. A. Hersperger, A. Rasner, George S. Fulmer, James Hay, James Wherry, S. A. Steel and Fred Lingenfelser.

Philadelphia, Pa.

The estimated cost of buildings whose erection was authorized in 1897 amounted to $25,915,770, which is an increase of $1,096,070 compared with 1896. The year's return is slightly above the average of former years, and has only been exceeded twice in eight years. During the year, 7181 new dwelling houses were erected throughout the city, at a cost of $15,270,115. Office buildings contributed $2,262,250 to the total, while the new Museum of Science and Arts for the University of Pennsylvania is to cost $500,000. The greatest investment was in two-story dwellings, the estimated cost for the year being placed at $8,682,715, and three-story dwellings stand next, with a record of $6,166,900. Builders generally regard the results of last year as indicating that the lack of confidence in the real estate world is disappearing.

The Northern Builders' Club has elected these officers for the current year: President, A. H. Prentzel; vice-president, Elwood Danehower; treasurer, William H. Schultz; trustees, Daniel M. Collamer, Peter J. Foley, John F. Snyder, J. H. Hinkle, James Branagan and Henry G. Schultz.

St. Louis, Mo.

The Master Builders' Association enjoyed a pleasant afternoon on December 27 last, the occasion being the installation of the new officers elected the week previously. The exercises were held at the rooms of the association, in the Turner Building. After the formalities were concluded a banquet was served at 2 o'clock, at which toasts were responded to by a number of the outgoing and incoming officers.

The new officers are: President, L. J. Evans; vice-president, J. D. Fitzgibbon; second vice-president, George Ittner; secretary, C. D. Morley; treasurer, Adam Bauer; trustees, James H. Bright and C. Linnenkohl.

San Francisco, Cal.

The recently elected officers of the Builders' Association of California are: President, John B. Gonyeau; vice-president, William Bell; treasurer, Joe Mahony; recording secretary, S. R. Doyle; financial secretary, John Furniss; Executive Committee, F. W. Kern, G. G. Gillespie, P. Griffin, D. Powers, J. Massey, J. McInerny, D. Francoeur.

Topeka, Kan.

The Master Builders' Association of Topeka is the title under which the leading contractors of Topeka, Kan., organized early in January of the present year. Their by-laws provide that contractors belonging to workmen's organizations will be excluded from membership. Material men are to be allowed space on the floors of the trade rooms upon payment of a fee of $5. The officers of the new association are: President, Michael Heery; vice-president, Chas. J. Drew; secretary, C. J. Prescott.

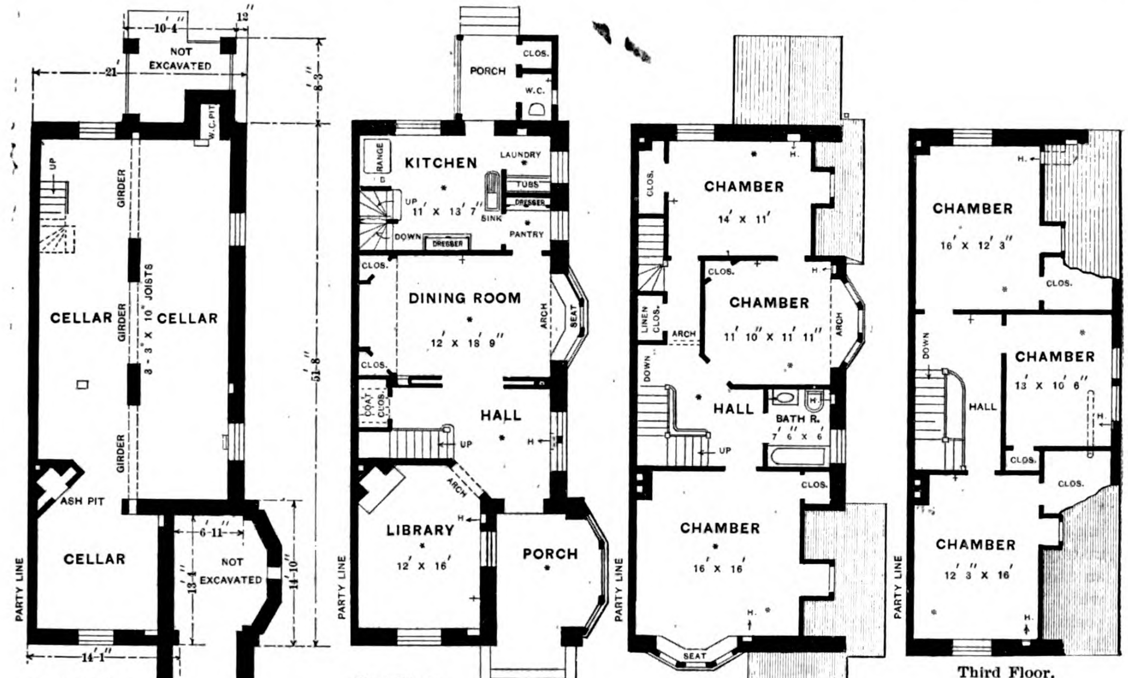
Notes.

The estimated cost of building construction in Chattanooga, Tenn., for 1897 is placed at $285,830, this being a gain over 1896 of $9125.50. September is banner month, with $86,658. The character of the building has been that on an average there have been less expensive structures and more of them. A notably increased amount of repairing and additions to manufacturing concerns has been observed.

The Master Carpenters' Association of Bridgeport, Conn., has recently been seeking to enforce an agreement between the lumber dealers of the city and the master carpenters which was entered into about five years ago, which allowed a discount to carpenters on their purchases.

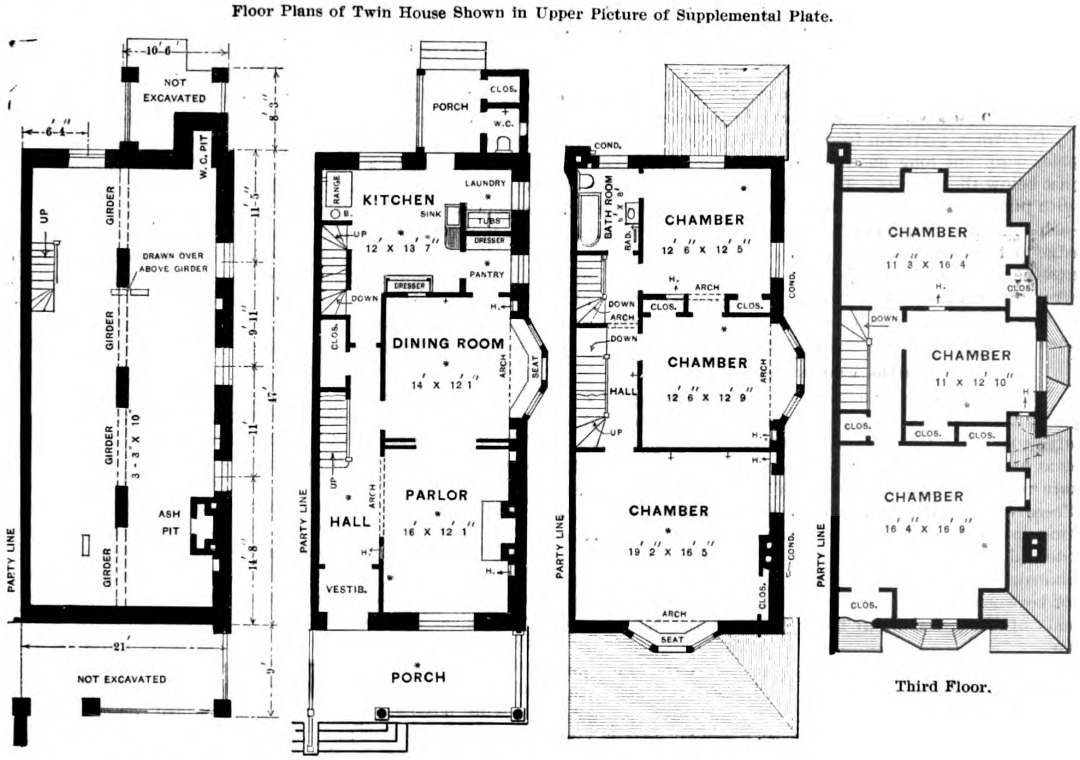
Two Double Houses at Overbrook, Pa.

The subjects of our half-tone supplemental plate this month are two double houses located at Overbrook, one of the many charming suburbs of Philadelphia, Pa. The floor plans of one of each of the double houses are shown on this page, the general arrangement being clearly indicated. The twin or double house, shown by means of the upper picture is constructed entirely of stone, with shingle roof and side gables finished in pebble dash. The halls, stairs, dining room and parlor are finished in chestnut and the kitchen and pantry in white gloss paint, with tile around the range and back of the sinks. The trim of the sleeping rooms on the second and third floors is white pine, natural finish. The bathroom has a wainscoting of oak. In the parlor is a fire place with a mirror mantel.



Foundation. First Floor. Second Floor. Third Floor.

Floor Plans of Twin House Shown in Upper Picture of Supplemental Plate.



Third Floor.

Foundation. First Floor. Second Floor.

Floor Plans of Twin House Shown in Lower Picture of Supplemental Plate.

Two Double Houses at Overbrook, Pa.—Floor Plans.—Scale, 1-16 Inch to the Foot.

The twin shown in the lower picture has the first story of stone and the second story of brick with blue slate roof. The hall and stairs are finished in oak and the balance of the rooms in natural white pine, the exceptions being the kitchen and pantry, which are treated in the same manner as in the case of the house shown in the upper picture. The plumbing throughout the house is of the open type and the bathroom has porcelain tub and decorated china basin in marble slab. There is also a fire place and mantel in the parlor. In all of the four houses the cellars are of portland cement. The houses shown are among the many which have been erected at Overbrook by Wendell & Smith, the plans in the present instance being prepared by Horace Trumbayer, architect, of 310 Chestnut street, Philadelphia, Pa.

BUILDING A CONCRETE ARCH.

AT a late meeting of the Illinois Society of Surveyors and Engineers a paper was read by C. H. Nicolet of La Salle, Ill., in which a very interesting description was given of the manner in which a concrete arch was constructed. The work was done in connection with improvements in Deer Park, which is located on the east bank of the Big Vermillion River, about 4 miles from its junction with the Illinois River. Within the area of the park is a deep cañon, and it was for the purpose of centrally connecting the drives on the east and west sides of it that the concrete arch was designed. The main cañon is an immense gorge carved out of the St. Peter sandstone, and extends from the east bank of the river in a northeasterly direction in a somewhat circuitous route for something more than a mile. At the point where the arch was constructed the walls of the cañon were about 30 feet apart, rising vertically some 30 feet, and then sloping back at an angle of about 45 degrees. The sloping sides were prepared by dressing into planes approximately at right angles to the line of thrust, thus affording an excellent natural skewback for the springs of the arch, which were located 33 feet above the bottom, and their position was such as to require a span of a little over 40 feet. The span of the arch therefore was 40 feet and the rise 8 feet, the arch being semi-circular. The width from out to out was 16 feet, the thickness of the ring at the crown 26 inches, at the spring 32 inches, wings 7 feet long, the spandrel walls and wing walls 16 inches thick inside the coping, being vertical on the outer faces and battered 3 inches per foot on the inner faces. The coping was 22 inches wide and 6 inches thick, extending out on each side of the walls for a distance of 3 inches.

To form a platform from which to erect the centers poles were cut long enough to reach across the cañon, just below the springs. These were put in and covered with plank. The ribs for the centers were 11 in number, each composed of 2 x 14 plank, 10 feet long, sawed on one edge to the proper curve, ends cut radially and bolted together so as to break joints. Half-inch bolts, with a wrought washer, were used. The pieces were also spiked together. The ribs were built at one side and then set in place from the platform.

Ribs and Bearings.

The bearings for the ribs were made by setting a 2 x 12 plank in proper position on each side and filling in behind with concrete. On one side, however, this plank was set so as to afford about 5 inches space for wedges, to facilitate removing the centers after completing the work. These wedges were made of 3 x 12 plank, cut 12 inches long and sawed diagonally so as to make wedges 2½ x 12 at one end and ½ x 12 at the other. The bearing faces were planed. They were made of hard pine and used in pairs, set between the bearing plank and a plank spiked to the ends of the ribbs, a pair being placed at the foot of each rib.

The ribs having been set in place, the exterior ones flush with the sides of the arch, viz., 16 feet out to out, they were crowned with 1 x 6 common fencing, nailed on with ten-penny wire nails. On each side of the center and nailed to the extreme ribs boxing was constructed of 1 x 10 dressed boards, nailed to 2 x 4 uprights, the latter tied across about the top of the arch. Two portable partitions were made to use on top of the center. These were made of 2-inch plank, 16 feet long, carrying a bracket at each end, made of 2 x 4 stuff. These partitions were set 2½ feet from each skewback, thus forming an inclosed space for the first block of concrete. A platform 10 x 16 feet was constructed on each side of the cañon for mixing the concrete.

The first block of concrete was now put in in 6-inch layers, the full thickness of the ring, when the force was transferred to the opposite side and that end started. By the time the second block was in place the first had sufficiently set to allow the moving of the partition forward 2½ feet for the next block. The brackets were so attached to the partition that they could be spiked to the center for each new position and having the force normal to the intrados.

Upon the completion of the ring the boxing for the spandrel walls was built and the construction of the walls carried on, the material being deposited in layers 6 to 8 inches thick. The boxing was made by a carpenter of 1-inch boards, dressed on one side, nailed to 2 x 4 uprights, and so constructed as to meet the conditions of pressure and give the form desired in the finished work.

The materials used were as follows :

Sand.—Ordinary river sand of fair quality for the kind, taken from the bed of the river and unwashed.

Gravel.—Ordinary river gravel, varying in size from a pea to pieces 3 inches in diameter and well rounded. It was taken from the bank or dry bed of the river, and well washed in the river water before taking to the site. It will be seen that the sand and gravel were not all that could be desired in such work.

Cement.—Portland, brands Offenbach & Pommerscher (Stettin), in the ring and coping and letica in the walls. The proportions used were as follows : Portland cement concrete 1 cement, 3 sand, 5 gravel. For the letica cement concrete, 1 : 2 : 4. The materials were incorporated by first mixing the cement and sand dry, tempering thoroughly with a limited amount of water and spreading. The gravel was then added in a layer on top and the whole then turned with shovels until fully mixed—usually accomplished in three turns. The mixing was done in batches of a size made by one borne of cement, and each batch was thoroughly tamped in 6-inch layers when put in.

The coping was surmounted by a railing made of two lines of 1½-inch wrought iron pipe, with uprights of same pipe about 8 feet apart, set 1 foot into the concrete. The lower ends of the pipes were filled with cement as a precaution against collecting water and freezing. At the foot of each post was placed a large ogee cast washer to give a more finished look.

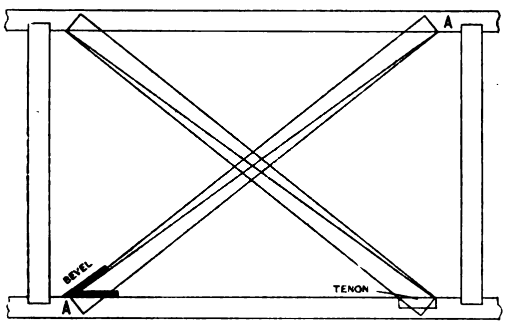
This work was closed up November 15, 1894. Frosts had set in before the ring was completed. No precautions were taken to prevent the freezing of the concrete. No fears were entertained for the Portland cement work, but doubts were felt as to the outcome of the spandrel walls, as these had been made of natural cement. There were good reasons for completing the concrete work, however, at that time, and it was done. Parts of the walls were subjected to severe frosts within a few hours after building.

The boxing, centers, &c., remained on the work through the winter and were removed on the advent of settled weather in the spring. The Portland cement work was in remarkably good shape. The walls, however, showed the effects of the frost on the outside, and in places it was necessary to scrape off the injured material to a depth of 3 inches. This, however, was the exception, as ordinarily only a skin coating was injured and had to be removed. This done, all the surfaces were washed with a hose jet and a coating of Portland cement mortar pressed home over all of them, the surfaces that were scraped out having first been built out.

CORRESPONDENCE.

Cross Bracing in Barn Framing.

From W. D. H , *Terry, S. Dak.*—I would say, in regard to the question of cross brace framing, that I am not criticising "C. G." of Enfield Falls, N. Y., whose letter appears in the December issue of *Carpentry and Building*, for "C. G." is all right. I wish, however, to show how I did such scribing long ago. I had my attention awakened in 1848 at Niles, Mich., when the Michigan Central Railroad Company built across the Saint Jo River a bridge 600 feet long, in spans of from 100 to 130 feet, and high enough for small steam boats to pass under by lowering 10 feet of jointed pipe. The piers were of rock to above high water mark, then 25 feet of heavy frame work above the stone pier—old fashioning framing, not balloons. There were very many heavy timber braces of all shapes. There was



Cross Bracing in Barn Framing.

an elevator warehouse in connection with the bridge 60 x 120 feet on the ground and 125 feet high from the water level to the top of the elevator cupola. I am the man who wrote the article which was published in *Carpentry and Building* in November, 1882, on the method of obtaining the camber in a Howe truss. I have had something to do with joinery, carpentry, millwrighting, bridges of lattice and Howe trusses, and much to do where iron bridges were built, and I have worked where several gold mills have been built in the Black Hills of South Dakota.

Referring, however, to the question in brace framing, I would say that the sketch which I send shows a way that any one can easily follow. When I have many such braces of the same dimensions I make a pattern of 1-inch board and as wide as the timber is thick. In the first place get the exact measurement from A to A on the side of the brace timber, as shown. Make the exact measurement on a straight edge board, then take or make this measurement on the opposite edge of the intended brace timber. By so doing you have the measurement of the brace from A to A as stated. Next make a chalk line on the timber from A to A, or if one has a pencil make a line with a straight edge from the points named. Next set a bevel as shown on the angling line of the sill or post, as the case may be, for the heel of the brace and frame accordingly. By this means the framer will be right without any extracting of the square root of the sum of the squares or any x or other unknown equation.

If any reader has a way shorter or better than the one here shown for an illiterate carpenter 75 years old I should like to see it. I would remark in closing that all the work is done from the angling line.

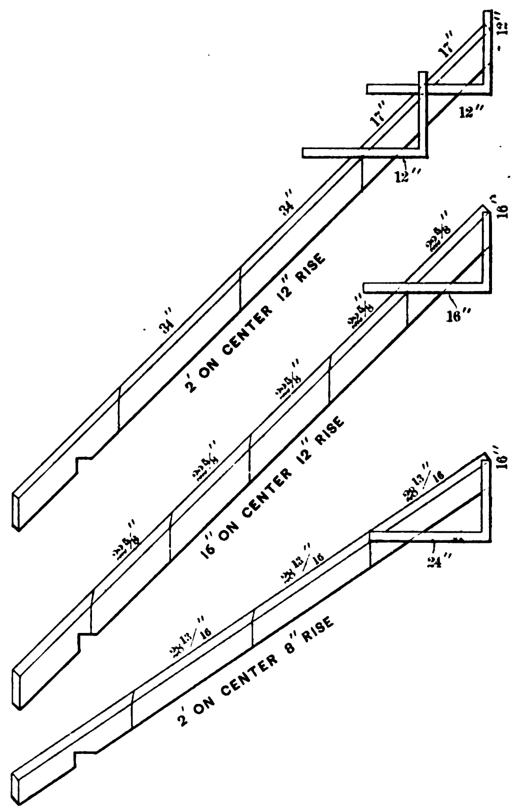
Popularity of House Designs in Carpentry and Building.

From J. B. P., *Hawkeye, Iowa.*—It may be of interest to many readers of the paper to learn that I have recently completed a house in accordance with plans published in the issue of *Carpentry and Building* for September, 1894. As might be expected, we made some modifications in the arrangement of the rooms, putting the dining room where the kitchen was and the kitchen in the place occupied by the bathroom and pantry. We also turned the back stairs around between the kitchen and the bedroom, with a double cupboard between the kitchen and dining room. The bathroom we placed up stairs. The house faces west with a side street on the south. The people for whom I built are well pleased with the house and think it exceedingly convenient. I made use of the porch design as shown in connection with the residence of A. W. Kimmell, published in *Carpentry and Building* for February, 1894, and copied the gable and shingle work shown on the residence of Lewis Williams, published in the January issue for 1896. It is possible that many other designs with slight modifications have been duplicated by readers of the paper, and I think it would be of interest to hear from them.

Note.—We indorse the suggestion of this correspondent, feeling certain that a record of the published designs which have been executed in duplicate will prove of much interest to readers of this department.

Obtaining the Lengths of Jack Rafters.

From W. W. B., *Kansas City, Mo.*—I send sketches to show my method of getting the lengths of jack rafters. After trying various other schemes I find this to be the shortest and more nearly accurate of any of them. I have not seen it illustrated in *Carpentry and Building*, nor



Method of Obtaining the Lengths of Jack Rafters Suggested by "W. W. B."

have I found it in general use ; therefore I make mention of it for the benefit of such readers as may be interested. I take the common rafter and divide it as shown in the sketch. In this case the common rafter strikes the ridge at the point of the hip. Suppose the common rafter is set off 8 inches from the point of the hip, the rafters being 24 inches on centers and half pitch, we have 24 — 8 = 16.

Take 16 and 16 on the square, which will give the length of the longest jack on the short side. Thirty-four inches off gives the next jack, and so on. The sketch which I send shows so clearly what is meant that further description would seem to be unnecessary.

Heating a Closed Room.

From M. W., *Little Falls, N. J.*—Will you or some of your readers tell me how to heat a room 12 feet long, 7 feet wide and 12 feet high to about 280 degrees with steam? The room has no windows and is as nearly air tight as it can possibly be made, being lined with asbestos paper. There is floor room for two 1-inch ten-pipe coils, the extra space being taken up with trucks upon which a substance like dough is to be dried. This dough is to be dried quickly, and when the work is properly done it will be crisp and break like glass. The boiler is about 60 feet from these coils and carries about 45 pounds of steam. I have four coils in the room now, each containing about 140 running feet of 1-inch pipe, the coils being supplied from the boiler with 1¼-inch pipe, and returns are 1-inch pipe. The coils will heat the room to 180 degrees, but will not do the work required of them. The boiler is only tapped for 1¼-inch and that is the reason that size main is used in the coil. The inside coils may be made of larger pipe, but I prefer to leave the coils now in and put other ones above them if necessary and over the ones on the floor. If you can change the plan any so it will supply the necessary 280 degrees of heat with the same amount of pipe or by adding more pipe to it, or suggest any other way of getting out of the trouble, I will be very thankful to you.

Answer.—The trouble of our correspondent lies almost entirely with the boiler pressure. Experience with japanning and vulcanizing ovens has shown that it is impossible to obtain 280 degrees temperature in a working oven with 45 pounds boiler pressure. The temperature of the steam in the boiler at 45 pounds is 292 degrees F.—only 12 degrees above the required temperature in the oven. The room as described contains 504 cubic feet of space, with coils equal to 560 feet of 1-inch pipe, or 187 square feet of heating surface. This is equal to 1 square foot of heating surface to 2.7 cubic feet of space, which, with the boiler 60 feet away and no statement as to the amount and quality of felting on the steam pipe, shows as efficient heating power in the dry room as may be expected under the present arrangement.

We can only advise increasing the amount of pipe in the oven as much as can be conveniently accommodated—say 200 to 300 feet of 1-inch pipe—put in a larger steam pipe, say 1½-inch, and felt all the steam pipe and connections from the boiler to the room with thick magnesia felting. Then raise the pressure in the boiler as high as safety will permit, say to 75 pounds or more.

Boilers for the temperature and purpose that you require usually carry from 100 to 110 pounds pressure. In order to properly dry a moist or wet material that is in masses that allows of the surface becoming dry and thus retarding the escape of moisture from the interior, the most approved management has been to close the room tightly at first and until such time that the whole mass has reached the temperature of boiling water, when the room becomes saturated with vapor and the surface of the material is moist and allows a free passage of the vapor from within. Then ventilate slowly to get rid of the vapor, and when the vapor ceases to escape at the ventilator a closure will raise the heat to the highest temperature required for perfect dryness.

Manual Training.

From J. H. HILL, *Director of Manual Training, Washington, D. C.*—Allow me to thank you for the article on manual training in the January number of the paper. I think if the journal took a stand for us we would have others to come out and advocate the work, not as trade schools only, but as a combination of mechanical branches with the higher education. This would make a better class of mechanics in the field. When I see our boys vainly striving to be professors and doctors, completely ignoring the mechanical arts, I wonder who will do work in the shops. Cardinal Gibbons said in one of his sermons on the labor question of to-day, regarding manual labor before the coming of Christ, that it was held in degradation and confined to slaves only, it being unworthy of freemen. Christ our Saviour dignified and ennobled labor by word and example. He was pleased to devote many years of His life to mechanical pursuits and thus shed a halo around the workshop. It is a fact that too many mechanics work day after day accomplishing their work by main strength, this being the direct result of a lack of proper and thorough application in the beginning of their mechanical life.

The point to be emphasized is that the mind is able through careful training and application to bring to bear a knowledge of principles involved as well as execution of the work in detail. The aim of every young man who is beginning his mechanical education should be to reach that standard of ability. When he has attained this no question of wages will ever trouble him. Such men are always wanted. The supply is not equal to the demand. There always has been and probably always will be two classes of mechanics—those who stand at their bench and go through the manual motions of their work like automatic machines; the others, that class of men who make no move without knowing why and how results are obtained and the relative importance of each step. This is mechanical education that counts. The one that schools the mind to a clear comprehension of principles equally with details leads unfailingly to that higher field where skill, diligence and marked ability find their natural level. The young man who, beginning his mechanical education, realizes and acts upon these truths, will develop that ability which is not gauged by mere manual dexterity, but rather that which in later years, when he may be called upon to design, plan or superintend the work of others, will enable him to do credit to the position which he fills. This is what we are trying to bring out of the manual training schools—the infant of education.

Constructing a Flat Skylight.

From YOUNG SUBSCRIBER, *Buffalo, N. Y.*—Will some of those who have had experience in doing work of this kind show in the Correspondence department the method of constructing an ordinary flat skylight?

Preventing Show Windows from Sweating.

From J. M. F., *Middletown, Del.*—Will some of the many readers of the Correspondence department of the paper tell me if they can what will stop bulk or show windows from sweating? The windows have inside sash and I have tried leaving them open, also have large ventilators both top and bottom, but they do not seem to make any difference.

Note.—The remedies which have been adopted in the past for overcoming the difficulty mentioned by our correspondent have been to so ventilate the space on the inner side of the window as to create a circulation of air. This can be accomplished in a variety of ways, local conditions determining largely the most convenient plan. We do not understand why, if our correspondent has established a means of ventilation, the trouble is not overcome. We present the question, however, to our readers, and trust those of them who have had experience in matters of this kind will describe the means adopted to obviate the difficulty. We shall be glad to have both descriptive matter and sketches, if the latter are necessary, in order to make the methods employed more clearly understood.

A Tilting Flour Bin.

From J. B. P., *Hawkeye, Iowa.*—In looking over the September issue of *Carpentry and Building* I noticed a letter from "M. F. B.," Waterloo, N. Y., in regard to a tilting flour bin. I would say that the principle is right as there described, for I have put in several this past summer and they work to perfection. I would say, however, that the correspondent need not go to the bother of getting castings made, for I use sash center or transom plates, as they are sometimes called, using ¼ x 1 inch stove bolts to fasten the plate on the bin. The sets cost me 5 cents each, and in these times we contractors have to apply the old saying that "a penny saved is two pennies earned."

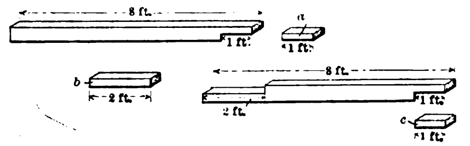
Removing Stains from Brick Work.

From H. T. C., *Houghton, Mich.*—Will some one please tell me what is the best method of removing weather stains on a brick wall where they occur under a valley or eaves of a building ?

Note.—It is possible that dilute muriatic acid may serve a useful purpose in this connection. We present the inquiry to our readers and shall be glad to have them express their views regarding the best method of accomplishing what our correspondent desires.

Problem in Splicing Timber.

From H. A. W., *Plymouth, Conn.*—In the October number of *Carpentry and Building* "Young Chip" of



Problem in Splicing Timber.—Fig. 1—Showing How the Pieces are Cut.

Montreal, Canada, presents a problem in splicing timber, to which I take the liberty of replying. The sketches accompanying this letter show the way I should do the work. The sketches are self explanatory, the pieces marked *a, b, c* of Fig. 1 being used in the places indicated by the same letters of Fig. 2. I have been a constant reader of this magazine for over two years, and I think I could not get along without it, especially the Correspondence department. I hope others will give different solutions of the problem.

Woods for House Finish.

From W. G. I., *Ligonier, Pa.*—From time immemorial paint has been the chief style of house finish for the interior, but within late years this old fashioned style has suffered greatly and has almost disappeared. The characteristics of the different native woods now in use for interior finish would fill a volume, while the great variety of grain, knot, curl and other peculiarities of formation renders the selection of the different markings of the woods a matter of taste, and an artistic taste is especially important if the best results are to be realized. Woods which combine knot, grain and knurl so as to give variety to the finish is what the modern idea of the beautiful now demands. Foremost among the woods particularly adapted to this work are the different varieties of oak. The usual idea regarding anything made of oak is solidity. But now this wood has come to be known for its beautiful attributes, for when well finished and finely varnished its beauty is not excelled by any other wood in the world. Mahogany and rosewood have that sameness of appearance throughout which soon tires the eye of the beholder, but the oak gives something of relief and variation. The selection of the constantly varying

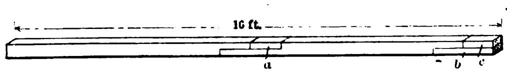


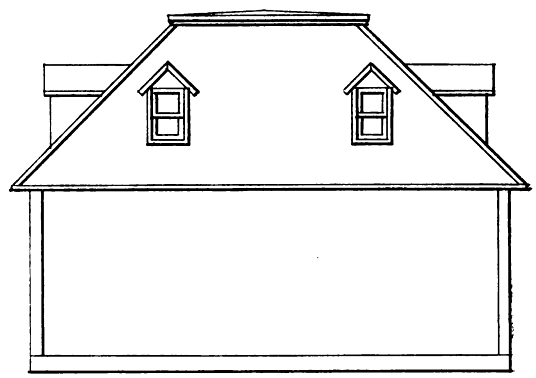
Fig. 2.—Showing How the Timber is Spliced.

grain and the placing of the finely finished knot in the right spot to draw attention, with the different grain effects, afford the artistic workman rare opportunities for beautiful combinations.

Machine men constantly try to avoid knots and tough pieces of wood, but these are just what the artistic house finisher wants in order to show his skill at this art. Unlike paper decoration, the natural wood finish does not present a continual repetition of figures. It is impossible to repeat the figure, and the artist who can combine all that is possible, even in the commonest woods, can give beauty that cannot be found in paper and ink. While oak excels in beauty, there are many other kinds of woods that give great beauty of finish. Maple, ash, cherry, sycamore and other woods are now much used for this purpose. A much neglected wood is the common butternut, which takes a very fine finish and is very rich in color and effect. Ash and maple are also much in favor for this work. This work presents a wide field and is in itself really a trade. In it we find displayed the beautiful and the artistic, and here are engaged men of great artistic genius.

Curing a Sweating Barn Roof.

From M. B., *Baraboo, Wis.*—Will some of the readers give me light on the following subject ? We have recently covered a building that is 60 feet square with hip roofs and a tin deck with steel roofing. It is used as an animal barn, and there are about 20 elephants kept in it. It is heated by a 47 inch portable hot air furnace having a galvanized iron jacket and a 30 x 30 inch square register set in the top of the bonnet. Cold air is taken in at the back from the main room, 6 inch holes being left all around the bottom of the jacket for admitting air. We had misgiving as to the sweating of the roof from our past experience, but were advised that a layer of paper underneath the steel would prevent the condensation of moisture. The steel roofing and the tin on the deck are laid on a sheeting that is tightly laid with a tongue and groove. On this sheeting there are two thicknesses of resin paper. The roof, however, has made us trouble from sweating on the under side and we would



Curing a Sweating Barn Roof.

be glad to hear of a remedy for it. We submit a sketch showing the shape of the building. There are eight dormers for ventilation located about half way from the eave to the deck. The boarding on the under side is covered with condensation to such an extent that the water just runs off in a stream. Would a large ventilator placed in the deck do any good, or will we have to board up the lower side of the rafters ? We would like to know what can be done with it, and think others would be interested in the problem. Would the trouble have been avoided if we had used felt roofing ?

Note.—We shall be glad to have our readers who have had experience with roofing give their views on this subject. It would seem that all ordinary provisions had been made to avoid trouble from condensation. In order to solve the problem, when the effect is known it is well to understand the cause. In this case the iron roofing and the sheeting on which it is laid will be considerably cooler than the atmosphere in the barn, and as a result any moisture in the atmosphere in the barn when brought in contact with the cool surfaces of the sheeting will result in condensation. In order to avoid this some step must be taken to prevent the moist air coming in contact with so cool a surface. One of the best non-conductors for a building is an air space, and it will be seen that if the rafters were provided with a ceiling of matched boarding on the under side a long step would be taken toward preventing the ceiling of the barn being cool enough to effect such a profuse condensation as is reported. If a ventilator was used in the deck as proposed it would make a very material difference in the amount of heat required in the barn. It doubtless would have the effect of carrying off the moist air. If there is a trap door in the deck this might be left partly open by way of experiment to test the efficiency of a ventilator for the purpose mentioned.

Repairing Furniture.

From C. J. W., *Berkley, Va.*—I would say in answer to C. O. M. of South Amana, Iowa, that the best way to take furniture apart is to break the glue with sharp yet not too heavy blows of a small sized hammer. The blows require to be very sharp, but light and given from the wrist, instead of the elbow. A little practice will enable him to break any glue joint as usually made.

Suggestions Regarding Stair Work.

From M. F. L , *East Orange, N. J.*—There has been so much said about stairs that I feel like putting in my oar and offering a few suggestions which may prove of interest to some of the younger readers of the paper. At the outset I will offer a few remarks relative to the laying out of a stair string. In the first place we obtain the rise and next the run. The rise may be taken as from A to B in Fig. 1 of the drawings. Space this off into say 15 parts, which will make the risers 8 inches. Now we will assume that

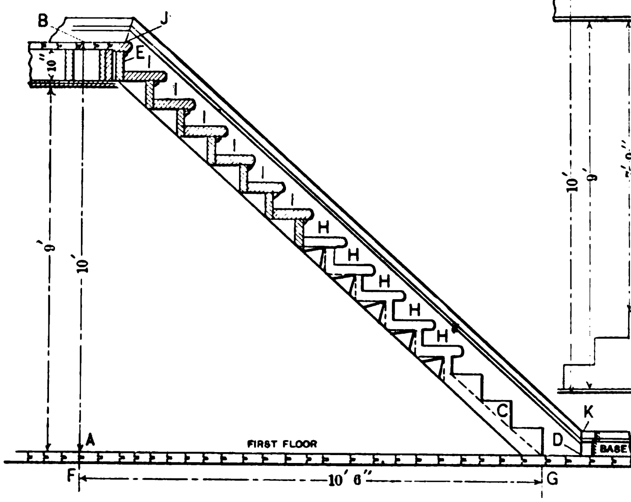


Fig. 1.—Laying Out a Stair String.

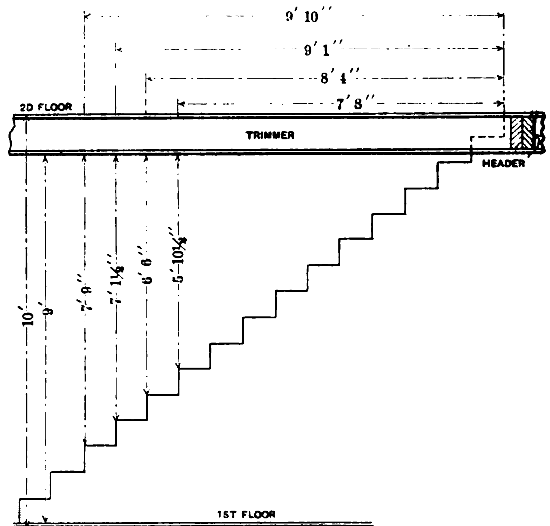


Fig. 2.—Finding Head Room in a Well Hole.

Suggestions Regarding Stair Work.

the run is 10 feet 6 inches, as shown from F to G. Space this off into 14 parts, or one less than the rise, which makes in this case 9 inches. We have, therefore, the riser 8 inches and the tread 9 inches. Construct a pitch board to these figures, and lay it on the string to a straight line as at C. Lay it off 15 times, which will give the length of string from D to E, and lay out for the wedge, as shown at H H, &c. The dotted lines represent the line of tread and riser, and the heavy lines the wedge. When the stairs are in place with treads and risers finished they appear as at I I, &c.

In order to cut for the base at the top lay the square on the string at the base of the first riser. Draw the square over the string until it reaches the figure corresponding with the width of the base, then cut as shown at J. Next, in order to cut for the base at the foot of the string, lay the square on flush with the floor wall. Move out until the figure corresponding with the base is reached, when cut plumb as at K.

It may not be out of place to describe how to find the head room in a well hole. The sketch, Fig. 2, is for a 9-foot ceiling, with 10 feet from floor to floor, which takes 16 risers of 7½ inches each, the treads being 9 inches. Now to find the head room go up say 3 risers, at which point there is 7 feet, 9 from the top of tread to the ceiling. If we go up four risers there is 7 feet 1½ inches, and five risers 6 feet 6 inches, which is little enough. The distance between headers, supposing we use 7 feet 9 inches head room, will be 9 feet 10 inches. It is well to frame from 2 to 4 inches larger in the width of the stairs. I hope these remarks may prove of benefit to some knights of the hammer and saw, and that they will come forward and give expression to their views relative to this or other subjects.

Proper Place for Door Knobs.

From A. W., *Winnebago City, Minn.*—I would like to have some of the practical readers tell me where a door knob should be placed on a door. There are a great many "chips" around here who say that the knob should be on a line with the cross piece of the door, and I would like to be set right in the matter.

Note.—The knob of a door is generally placed at such a hight from the floor as will be within most convenient reach for opening or closing, and while no cast iron rule may be said to be recognized in such matters, it is common practice to place the knob about 3 feet 2 inches from the bottom of the door. This will bring the knob in the upper tenon of the lock rail of the door. It may be that practice in the Western section of the country differs to some extent from that of the East, and we shall be glad to have our readers discuss the question as raised by the correspondent above.

Designs of Roof Trusses.

From J. S. S., *Cumberland, Md.*—I am greatly interested in *Carpentry and Building*, and it has become quite a necessary feature in my office. I would like to call the attention of the correspondents who send in detailed designs of roof trusses that they often neglect to state the kind of roofing they carry, and, what is still more important, the distance between trusses. In presenting matters of this kind I think too much information cannot be given.

Rake and Level Moldings.

From C. P. W., *Wilmington, Del.*—I have never before contributed anything to the Correspondence department of the paper, although I am greatly interested in its columns. I would like, however, to tell my brother readers how I miter a level molding with the rake. In the first place, draw the pitch of roof on the molding and hold it on the outside of an ordinary miter box even with the cut across the box. This is when one has only one or two cuts to make, just to save the trouble of making a special box. I would also like to suggest to any one who has to climb over roofs to get a pair of tennis shoes with rubber soles. These prevent slipping and serve a very good purpose.

Question in Barn Framing.

From WILLIAM A. WARREN, *West Liberty, Iowa.*—In regard to the question of barn framing presented by "J. L. T," Bremen, Ind., allow me to say that I know of a barn framed exactly the same as shown by his plan in the October number for 1897, and the barn spread the first time it was filled with hay. Now the owner cannot speak a good word for the contractor. The barn of the correspondent is sure to spread if not tied in some way. I present in the accompanying sketch my plan of a hay barn, and in every other bent I omit the beam running from A to B. I would say to the correspondent build your barn so strong that it will never lose its shape, do the work so well that people will hunt for and even wait for you, and your labors will surely be crowned with success.

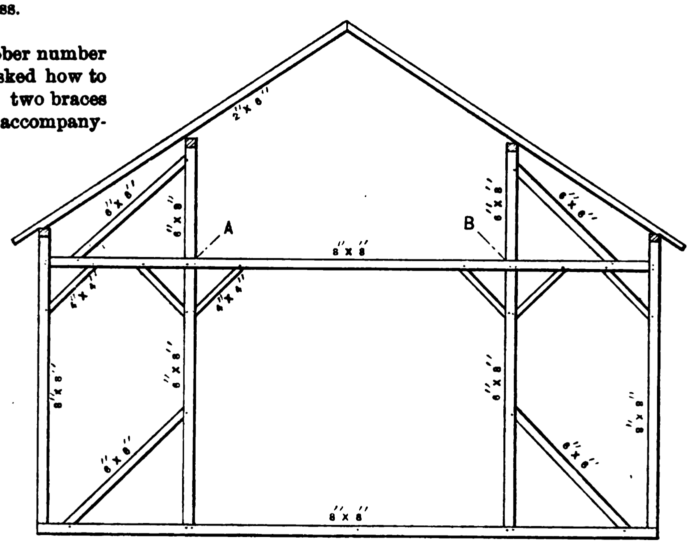
From O. F., *Pawling, N. Y.*—In the October number of the paper "J. L. T." of Bremen, Ind., asked how to obtain with the steel square the cut where two braces cross as represented in Fig. 2 of the sketches accompanying his published letter. My method may be described as follows: First find the pitch as in a rafter, which may be ascertained by measuring half the distance between the centers of the two mortises on the sill, which will be the run; then half the distance between the sill and beam will be the rise. Drop a chalk line from end to end through the center of the timber. In this instance the rise is greater than the run, so that the tongue of the square must be used to make the bottom slant. Then lay on the square with the numbers on the chalk mark so that the short end will bear the same proportion to the long end as the run bears to the rise. For example, the run is 3 feet and the rise is 9 feet; then the number at the chalk mark on one end of the square should be three times as great as on the other end. The proportions may be reckoned in inches or half inches, according to circumstances. In this example the common square is not long enough to reckon in inches—12 half-inches by 36 half-inches, or 6 x 18, will be the pitch. Divide 6 inches into 3 feet, the run, and we have six runs to be made with the square. Make the six runs and mark the upper slant. The point where it crosses the chalk mark will be the center of the cross, and where it touches the edges of the timber will be the upper and lower points of intersection of the two braces. Now slide the square along until the short end reaches the point where the slant crosses the chalk mark, and make another mark crosswise of the timber. Where this mark touches the edges of the timber will be the right and left points of intersection. Now lay on the square and mark from the upper point to the right or left point, and from the lower point to the right or left, and the result is the proper cut.

Finding the Lengths and Cuts for Hip Rafters.

From W. L., *Kingston, Mass.*—As the rafter question seems to be up for discussion, I take the opportunity of asking my brother chips for their rule for cutting a hip rafter where there is 4⅜ inches to the foot rise in the common rafter. In getting the correct cut, do you give 5 inches more on the square, thus making the figures 4⅜ and 17? The piazza roof to which I am referring is 5 feet 6 inches from the outside of the plate to the main house. In this case is it right to place the square on the stick at 4⅜ and 17, and scribe along 5½ times in order to obtain the correct length?

Rule for Furnace Pipes.

From C. W., *Newark, N. J.*—I submit for the consideration of the readers who may be interested the following suggestions as to the size of hot air pipe to be used for a given room. The rule which must be applied, with variations to suit the location of the room and its size, is to multiply the square feet of floor space by 2½, 3, 3½ or 4, then divide the result by 10, and the result will be the area in square inches of the hot air that should be used. For example, a first floor room 15 x 15 feet, with two walls exposed and the usual windows, would have an area of 225 square feet. This multiplied by 3½ would give 787, and divided by 10 would give a fraction over 78 as the number of square inches of area that a hot air pipe should have for this room. If the room had three sides exposed on the cold side of a building the square feet should be multiplied by four. For example, a 14 x 16 foot room would have 224 square feet, and multiplied by 4 and divided by 10 would give 89.6 as the area in square inches



Question in Barn Framing.—Bent of Hay Barn as Built by Mr. Warren.

of the proper pipe, which would be almost equal to an 11-inch pipe. If the room was to be used only as a sleeping apartment, and over a room that was warmed, either 2½ or 3 should be used as the multiplier, according to the exposure and amount of heat required. It will be seen that this rule is somewhat elastic and not derived from a scientific base, but simple in application and a fair guide. On computing the cubic contents of the rooms with a 10-foot ceiling it will be found that in the more exposed room 1 square inch of area is provided in the hot air pipe for every 25 cubic feet of space, and in the other room the proportion is about 1 to 30. It corresponds with the method of proportioning the pipe to the cubic space, but the different multipliers have an advantage to beginners, as they do not leave so much to judgment. Multiply by 4 for cold exposed first floor rooms and by 3½ ordinarily. For exposed second floor multiply by 3, and by 2½ ordinarily for sleeping rooms. These multipliers used for rooms of different sizes naturally will not always give an amount which corresponds with the area of a regular size of pipe, but will sometimes give an amount between two sizes; then the larger or smaller size may be used as the room may seem to need, or according to the number of pipes which are used on the furnace. If there is a large number of pipes on the furnace, taxing its capacity, better results will be secured by using the smaller size of pipe. Small furnaces and small pipes only do their work at the expense of overheating the air, which should always be avoided.

Hints on Ventilation and Heating.

Mrs. Alice P. Norton recently gave a talk at the Women's Educational and Industrial Union School of Housekeeping, at Boston, Mass. Her subject was "Ventilation and Heating," and many housekeepers and others interested in this plan to study the vexed question of domestic service were present. In considering that which has come to be counted among the lost arts, the ventilation of the modern house, Mrs. Norton said that few patent arrangements are better than a piece of board so placed that the window sash will not shut down. This admits air into the room, but the most sensitive person cannot feel it. Few persons, said the lecturer, comprehend the simple fact that a window dropped just a trifle from the top on each side of a room or hall will change the air, whereas if several are opened wide the sudden cold makes their closing necessary before any air has a chance to enter. Open fire places are inadequate and inexpensive as heaters, but they are good ventilators, especially if they are constructed with that aim. Steam and hot water heating have disadvantages unless the heat is carried into rooms indirectly, whereas a furnace, properly constructed and intelligently managed, should not cause any unhealthfulness.

"The great trouble is," said Mrs. Norton, "that we do not supply enough pure air to the furnace, but depend on actual heat from the fire. Put a thermometer down the register and see if you are not surprised at the way it runs up. The cold air box should be well constructed, and as far from the ground as possible, so that no cellar air nor combustible products are carried to the upper parts of the dwelling. A good supply of heat in the halls produces better results than if the rooms only are heated, as the entire temperature then becomes equalized. Rooms well ventilated will heat more quickly than stuffy ones. Members of the family who complain of cold apartments are always the ones who dislike to admit fresh air. Most rooms are kept too hot. The glass should never be allowed to go above 70 degrees, and lower than that is desirable for the average person. As age comes on the body requires more warmth, while children thrive in a low temperature. It is not an uncommon thing for church furnaces to take air from the audience room that has been breathed and heated again, as the plan of providing outside air is considered as too expensive."

Average Cost of Buildings.

There has recently been so much said in the trade press about the cost of buildings per cubic foot and the reliability (?) of such figures in estimate work, that the views of a well informed member of the craft may not be without interest at this time. After stating that architects and builders who have presumably kept a faithful account of the cost of their work and possibly of the work of others, have so varied in the resulting figures that no sensible contractor would be inclined to place much, if any, reliance on them, the writer says : Frame buildings are put down all the way from 3½ cents per cubic foot to 30 cents per foot, depending of course on the character of the building, style of finish and whether of hard or soft wood. For brick buildings figures have been given from 7 cents to $1 per cubic foot and for some public buildings even more than that. In stone work where much carving has been done the cost in some instances has run up to $1.75 per cubic foot, but in plain stone buildings it has been as low as 12 cents per foot.

There never was, nor will there ever be, a constant figure that can be used in all cases of wood buildings or of brick or stone. There are so many conditions in building that a rule to estimate by cubing—correctly—can never be devised unless human intellect acquires power now not known. A quick method of cubing a building should be within the reach of every builder, which he may use in order to obtain an approximate estimate of a proposed building. Architects and builders are often asked the question : "How much would it cost to build a house so and so, with so many rooms and so and so?" and it frequently happens that on the answer to such a query the erection or not of the house depends. A rapid cubing of the proposed house would at once enable the questioned to answer with some degree of correctness, and while he can make his answer it will be but just and fair to the questioner that he be informed that the answer given is only approximate.

It should be borne in mind that frames for windows and doors cost about the same in wood, bricks or stone, the same style of finish and trimmings being used in each case. The same may be said of all other wood finish, for after the walls are up and the roof on, the difference between a stone or brick building and a frame one ends almost entirely, all things of course being equal. It is generally supposed, however, that the wood work made for the interior of a brick or stone house should be more elaborate and more costly than the same class of work in a frame house.

Perhaps this idea springs from the notion that a frame house is a temporary affair at best, though as a matter of fact a well built frame house, placed on a good solid stone foundation, will last as long as the average brick house.

Women as Practical Architects.

"The reason why women will make good practical architects," said a bright professional woman last week, "is because they know pre-eminently what is needed about a house. They know how to have everything arranged so that as a whole it is as convenient as it is possible to make it. The gas fixture is not placed in some back corner behind a door, where nobody would ever think of looking for or wanting a light; the wall lines are not so broken up with doors and windows that there is no room for the necessary furniture ; the doors are not hung in such an awkward manner that they must swing against the windows or gas fixtures ; the space for the dresser is not left on the side of the room farthest from the light ; the closets are not like dark pockets in a basement, but arranged to be well ventilated as often as needed ; the dining room is made large enough, so that it will contain a sideboard, as well as the table and chairs, and it will not be necessary for all to rise from one side of the table in order that the waitress may pass to the other side, or else hand things across the table, as occurred lately in an apartment building designed by a man ; the mirrors will not face the light ; the pantry will have a window and will not be placed in the center of the house ; the registers or radiators will not occupy the only wall space large enough for the bedstead or the sofa or the sideboard ; the doors will be wide enough to admit of any article of furniture made and the halls will be large enough so articles can be wheeled through them from one room into another."—*Chicago Times-Herald.*

Meaning of the Word "Clapboard."

The word "clapboard" is in the New England States employed to designate a thin, narrow board used to cover the sides of the houses and placed so as to overlap the one below. It has been supposed to be an Americanism, but, like many other Americanisms, it was brought over to this country by the early English colonists. According to very old dictionaries published in England, clapboards were thin boards formed ready for the cooper's use for the manufacture of casks. They were originally "cloveboards," because they were "cloven" out by hand and not made with a saw as other boards are. In course of time the word was abbreviated to "cloboards," "claboards" and "clapboards." In the law of the Massachusetts Colony, in 1641, the price of these articles was 3 shillings for "claboards" 5 feet in length. The legal price for the work performed by hired labor was: "If they cleave by the hundred, they shall be paid six pence per hundred for five-foot boards." In other parts of the country the term siding or weather boards is used to designate this particular product.

SLATE AND COPPER ROOFING.

SINCE the construction of fire proof buildings the methods of inserting flashings and fastening slate and copper roofing have changed. Where formerly the slates were nailed on the wooden planking, now porous terra cotta blocks are laid by the mason into the angle irons, which are secured to the iron rafters of the roof, and on these terra cotta blocks the slates are nailed, or fastened to iron lath or corrugated iron by means of copper wire on the inside.

In the same manner, where formerly the flashings were inserted into the joints of the brick work, the copper flashing must in some cases, in the class of buildings above mentioned, be made water tight, against stone, terra cotta or iron, by means of cut grooves and lead wedges for stone and terra cotta work and tapped holes and bolts for iron work.

As the gutter is usually the first piece of work to go on the building before starting the roofing, says a writer in *The Metal Worker*, we shall begin with the most simple form of gutter. A sectional view of a copper gutter, showing method of fastening to brick wall and terra cotta roof is found in Fig. 1. A represents the brick wall, B the stone plate and C the iron T beam resting and bolted on same. V V are angle irons fastened to the T beam, and into these angles the porous terra cotta blocks X X are laid. E represents the copper gutter, having a drip formed at G, standing away from the front edge of the brick work, so that in case of an overflow it will keep the water from running down the face of the wall. D F is a copper strip 1-16 inch thick by 1 inch wide, riveted to the bottom of the gutter at H and drawn in tight, so that the back of the gutter lies snug against the stone plate B. The copper band is then nailed into the joints of the brick work at I and J with hard brass wire nails 3-16 inch thick by 1½ inches long. The rivet H and the seam at the drip G are thoroughly soaked with solder to avoid leakage. The back of the gutter extends up and on to the terra cotta blocks as far as U, or, as is usually the case, a distance of 8 inches. K is a brass angle, 1 inch by 1 inch by ⅛ inch thick, bolted into the upper angle of the copper gutter, as shown, by means of brass flat head bolts and nuts ¼ inch thick, ¾-inch long bolts being employed at L, with the nut on the inside, and 1 inch long bolts being used at K, with the nut on the outside at M, connecting with the brass twisted brace N at M. This brass brace, N, extends back, having the rear bend higher than at the front, and is bolted on and through the copper and terra cotta blocks by means of bolts, P and O, which should be of brass ¼ inch in thickness and as long as required, with brass nuts and washers on the inside, the washers being made of band brass 6 inches long, 1¼ inches wide and 3-16 inch thick.

Care should be taken when putting in the first bolt, O, to have it about 3 inches higher than the front top edge of the gutter, so that in case of an overflow the water will not reach the first bolt, but will overflow at M. The brace is made of band brass, 1¼ inches wide by 3-16 inch thick, the twist N being introduced in the first place to stiffen the braces and in the second place to keep the water from following the brace and streaming over the front edge of the gutter.

These braces can be made in the shop by means of a simple little tool, shown in Fig. 2, and can be made in the following manner: Obtain a piece of steel 20 inches long, ⅜ inch thick and 1 inch wide and have it bent according to the shape and dimensions shown in Fig. 2, the distance A being such that the thickness of the brass brace used will enter easily. Having completed the brace twister, the brass braces are twisted in a vise, the result being shown in Fig. 3. A hole is punched at A for the brass bolt K in Fig. 1, and two holes are punched in their proper position at B and C of Fig. 3 and countersunk on the upper side. These are for the bolts to fasten to the porous terra cotta blocks.

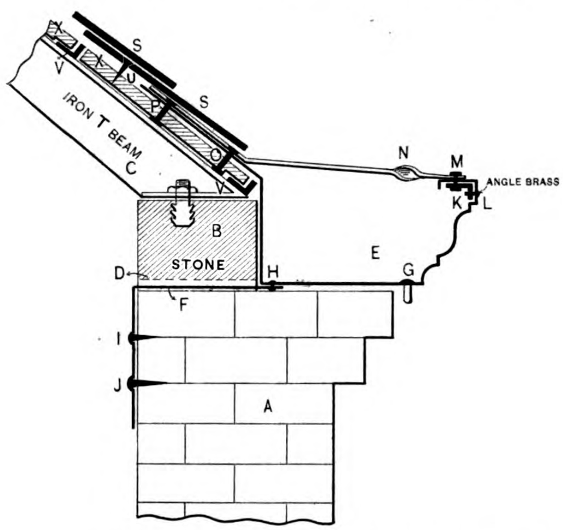


Fig. 1.—Fastening Metal Gutter on Brick Wall and Terra Cotta Roof.

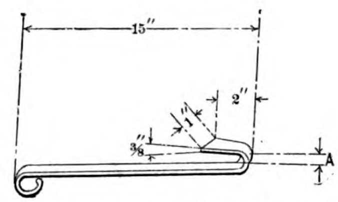


Fig. 2.—Steel Brace Twister with Dimensions.

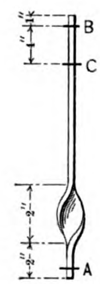


Fig. 3.—Side View of Finished Twisted Brass Brace.

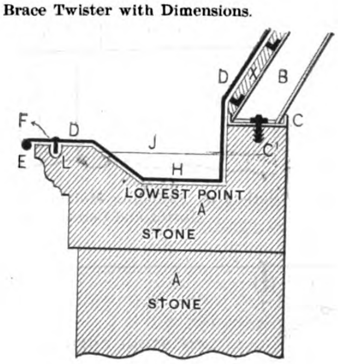


Fig. 4.—Lining Stone Gutter with Sheet Copper.

Slate and Copper Roofing.

The method of lining a stone gutter with sheet copper is shown in Fig. 4. A A represents the stone work, the gutter being cut direct into the stone work, H being the lowest and J the highest points. B represents the iron rafter, C the channel plate and C' the bolt. X shows the porous terra cotta laid on angle irons. D D is the copper lining, laid to correspond to the profile of the stone work with a beaded edge at E, and extending up under the slating 8 inches. The bead at E serves to stiffen the front edge of the copper and forms a drip. To prevent the wind from raising the front edge of the lining, holes are drilled at intervals along the top of the stone cornice, as at L, which are plugged out with lead, and brass nails driven through the copper into same. Another method of fastening the front edges of the copper lining is shown in connection with covering stone cornice with sheet copper.

In Fig. 5 A is the stone cornice, B the iron roof beam, on which an asphalt roof is to be placed; C D represents the copper lining, having a beaded edge at E, but turned into the fillet or member of the stone cornice, as shown, which prevents the copper from rising at the front. The lining extends back and forms a flashing at F, over which the asphalt is laid. When the top of the cornice is very wide the copper is apt to rattle, but this can be avoided by bolting or screwing the sheet copper to the stone work in the following manner: Have holes drilled at intervals in the top of the stone work, as shown at A, Fig. 6, and obtain an iron pin having a diameter equal to the screws which will be used. Clean out the hole in the stone and see that it is perfectly dry; dip the iron pin in a little oil, then set it in the center of the hole, as shown, and, using a ladle, pour into the hole molten lead. By having the pin dipped in oil it can be easily removed. Now, assuming that this has been done in Fig. 5 at H, the lead being soft, the thread of the screw will work itself into the lead and hold down the copper and prevent it from rattling.

The method of fastening molding to stone work in a water tight manner, the molding forming a gutter under a mansard roof which is connected to a cast iron pipe on the inside of the building, is illustrated in Fig. 7 of the cuts. A is the brick wall and B the stone coping, with a groove, C, cut into it the entire length of the molding. D represents $\frac{1}{2}$-inch holes 1 inch deep, drilled into the coping at intervals of 2 or 3 feet. E is the molding with flange bent outward at F and set into the groove, which is filled with molten lead. The brass brace I I, which has been previously fastened to the copper molding by the brass bolt at E, is now fastened by means of brass nails into the drilled hole D in the stone, which has previously been plugged with lead.

The molding being set plumb, the gutter is then lined by the carpenter with planks J J, after which it is lined with sheet copper, locking the same into the lock G at the top and extending up against the porous terra cotta roof, as shown by K. Care should be taken to extend the copper lining high enough so that in case of an overflow the water will not flow behind the lining. Over this lining the slates L are laid and fastened to the terra cotta by means of brass nails. On some buildings the rain water is carried off by cast iron pipes, run up on the inside of the building in recesses left by the mason. P in Fig. 7 represents a cast iron pipe, put up by the plumber but connected by the roofer, by means of a 20-ounce copper tube, O O, connected with the copper gutter at the top with a copper strainer, N, and connected to the iron pipe P by means of a brass ferule soldered to the copper tube and calked to the iron pipe. Where the copper tubes pass through the stone or brick work it is usual for the stone cutter or mason to make the necessary openings.

In fastening ridges on fire proof roofs we will let A A of Fig. 8 represent the roof beams, on to which the angle irons are bolted and filled with fire proofing, as shown at B B, &c. At C C is shown the slating butting against the wooden ridge roll D, which is placed in position by the framer, by means of the bolt E, and fastened at the inside by means of a washer and nut. J J show the copper ridge, which is placed over D, flashing over the slates and covering the nail heads. To prevent the wind from tearing up the ridge roll, brass clamps L L made of 3-16 x $1\frac{1}{4}$ inch band brass are placed over the copper ridge and fastened by brass screws O O.

If a number of changes are to be made to fit the ridge, the first step is to get the required stretchout, cut off all the lengths of brass, punch and countersink the holes, so that they will come in the position shown at O O, and bend the flanges at their proper angles. The clamps being made of soft brass, are bent cold, using a little device known in the shop as a gauge and made of $\frac{1}{4}$ x $1\frac{1}{4}$ inch band iron, having the required angle and half the profile of the ridge.

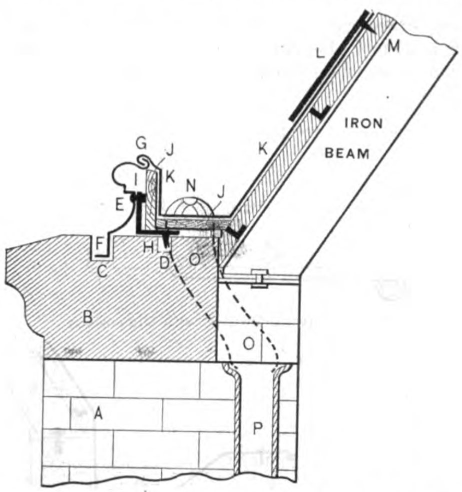


Fig. 7.—Method of Fastening Molding to Stone Work, Forming Gutter and Connecting Tube.

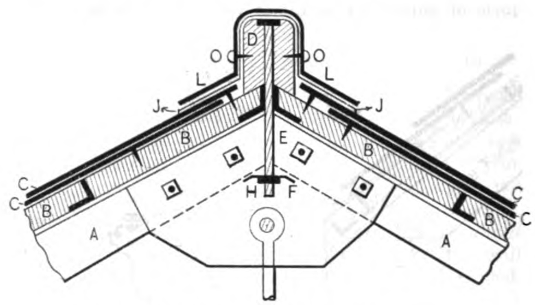


Fig. 8.—Section Through Ridge and Copper Covering.

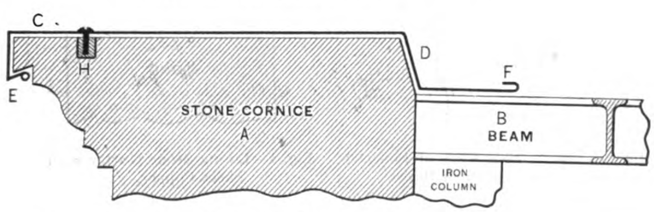


Fig. 5–Covering Stone Cornice with Copper.

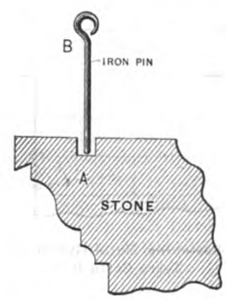


Fig. 6.—Method of Placing Iron Pin.

Slate and Copper Roofing.

THE organization of a builders' exchange at Montreal, Canada, has recently been completed and the following officers elected: President, James Simpson; vice-president, C. T. Williams; secretary-treasurer, G. J. Sheppard. The Board of Directors include James Simpson, P. Lyall, A. Cowan, J. McLean, F. Fournier, C. T. Williams and William P. Scott. The exchange occupies rooms in the Mechanics' Institute Building, the 'change hours being from 10 to 12 o'clock each day. The management is in good hands, and there is every reason to believe that the exchange will rapidly grow in membership and influence.

ESTIMATING A BRICK HOUSE.—IX.

BY FRED. T. HODGSON.

IT will now be in order to find out the cost of finishing the inside of the circular windows in the sitting room. The room being finished in hardwood, the sash must be made of the same material, or else veneered on the inside with it. In either case the sash—having bent or curved rails—will cost a little over double the amount they would if made with straight rails If made in pine and with straight rails, the cost would average 96 cents a pair ; if of hardwood and straight the average would be $2 a pair for oak, walnut or cherry, and $1.60 for birch, sycamore or maple. For bent rails in either of these woods the average would be doubled. The cost of trimming these windows and preparing heads, stools and other necessary circular or curved work will take double the labor of an ordinary window. From this the cost may readily be estimated, but I would in every case advise the contractor to get prices from the factory of such stuff as he may require, before making up his tender for the work, but where this cannot be done the figures given herewith will be found to be very nearly right and a tender based on them will insure the contractor from loss if he possesses ordinary common sense and ability.

as prices now range. Each door will probably cost another $1.50. This will make the cost of each door when completed ready for the painter, less cost of locks, bolts and hinges, as follows :

Cost of material for frame	$1.50
Cost of door	1.50
Making, setting frame and finishing door	2.84
Total	$5.84
If we add to this for lock and butts	1.00
We have the estimating price of	$6.84

Or, in round figures, seven dollars for each door, which is a fair price for an average door completed.

Base Boards.

It is not necessary that we should measure up the plans and give the exact number of feet, running measure, of base board required; suffice it to give the cost of laying

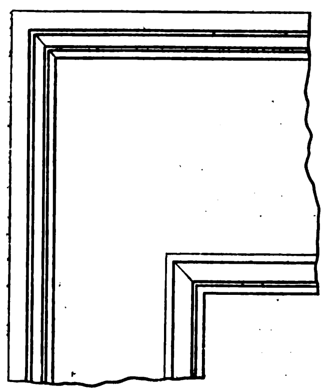


Fig. 13.—Detail of Head Casing for All Pine Finish.—Scale, 3 Inches to the Foot.

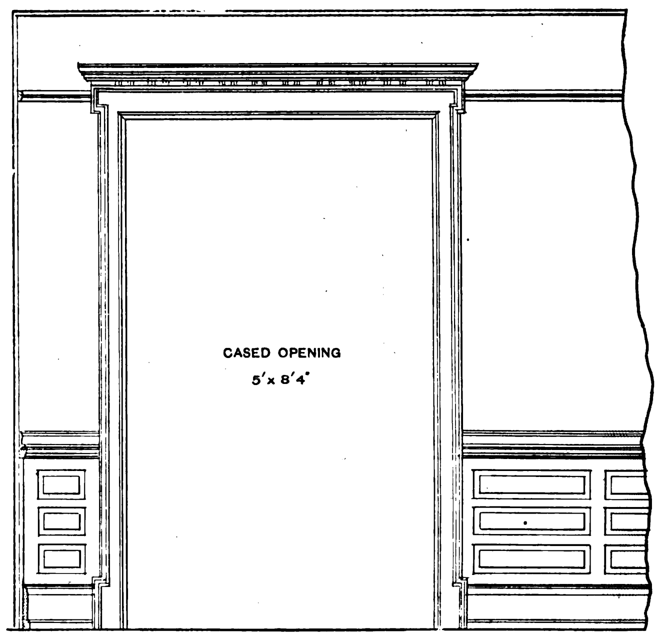


Fig. 14.—Elevation Showing Dining Room Finish.—Scale, ⅜ Inch to the Foot.

Estimating a Brick House.—Details of Inside Finish.

Second Floor Finish.

It is understood that the second floor is finished in soft wood and painted. The cost of the windows on this floor was given in No. VIII ofthis series of papers, and the cost of trimming will be the same as that mentioned for price in the previous paragraph. There are 16 doors and doorways on this floor, all doors being four-paneled, molded and 1⅜ inches thick. The casings throughout, windows and all on this floor are to be as shown in Fig. 13. The cost in labor to finish one of these doors, all the material being furnished and finished ready to put in place, will be about as follows :

Making frame	$0.84
Setting frame in place	.30
Casing frame, two sides	.60
Planting back molding, two sides	.30
Fitting and hanging door	.40
Putting on lock and furniture	.40
Total	$2.84

There must be added to this the cost of material for frame, casings, moldings and the door itself. Each door will require 38 feet in length of 6 inch casing, and the same number of feet of band molding, also about 15 feet of dressed and rebated plank for the frame. The cost of this material will of course be governed by local prices, but about $1.50 will be the average cost of this material,

down 100 feet of such as would likely be used in a building similar to the one under consideration. The dining room, kitchen and bathroom are wainscoted, the former in hardwood paneling, the latter in matched pine. The main hall, like the dining room, is paneled, which leaves the sitting room and parlor to be finished with a hardwood base, which should not be less than 14 inches wide. It should be a double base—that is, it should have one plain plinth board 8 inches wide with groove on top edge, and a molded top piece with tongue in lower edge to fit in groove provided in plinth. The top piece should not be less than 6½ inches wide, including tongue. To lay this base properly, coping internal angles and mitering external ones, is worth 5 cents a foot running measure, and twice that amount fitting around the curved wall in the sitting room. The material, finished ready to lay down, will cost from $40 to $75 per 1000, according to the kind of material used. When down, it is usual to plant a quarter round against it, the quarter round being nailed to the floor. This piece sometimes gets the name of " carpet strip."

The base on the second floor and in the attic is of pine or other soft wood and should not be less than 12 inches wide on second floor, nor 10 inches on attic floor. To lay either of these, including quarter round, is worth 3 cents per foot and the material is worth about 4 cents, making the total cost of base when laid about 7 cents per foot.

Back Stairs.

The back stairs leading from the kitchen to second floor are closed stairs, with a platform landing about half way up. These stairs will require 16 treads; each tread and riser, including strings, carriage and platforms, costing about $1.80. The stairs leading from second story to attic floor are similar to the above, with the exception that the platform is divided into three winders in order to get sufficient lift to reach the attic floor at a given point. The material used in this upper flight need not be so costly as that in the lower flight, which may bring the cost down to $1.50 per step. Back stairs in buildings of this kind are generally estimated to cost from $25 to $35, the former figure being the most employed. The estimate above is as near the current figures as it is possible to get them.

Wainscot.

An estimate for the hardwood wainscoting in dining room and main hall, to be finished as shown in Fig. 14, has been rendered, so we will not repeat, but that exhibited in Fig. 15, which is designed for the kitchen and bath-

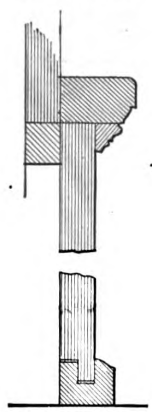


Fig. 15.—Detail of Wainscoting in Kitchen and Bathroom.—Scale, 3 Inches to the Foot.

Estimating a Brick House.—Details of Inside Finish.

room, has not yet been figured on. This wainscot may be of pine or of other soft wood in the kitchen, and worth about $1 per square of 100 feet to put in place, including cap and floor piece as shown. I would advise that all bath-rooms be finished throughout with hardwood, including wainscot. This would be worth $1.75 per square to put up, if of the same pattern as shown in Fig. 15. If paneled it would be much more. If done in pine same as kitchen, it will cost the same as kitchen per square. Material suitable for this work will vary in price. In some places it may be obtained for $18 per 1000, matched and beaded; in other places it will run as high as $50 per 1000, so the estimater must first satisfy himself as to the price of the material before he figures out his tender for presentation. To the above must be added nails, which will average about 10 pounds to the 1000 feet of wainscoting. Cost of nails must also be added to prices given for laying base.

Closets.

There are nine closets in the building, not counting toilet closets, china and pantry closets. These nine closets are to be fitted up with two deep drawers, closed cupboard under drawers, with shelves and wide shelf over drawers, wardrobe hooks and ribbon pieces for hooks and upper shelves. To make drawers, doors, shelving and ribbon pieces will take about 100 feet of stuff for each closet, and the work, including fitting and hanging doors, making and dovetailing drawers and fitting them in place, building in frame and doing other work to complete the closet, will take about three days' work for one man. This of course includes machine work, putting on wardrobe hooks and trimming cupboard doors and putting hardware on drawers. Hinges, catches, drawer pulls, 1 dozen wardrobe hooks, nails and screws, may be purchased for about $1.30. Here, then, we have the estimate of one closet complete, ready for the painter, namely:

100 feet of stuff	$....
3 days' labor at	....
Hardware complete	1.30

This will be the average cost for each closet, and if multiplied by nine, will give the total for all the clothes closets in the house. The toilet closet under the main stairs will be fitted up in hardwood and will have basin and marble slab and be plumbed for hot and cold water supply and waste, with hardwood doors under stand. Hardwood paneled wainscot and mirror frame, 1 dozen bronze wardrobe hooks on suitable ribbon pieces, the whole finish to conform with that in reception hall. The work alone to fit up this closet, exclusive of plumbers' work, will require one man about eight days. This includes all machine and other work. About 100 feet of good hard wood stock will be required, and the hardware, not counting mirror, will cost about $3, as all the furniture will be bronze. The china closet leading off from dining room should have a glass door in front and be fitted up with hardwood inside and be supplied with drawers, shelves and hooks for cups and similar porcelain, under shelves. From these figures the total cost of fitting up china closet in good style may be estimated. Besides wardrobe hooks and ribbon pieces in clothes closets, there will be required about 100 feet of ribbon pieces and 6 dozen hooks in kitchen, servant's room and attic, the total cost of which will be about $4 all told.

Bathrooms.

There are two bathrooms in the house, one for the family on the second floor and one for the servants in the attic. The main bathroom is supplied with wash basin, water closet and 14 ounce planished copper bathtub. This room is fitted up in hardwood in good style, wainscoted, as stated before, with matched and beaded narrow stuff. The front of tub is faced with same stuff, with roll top, the whole finished off nicely. The wash stand has hardwood paneled doors, hung and trimmed with bronze trimmings. The water closet is detached, fitted with roll seat and cover hung with bronze hinges. The cost of the wood work in this room, exclusive of wainscot, doors, windows and their trimmings, would be about $20. This would include labor, material and hardware, but would not include plumbing supplies. Since this house was designed, in 1894, it has become more usual to have bathtubs isolated or "detached," and this does away with the necessity of inclosing the bath-tub with paneling or wainscot—a very important matter and one in the interest of cleanliness and health. Where expense does not stand in the way, it is always better to have a porcelain tub and have the whole bathroom fitted up with open plumbing. The bathroom in the attic should also have a wash basin and water closet, as well as a bathtub. The work may be plain, but all the material used should be of hardwood with japanned hardware. To fit up this room in keeping with finish in other parts of attic, including everything but plumbers' supplies, will cost about $16. This does not include windows, doors, wainscot or their trimmings.

About 8,500,000 workers in Great Britain are dealt with in the fourth annual report of the Labor Department of the British Board of Trade, just published, and covering the year 1896. Of these, the report indicates that only about 607,000 were affected in their wages. The general tendency in this respect was upward, 382,825 persons having had their wages raised and only 167,357 had theirs decreased, while there were temporary changes, up and down, in the case of 58,072 more. The net result of all the changes was an average rise of 21 cents a week. In the building trades the advance was 50 cents a week and in the metal, shipbuilding and engineering trades 27 cents a week. The hours of labor in 1896 were changed in the case of 108,271 individuals, the changes representing an average reduction of three-quarters of an hour's work a week for each person affected.

The Builders' Exchange

Directory and Official Announcements of the National Association of Builders.

Officers for 1897-8.

President,
Thos. R. Bentley of Milwaukee, Wis.

First Vice-President,
Wm. H. Alsip of Chicago, Ill.

Second Vice-President,
Stacy Reeves of Philadelphia, Pa.

Secretary,
Wm. H. Sayward of Boston, Mass.

Treasurer,
George Tapper of Chicago, Ill.

Directors.

Baltimore, Md.	S. B. Sexton, Jr.
Boston, Mass.	C. Everett Clark.
Buffalo, N. Y.	Charles A. Rupp.
Chicago, Ill	Wm. M. Crilly.
Detroit, Mich.	John Finn.
Lowell, Mass.	Wm. H. Kimball.
Milwaukee, Wis.	W. S. Wallschlaeger.
New York City	Chas. A. Cowen.
Philadelphia, Pa.	Geo. Watson.
Portland	George Smith.
Rochester, N. Y.	John Luther.
St. Louis	P. J. Moynahan.
Worcester	John H. Pickford.

Arbitration.

As the time approaches when rates of wages, hours of labor, working rules, &c., for the ensuing year are under consideration by employers and workmen in the building trades, the Form of Arbitration prepared and advocated by the National Association of Builders is recommended as offering the best possible means for establishing harmonious relations between the two. As implied by the word arbitration, the form recommended by the National Associaton provides for arbitration pure and simple, and under such conditions that both sides are equally represented and benefited. Under the operation of the form a deadlock is impossible, and both workmen and employers have equal voice in choosing the umpire, whose decision is final, in case the services of an umpire are required.

In addition to the Form of Arbitration the National Association of Builders has prepared rules and regulations for the establishment and government of a Joint Committee of employers and workmen, under the operation of which arbitration is applied.

Wherever this Form of Arbitration has been set up the results have been most satisfactory, and questions that have formerly failed of settlement have under this system been adjusted without friction and to the satisfaction of both sides.

The secretary of the National Association of Builders will gladly supply all who desire the same with copies of the form and the rules for the establishment and government of the Joint Committee under which it is applied. The secretary's address is Wm. H. Sayward, 166 Devonshire street, Boston, Mass.

Organization Among Builders.—II.

Comparatively few members of the average builders' exchange understand the meaning of the word organization. It is generally understood to mean, when applied to a builders' exchange, a body of men bound together by an agreement to abide by certain rules and regulations for the government of their business conduct for the accomplishment of certain ends. As a proposition this general conception is, broadly taken, fairly correct; but when an attempt is made to put it into practice—to organize—something more is required. In actual organization every member must understand that unless he personally conforms to the letter and spirit of membership, organization does not exist. If, in a builders' exchange, a member fails to treat his competitor fairly, or tries to secure contracts through unjust treatment of sub-bidders, or gives preference to outsiders when other things are equal, he violates the spirit or letter, or both, of his pledge to his fellow members and creates disorganization.

Organization in the true sense cannot exist unless all the members are in harmonious relation to each other. In many cases members of an exchange do not feel that they should give fellow members the benefit of any work they may have to let or materials they may wish to buy; but they do have a very keen appreciation of the fact that other members having work to let or materials to buy should give them the preference.

The only understanding possessed by the average exchange member of the rules of conduct to which he has pledged himself is the knowledge that he has subscribed to a constitution and by-laws containing certain requirements by which he is expected to abide. As to the spirit of those requirements and the principles they announce he generally knows little and cares less. Most members fail to realize that membership carries with it an actual obligation to do something. Organization is not a gift enterprise in which all members are to receive and never give; it is an arrangement for reciprocal action in which the benefits received should be in exact relation with the benefits conferred. A builders' exchange is not necessarily an organization; it may have a constitution and by-laws, a corps of officers and a place of meeting and still not be an organization, for the members may be so out of harmony with each other that distrust, opposition, &c., have brought about complete disorganization, in spite of the fact that the husk of organization still exists.

Many builders' exchanges that are already in existence are organizations in name only, and are still confronted with the need of organizing before any adequate benefits from membership can be secured. It is the duty and privilege of those members who are willing to live up to the letter and spirit of organization to require all others to do the same or get out, and the bugbear of requiring compliance with honorable business methods from tricky members or expelling them outright is greatly overestimated. Infinitely more harm results from the presence of tricky members than from their absence, no matter how much their enforced absence may seem to cost.

Builders who are contemplating the establishment of exchanges should be careful to select only such members to begin with as will insure organization—that is, as will insure a body of men whose relations will be as nearly harmonious as possible, and who will form a nucleus of future strength and dignity by making association with them so desirable that rigid selection may be pursued in the admittance of all future members.

ANOTHER hotel is to be added to the large number already existing in New York City, plans having recently been filed with the Bureau of Buildings for a structure which will be 12 stories in hight, and which is estimated to cost $500,000. It will have a frontage of 80 feet on Thirty-fourth street and will occupy the site of the old Fourth Presbyterian Church near Sixth avenue.

THE new Roman Catholic Cathedral which is to be erected in Newark, N. J., will have a seating capacity of 2000. It is expected that owing to the magnitude, complexity and length of time required for the work the contracts will be awarded in separate parts, over 14 in number.

Iron Roofing Association.

The twelfth annual meeting of the National Iron Roofing Association was held at the Grand Hotel, Cincinnati, Ohio, January 18 and 19. The first day's business was devoted exclusively to the work of the various executive committees, the real business of the meeting being transacted on the last mentioned date. The industry was represented by the following firms, viz.:

American Corrugating Company, St. Louis, Mo., by H. P. Lloyd.

American Steel Roofing Company, Cincinnati, Ohio, by Geo. M. Verity.

Ætna Standard Iron & Steel Company, Bridgeport, Ohio, by W. H. Eaton.

Chas. H. Connor & Co., Louisville, Ky., by E. H. Connor.

Chattanooga Steel Roofing Company, Chattanooga, Tenn., by J. E. Annis.

Cincinnati Corrugating Company, Piqua, Ohio, by J. G. Battelle and J. H. Frantz.

Cambridge Roofing Company, Cambridge, Ohio, by J. B. Outland and H. C. Hornbrook.

Garry Iron Roofing Company, Cleveland, Ohio, by Geo. E. Needham.

Globe Iron Roofing & Corrugating Company, Cincinnati, Ohio, by A. L. Andrews.

Gedge Bros., Anderson, Ind., by B. H. Gedge.

Hyndman Steel Roofing Company, Cincinnati, Ohio, by R. J. Hyndman.

W. A. List & Co., Wheeling, W. Va., by W. A. List.

St. Louis Corrugating Company, St. Louis, Mo., by G. A. Banantine.

E. E. Souther Iron Company, St. Louis, Mo., by A. G. Souther and F. E. Codding.

New Philadelphia Iron & Steel Company, New Philadelphia, Ohio, by H. D. Westfall.

American Tin Plate Machine & Mfg. Company, Canal Dover, Ohio, by S. Y. Buckman.

T. C. Snyder, Canton, Ohio.

A large number of letters were received by the secretary from those unable to be present, expressing their regrets.

The morning session was entirely taken up with the appointment of various committees and the discussion of details having for their basis the betterment of trade conditions. One of the principal features of the discussion was the use or adoption of a specific paint formula, the object being to adopt a uniform weight, quantity and quality. Prices were also dwelt upon, it being the consensus of opinion that in view of a reasonable certainty of an advance in raw material producers of roofing must of necessity ask a corresponding advance in the finished product, and that in the very near future, too. The meeting closed with the election of the following officers, to serve during the ensuing year, and the formation of an Executive Committee:

Geo. E. Needham, Cleveland, Ohio, *president.*

E. E. Souther, St. Louis, Mo., *vice president.*

Geo. M. Verity, Cincinnati, Ohio, *secretary and treasurer.*

Executive Committee.

Alex. Glass, Wheeling, W. Va.; E. Langenbach, Canton, Ohio; J. G. Battelle, Piqua, Ohio; J. E. Annis, Chattanooga, Tenn.; A. L. Andrews, Newport, Ky.; H. C. Hornbrook, Cambridge, Ohio.

New Publications.

A TREATISE ON ARCHES By Malverd A. Howe, C. E., Professor of Civil Engineering at Rose Polytechnic Institute. Size 6¼ x 8¼ inches. 371 pages and 73 illustrations; bound in cloth. Published by John Wiley & Sons. Price, $4.

This work is designed more especially for the use of engineers and students in technical schools, and is a very comprehensive treatise on the theory of the elastic arch, while including a consideration of masonry arches. The theory of the elastic arch as developed in the pages of the volume is based upon four fundamental equations demonstrated by Weyrauch in 1879. From these equations have been deduced formulæ similar to those commonly given in American text books, but in a simplified form for practical use. In addition to these there have been introduced a number of general formulæ, many of which are new. The work is divided into 15 chapters with appendices and numerous tables. The treatment is wholly analytic, yet is presented in such a way as to render what would otherwise appear to be complicated equations of comparatively easy application. The effect of the axial stress, which is usually neglected by American authors, is thoroughly discussed, exact as well as approximate formulæ being given for all cases likely to occur in practice. It is shown that in flat arches, fixed at the ends, the effect of this stress should not be neglected, if economy of material is considered. In regard to masonry arches, many difficulties and inaccuracies of the common methods of treatment are pointed out. The practicing engineer, who has little time for mathematical demonstrations or to search through pages of transformations for a desired formula, cannot fail to appreciate the collection in simple form of the necessary formulæ likely to be needed in practice, and also the ease and celerity with which they can be applied with the aid of the tables which are given. The author believes that the demonstrations are sufficiently simple to be easily followed by the senior students in technical schools, and with the aid of the tables class problems can be solved that otherwise would be impossible on account of the time required where direct computation of the various terms must be resorted to.

IN the Forestry Building at the Centennial Exposition at Nashville, Tenn., 45 different kinds of hardwoods were exhibited in one collection, all from one Tennessee farm.

CONTENTS.

CARPENTRY AND BUILDING

WITH WHICH IS INCORPORATED
THE BUILDERS' EXCHANGE.

DAVID WILLIAMS COMPANY, - PUBLISHERS AND PROPRIETORS
232-238 WILLIAM STREET, NEW YORK.

MARCH, 1898.

Education of Young Architects.

In these days of towering office buildings and magnificent structures both public and private, it behooves the young man who decides to enter upon the practice of architecture as his profession in life that he prepare himself for his work in a manner which will render every detail thoroughly familiar. Broadly speaking, he must acquaint himself with the nature of all materials entering into the construction of buildings and must understand how to combine architectural effects in such a way as to produce a pleasing and harmonious whole. It necessarily requires a vast amount of study to accomplish all that this implies, but some of the methods of training looking to the education of the architect are interestingly described in an article contributed to the *Atlantic Monthly* for February by that well-known student of architecture, Russell Sturgis. An expression of opinion from one so well qualified to discuss the question cannot fail to command the attention of a wide circle of readers. The author deals with the subject under the head of " The True Education of an Architect," handling his theme in a vigorous manner and at the same time bringing a strong indictment against the present methods of architectural teaching, which, in his opinion, are wrong and misdirected. The author states that first of all the young architect should be taught " how to build "—that is, he should not only have a thorough understanding of the means at his disposal and the object which he purposes to attain, but he should be able to present a mental picture of the building he intends to erect together with its details of construction. This requires that he should know all about the way in which " brick and stone are laid ; how mortar is mixed and applied ; how walls are bonded together ; when anchors are needed which shall tie the walls to the floors and whether it be possible to avoid the use of anchors ; under what circumstances lintels may be safely employed ; how far corbels may be used to advantage ; the conditions of an arch, and whether brick walls should be solid or hollow." He should also have some ideas with regard to the use of air spaces, while the building of chimneys should be made a special study. In fact, says Mr. Sturgis, " the professional architect must know in an intimate sense the whole art of building. He must also love building; he must love heavy stones, good bricks, stout solid walls and handsome timbers handsomely cut and framed." He must finally have such an eye and such a soundness of judgment that bad work cannot escape him. As regards the modern construction in which iron and steel are so largely employed, the author recognizes this to be the province of the engineer, although the architect, while serving a subordinate capacity, should understand its general principles.

A Knowledge of Drawing.

The second important point in the education of the young architect is " to learn to draw." He should draw from the best examples within his reach, and at all events he should draw in great numbers " gables and dormers, towers and steeples, timber roofs seen from within and molded arches seen at various angles ; groups of columns, entablatures and archivolts and masses of buildings as seen from an adequate distance." These things, we are told, he should draw free hand under all sorts of conditions and in all sorts of light and from such drawing he should gain " such a knowledge of the appearance of the existing building, solid and enduring, with firm joints and upright angles, that the look of the structure will have become a part of his familiar knowledge." Mr. Sturgis intimates to the young architect that if he is content, as many of the practicing architects seem to be to-day, " to design buildings without decorative sculpture or decorative painting," he need not worry to learn drawing ornament. On the other hand, however, it should be remembered that architecture has always adorned itself with sculpture and with painting and probably always will. " The rejection of such ornament," says the author, " is a surer sign of deadly decay than exaggeration or misapplication of such adornment," and the architect who deliberately rejects the knowledge and the practice of sculpture and painting is hardly more than " an inartistic modern of the most hopeless species."

Modeling in Clay.

The third requirement which the young architect should possess is a knowledge of modeling, which for architecture is of two sorts, one and the same in tendency and character, but still capable of separation, the one from the other. The writer dwells upon the matter of sculptured detail as " the other half of the subject of modeling in connection with architecture." It will be readily admitted, he says, that when a capital is required which shall not be a mere or even a slavish copy of an old one, it should be modeled full size. Bas reliefs run a better chance of being effective as decoration if they have been modeled instead of being cut direct from a drawing. The great advantage of modeling, if not full size at least on a large scale, is shown in the example of a porch on which three or four columns are to be clustered together in one group, or arranged in couples. Possibly two of the capitals may need to be cut from one and the same block, but we are told that even if each capital should be shaped from a separate stone the close proximity of the two, and still more of four capitals, requires in each a treatment which will be found to differ from that of a capital which is four feet away from its nearest neighbor. If the capitals are to differ in design it becomes highly necessary to see their models side by side, and this perhaps in full size. And so it is with other parts of a building which are to be regarded as decorative or ornamental in their treament. Even the most severe piece of classic work should be modeled, says Mr. Sturgis, in order that the designer may be sure that he is getting his own design into shape. In concluding his paper the author emphasizes the three requirements of the young architect as " sound and ready knowledge of building, dextrous readiness and some approach to excellence as a free hand draftsman and some skill as a modeler." All these, he states, is a part of his higher education and of his training as a man rather than as an architect.

Fires in High Buildings.

The destruction during the past month of one of the downtown office buildings, while in no sense a fire proof structure, served to afford, by reason of its proximity to one, an excellent illustration of the practical impossibility, under the present conditions, of checking a fire when it attacks the upper floors of a modern "sky scraper." Since business buildings have towered to a hight of over six stories the difficulty of providing adequate fire protection has become almost insuperable. Chief Bonner of the New York City Fire Department, than whom there is no higher authority in these matters, does not hesitate to declare that once a fire secures a good start in one of the upper stories of a modern sky scraper nothing can be done but to let it burn. He holds that it is utterly impossible to fight a fire above a distance of 125 feet. The only remedy that is suggested is the adoption of interior fire plants and the organization of a fire corps of employees to operate them in case of an outbreak. A number of the high modern buildings in New York are already supplied with interior stand pipes and the necessary equipments, but the majority of the owners of such structures are content to depend upon the fire proof construction of the walls and floors, a protection which time and again has been practically demonstrated. The insurance companies are actively working in this matter, however, and it is not unlikely that pressure will be placed on the Building Department to compel owners of buildings over six stories high to provide their own fire fighting apparatus. It is not merely a question of danger to the building itself and its occupants, but also to the lower buildings adjoining, and to those across the street, when the street is narrow, as is so often the case in the crowded parts of a city. This was proved in the case of the recent fire in Nassau street, when the buildings at the side of the structure were burnt out by reason of the flames entering the windows, while those opposite were damaged and only saved with difficulty from sharing a similar fate.

The National Association of Builders.

Attention is called to an extract from the last annual report of the secretary of the National Association of Builders in relation to the attitude of the organization toward local bodies of builders. The constitution adopted at the last convention seems to have placed the association on a broader platform than ever, and to have opened the way to wider extension of sound business practices and increased feelings of fraternity among builders throughout the country. The abandonment of everything in the nature of compulsory requirements to membership encourages participation in its work, which is purely educational and entirely apart from the mechanical or constructive side of the builder's business life.

New Manual Training School.

A new manual training school is being erected at Menomonie, Wis., which covers an area of 78 x 182 feet in size and will cost about $125,000. It is known as the Stout Manual Training School, and is being put up and equipped by Senator James H. Stout of the place named. The building will be of fire proof construction, three stories and basement in hight, and with a tower 140 feet high. Provision will be made for all branches of manual training, including joinery, pattern making, wood turning, black smithing, molding and foundry work, mechanical drawing, free hand drawing, wood engraving, clay modeling, &c. The structure was designed by John Charles of Menomonie, Wis., with Conover & Porter of Madison as associate architects

Novel Fire Proof Construction for Warehouses.

A building, which is generally regarded by architects and underwriters as one of the best examples of strictly fire proof construction in that city, if not in the United States, is the new warehouse of John Druecker, now in process of erection on Canal street, in Chicago, Ill. The steel frame work is being incased in a fire proof covering of cinder concrete, the nearest approach of the steel to the air at any point being over 3 inches. The interior of the columns will be filled solid with the same material. The floors will be cinder concrete, in which the beams will be entirely enveloped, and the wearing surfaces of the floor will be Portland cement and crushed granite. The external columns will be treated the same as the internal ones, except that the outer or weather covering will be hollow bricks. No tile, however, will be used in the construction of the building, except the elevator inclosure. The window frame and sash throughout will be of iron, and all window glass will have wire imbedded in it to prevent breaking under the action of heat. The building will rest upon Norway piles driven to the hard clay, the piles being 55 feet in length and cut off at least 5 feet below the level of the water in the river. The piles will carry dimension stone foundations up to the basement floor line. The structure, which will be 15 stories in hight, is estimated to cost $300,000, and 100 feet of the frontage it is expected will be completed by May 1. The entire west front will have steel rolling doors through which freight will be handled direct from the cars to the floor. The entire east frontage will have steel rolling doors opening on to the river, through which freight will be handled from vessels. The structure will be lighted by electricity and will have three high speed freight elevators.

WE are indebted to Secretary Alfred Stone of Providence, R. I., for a copy of the "Proceedings" of the thirty-first annual meeting of the American Institute of Architects, which was held at the Hotel Cadillac, Detroit, Mich., September 29, 30 and October 1, 1897. The "Proceedings" are issued in the usual attractive style characteristic of the secretary's office, and carry as a frontispiece an excellent likeness of A. J. Bloor, who was secretary of the institute in 1874, '75, '76, '77, '81, '82, '83, '87, '88 and '89. For the past 30 years Mr. Bloor has devoted his efforts to the interests of architecture in this country, and during this long period has been secretary of the New York Chapter. He has just now retired from the office, and gone abroad for a visit to Egypt and Palestine. In addition to the proceedings of the convention the publication contains a list of the officers and committees of the institute, as well as a list of the members arranged in alphabetical order. There is also given a list of chapters of the institute arranged in chronological order.

HENRY WARD JOHNS, the pioneer in the asbestos industry of the United States, died on February 8, at his home in Park Hill, Yonkers, N. Y., after a prolonged illness. He was born in West Stockbridge, Mass., in 1837, and at an early age came to New York City, engaging in various lines of business before entering on that with which his name is more especially connected. In 1858, while experimenting with the view to perfecting a fire proofing compound, the indestructible character of asbestos impressed itself upon him and he devoted his entire attention to its development for commercial uses, building up a business of great magnitude. Mr. Johns was president of the H. W. Johns Mfg. Company of New York, and of the Johns-Pratt Company of Hartford, Conn.

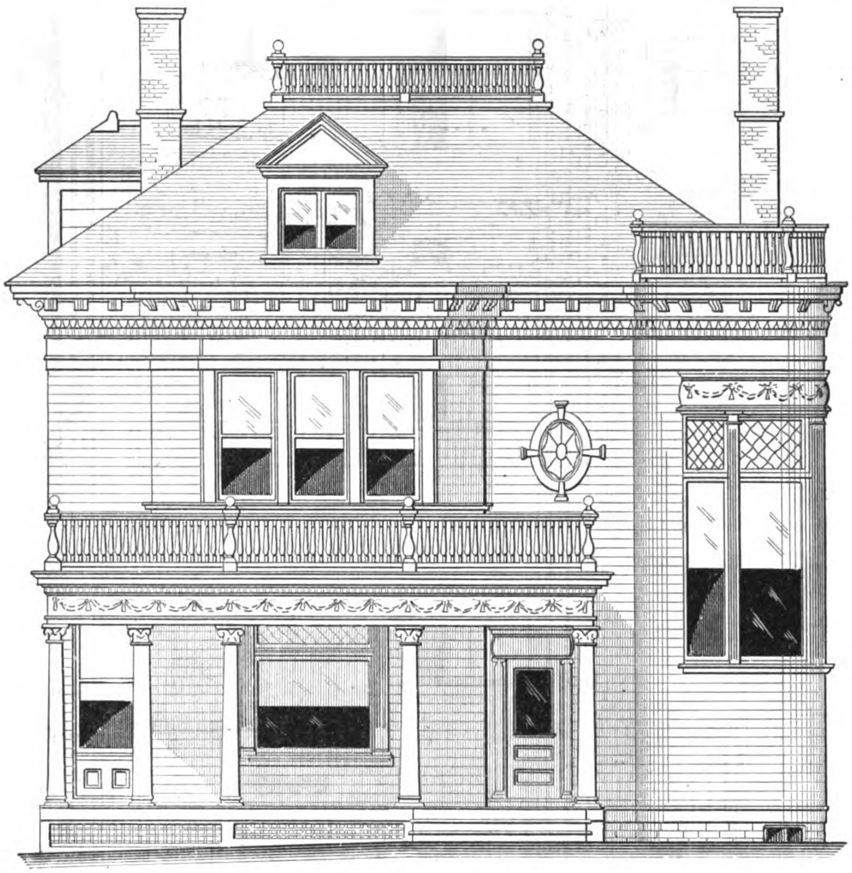
TWO DOUBLE HOUSES AT OVERBROOK, PA.

HORACE TRUMBAYER, ARCHITECT. WENDELL & SMITH, BUILDERS.

For Floor Plans see page 39.

COLONIAL RESIDENCE IN CINCINNATI, OHIO.

WE have pleasure in laying before our readers this month illustrations of a residence which is unique in design and "colonial" in its architectural treatment, the striking feature being the circular corner with large plate glass window which lights the main stairs just above the first landing. The general effects are rich yet unpretentious, while the details are carried out in a thoroughly first-class manner. Our half-tone supplemental plate shows the appearance of the finished structure, which stands on Price Hill, one of the many beautiful suburbs of Cincinnati, Ohio, and was completed only a few months ago for Mrs. Lizzie A. Hunter of that place. The floor plans show the general arrangement of the rooms while the accompanying details give an idea of the interior and exterior finish.



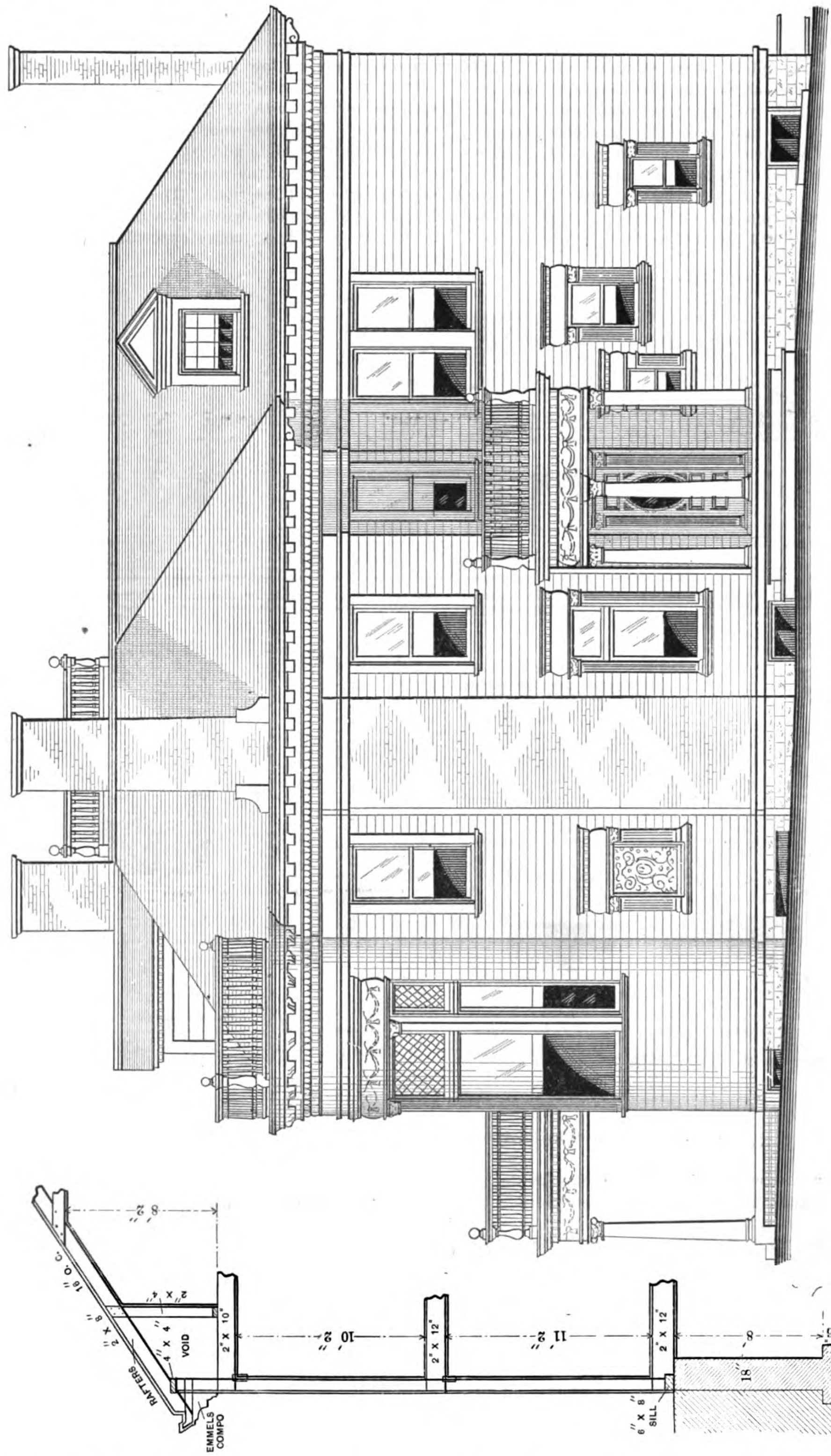
Front Elevation.—Scale, 1-8 Inch to the Foot.

Colonial Residence in Cincinnati, Ohio.—John P. Striker, Architect.

The underpinning is broken ashlar with cut chisel dressed beds laid in cement mortar. The entire exposed faces of the outside chimney on the left side of the house are of limestone broken ashlar, while the exposed face of the south chimney, which is the one shown in the half-tone picture, is of first quality Batavia red pressed brick, laid with sunken joints and pointed with black cement mortar. The timber employed is of best quality Norway pine. The outside walls, roofs and balconies are covered with yellow pine sheeting, planed and matched and secret nailed to every stud and rafter. All plain surfaces on the outside of the building are covered with Sachetts' No. 2 water proof sheeting paper, over which in turn are placed white pine weather boards 3½ inches wide and laid 2½ inches to the weather. All exterior finish, including porches, moldings, columns, dormers, window and door casings, water table, brackets, mullions, imposts, &c., are of white pine. The turned columns on the north and east porches are solid poplar with a 2-inch hole through their entire length. The porch ceilings are lined with narrow beaded yellow pine flooring, secret nailed. The deck on the main roof, floors of balconies and the porch roof are covered with M F tin, painted one coat on the under side. The main roof is covered with 10 x 18 inch Brownville black slate laid 7½ inches to the weather.

The sills on top of the stone walls are 6 x 8 inches, solid, and halved at intersections. The first and second story joist are 2 x 12 inches, while the attic floor joist are 2 x 10 inches, all placed 16 inches on centers. The floors are cross bridged with 1 x 3 inch bridging. The girder in the ceiling of the laundry is 6 x 10 inches, the post supporting it being 6 x 8 oak. The joist for porches with wooden floors are 2 x 8 inches, the main rafters are of the same size and the collar beams in the attic are 2 x 6 inches, also placed 16 inches on centers. The porch and balcony ceiling joist and rafters are 2 x 6 inches, and the studs are 2 x 6 and 2 x 4 inches, all placed 16 inches on centers. The second and attic floor joist are notched half an inch over a 1 x 5 inch girt strip let into the studs and spiked. The main corner posts of the building are 4 x 6 inches. Over the sliding doors is a 4 x 8 inch timber firmly attached to the studding, to which the sliding door hangers are fastened. The deck beams are 4 x 8 inches and the deck joist 2 x 8 inches, placed 16 inches on centers.

The floors are double, the lower one being of white pine and the upper one in the main hall and dining room of quartered oak strips 2½ inches wide. The floor of the music room and the chamber above is of clear white pine strips, secret nailed. The attic floor is standard yellow pine. All other floors are of white pine strips not over 3 inches wide and secret nailed. The floors of the porches are made of 1⅛-inch white pine tongued and grooved stuff, the joints being filled with white lead, painted and secret nailed. The main stairs are of quartered oak. The front door and that on the east side of the house are veneered with oak on both sides. All inside doors have five horizontal panels. The doors and frames showing in main hall and dining room are veneered with oak, but all others have stiles and rails of white pine with panels of yellow pine. All doors in the first story and the doors in the second story front chambers as well as the hall in the second story are 1¾ inches thick, all others being 1⅜ inches thick. The sliding doors are 2¼ inches thick hung with Coburn trolley hangers.

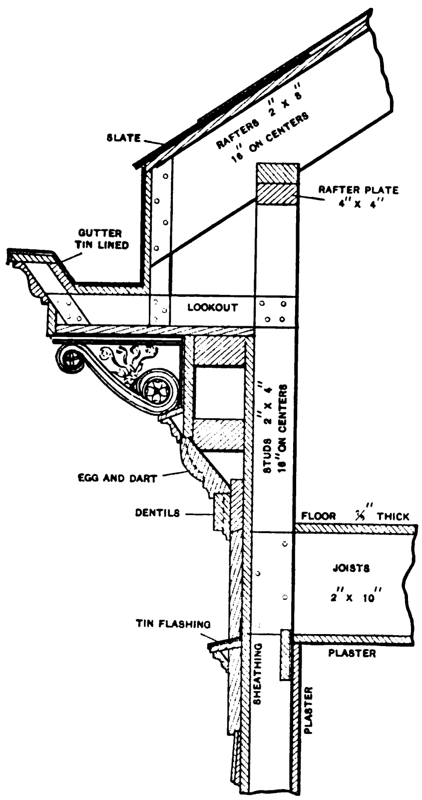


Side (Right) Elevation.—Scale, 1-8 Inch to the Foot.

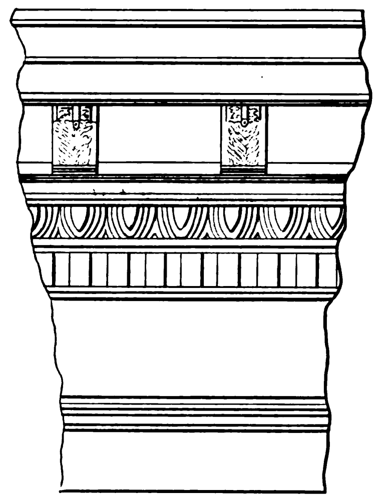
Colonial Residence in Cincinnati, Ohio.—Section and Side Elevation.

The finish in the first and second story main halls and dining room is of quartered oak, the dining room having a panel wainscot all around 4½ feet high, finished with shelf on top and base at floor. The fret work in the main in the dining room have a wide stool paneled underneath to the floor matching the wainscoting. The china closet in the serving room is fitted with glass doors, drawers, shelves, &c., all of yellow pine. All the hardwood in the first story halls and in the dining room is treated with a good paste filler, rubbed down with sandpaper and finished with two coats of Murphy's transparent wood finish. All the inside and outside wood work is painted with three coats of pure white lead and linseed oil.

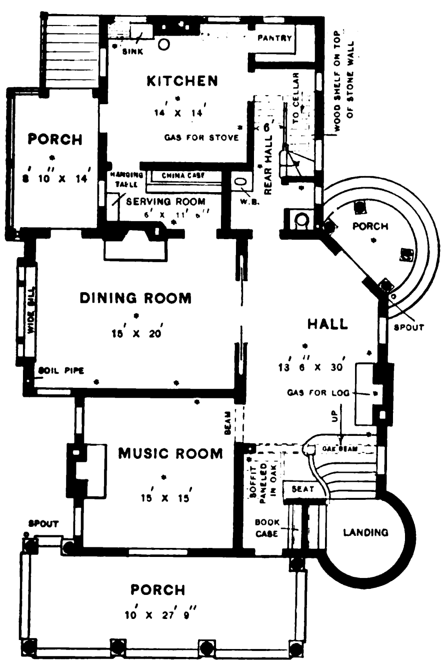
The bathroom has tiled floor and is fitted with Wolff's white enameled tub, siphon jet closet, Duroware bowl and nickel plated fixtures. The wash stand on the first floor and in the guest chamber on the second floor has a 14 x 17 Duroware oval bowl with Italian marble slab, supported on nickel plated brackets. The house is wired for electric lights and electric gas lighting, and is fitted with speaking tubes, electric bells, annunciators, &c.



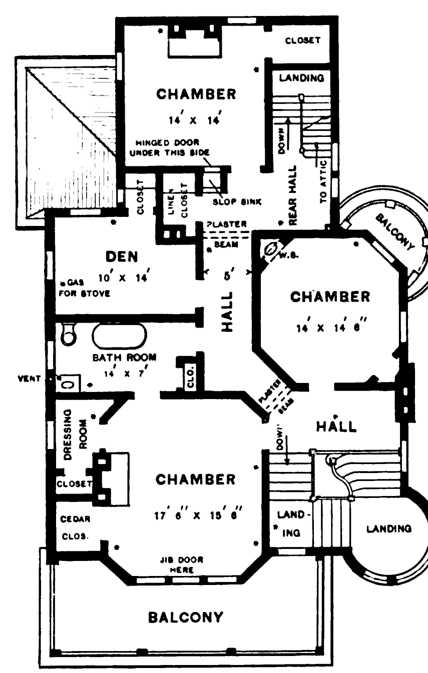
Detail of Main Cornice.—Scale, ¾ Inch to the Foot.



Partial Elevation of Main Cornice.—Scale, ¾ Inch to the Foot.



First Floor.



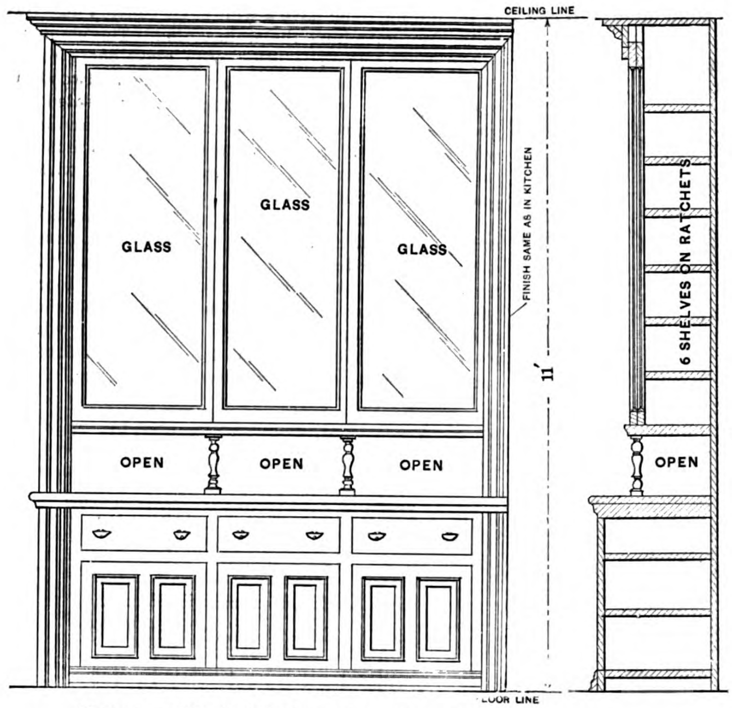
Second Floor.

Scale, 1-16 Inch to the Foot.

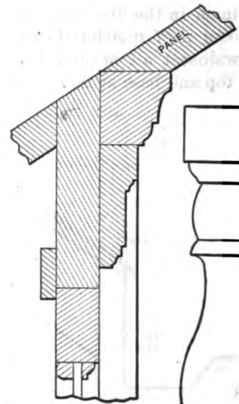
Colonial Residence in Cincinnati, Ohio.—Floor Plans and Miscellaneous Details.

hall is executed in oak. The finish in the music room is white pine, while that in the "den" is poplar, varnished. The finish in the front chamber on the second floor is of poplar stained in imitation of mahogany. All other finish is of selected yellow pine, varnished. The south windows

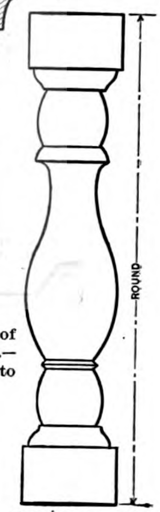
The building was erected in accordance with plans prepared by Architect John P. Striker of 96 Perrin Building, Cincinnati, Ohio, the contract price being $6800, but nearly $10,000 was expended by reason of various changes ordered by the owner before the structure was completed.



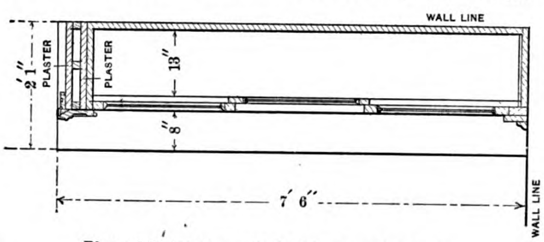
Elevation and Vertical Section of China Case.—Scale, ⅜ Inch to the Foot.



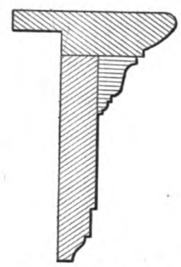
Detail of Cornice of Oak Bookcase.—Scale, 3 Inches to the Foot.



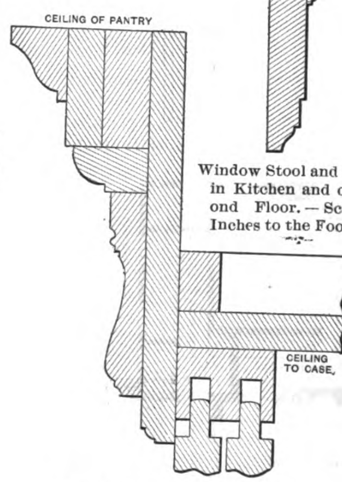
Spindle in China Case. — Scale, 3 Inches to Foot.



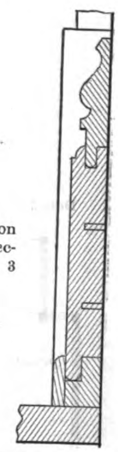
Plan of China Case.—Scale, ⅜ Inch to the Foot.



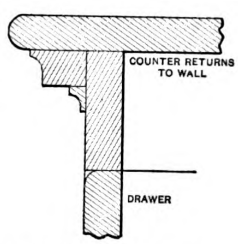
Window Stool and Apron in Kitchen and on Second Floor. — Scale, 3 Inches to the Foot.



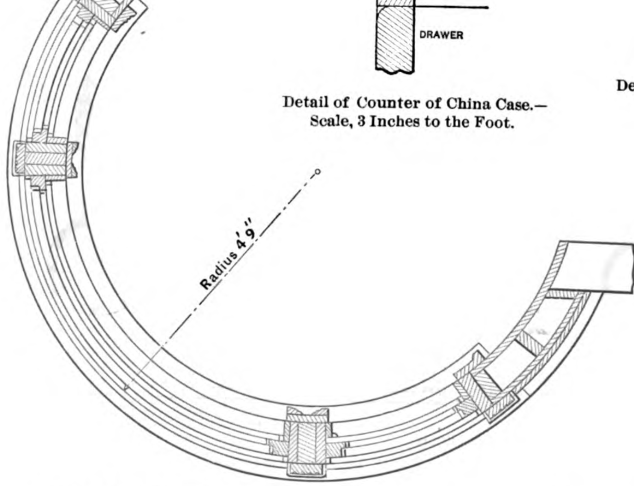
Detail of Cornice of China Case.—Scale, 3 Inches to the Foot.



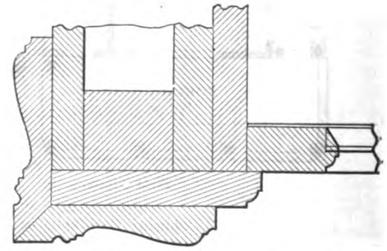
Base in Kitchen and on Second Floor. —Scale, 3 Inches to the Foot.



Detail of Counter of China Case.—Scale, 3 Inches to the Foot.

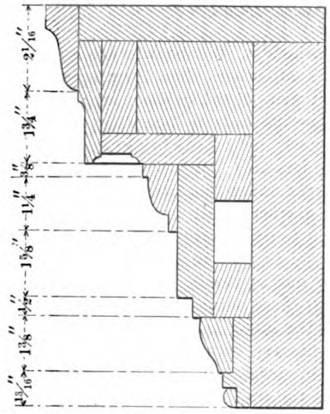


Plan of Circular Window at Front Corner of House.—Scale, ⅜ Inch to the Foot.

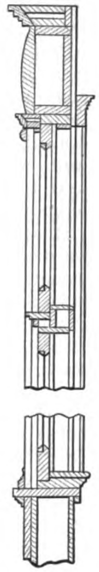


Horizontal Section of Trim at the Corners of the China Case.—Scale, 3 Inches to the Foot.

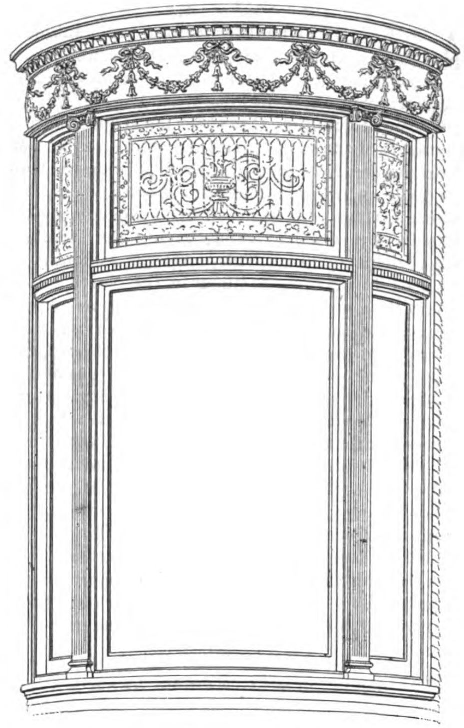
Miscellaneous Constructive Details of a Colonial Residence in Cincinnati, Ohio.



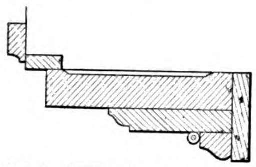
Detail of Finish in Music and Dining Rooms. —Scale, 3 Inches to the Foot.



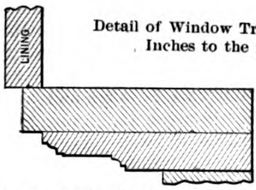
Vertical Section through Circular Window.—Scale, ⅜ Inch to the Foot.



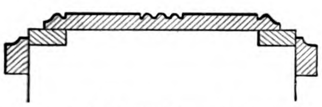
Details of Circular Window at Front Corner of House.



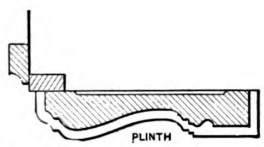
Detail of Window Trim.—Scale, 3 Inches to the Foot.



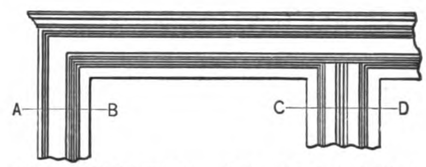
Horizontal Section through Trim at Side of Oak Bookcase — Scale, 3 Inches to the Foot.



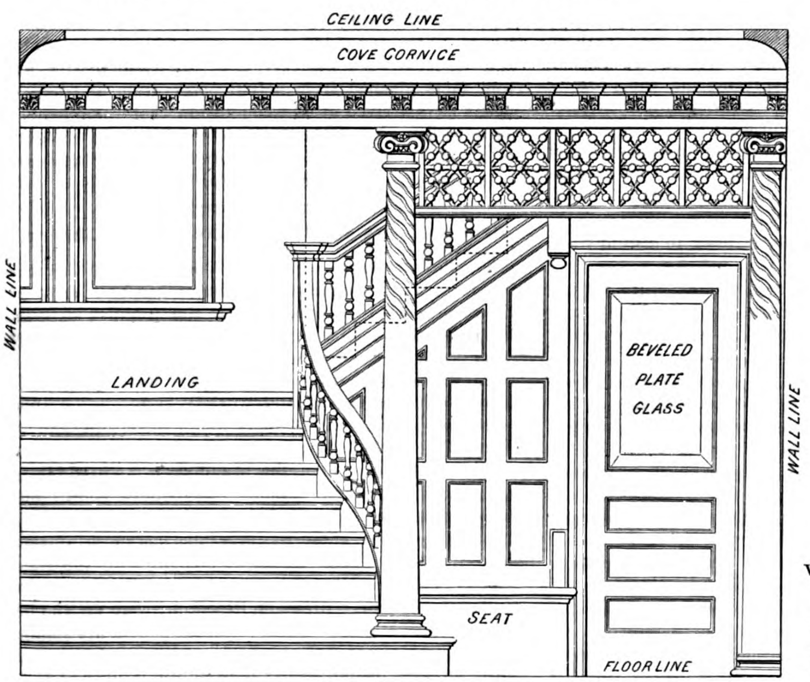
Section of Triplet Window on Line C D.— Scale, 3 Inches to the Foot.



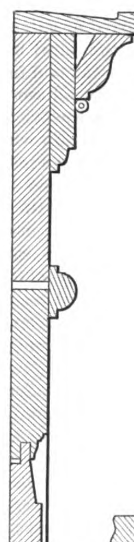
Section of Triplet Window on line A B.—Scale, 3 Inches to the Foot.



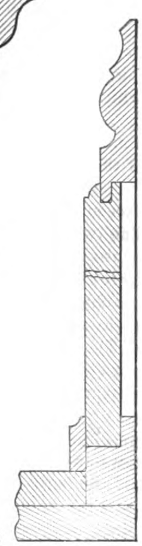
Trim of Triplet Window —Scale, ½ Inch to the Foot.



Detail of Main Stairs.—Scale, ⅜ Inch to the Foot.



Vertical Section of Oak Wainscoting in Dining Room.—Scale, 3 Inches to the Foot.



Base in Main Hall, Music Room and Dining Room.—Scale, 3 Inches to the Foot.

Miscellaneous Constructive Details of Colonial Residence in Cincinnati, Ohio

BRICK VENEER CONSTRUCTION.

A GREAT DEAL has been written on the subject of brick veneer construction, with arguments pro and con showing the existence of a decided difference of opinion among those presumably well qualified to discuss this form of building. One of the latest contributions to the literature of the subject is an article in a recent issue of the *Brickbuilder*, from the pen of Fred. T. Hodgson, from which we quote as follows : There is a species of construction in which a facing of 4 inches of brick work is applied to the outside of a wooden frame, giving the simulation of a solid brick structure. This device is seldom met with in the East, but is quite common in the North and the West and in the Canadas, and though owing its origin to conditions of a time when framing lumber was cheap and bricks were expensive and not easily obtained, it has persisted in spite of its manifest sham, and has ascribed to it virtues which are hardly offset by its illogical character. Most people who desire to use this construction have the impression that a frame house veneered with bricks will cost considerably less than would a similar house if the walls were solid and of the usual thickness. In an experience of many years I have seldom been able to persuade a client to substitute a solid brick walled house for the intended veneered sham, and yet the difference in the cost is in favor of the solid wall, if the veneering is figured as being properly done, and the wood work for the skeleton built in a thorough and substantial manner.

Foundation Walls.

The foundation walls required to sustain a veneered house must of necessity be as costly as those for a brick superstructure of corresponding dimensions, consequently there can be no saving in the foundation work. All bricks used in veneering must be facing bricks of very good quality, and as the veneering is but 4 inches in thickness all the brick work, excepting quoins, must be formed of stretchers, no "bats" being permitted, consequently the bricks will cost from 25 to 40 per cent. more than would bricks required for a solid wall, while the labor of laying a 4-inch brick course, including tying or bonding the bricks to the wood work, is nearly double that of laying bricks in a solid wall. Then, the brick veneer must be laid from an outside scaffold—an expense not always necessary in the building of a solid wall—and iron, japanned, tarred or galvanized ties or anchors to hold the bricks in position must be employed, at the rate of three to every 100 bricks laid in the wall, and these ties must be fastened to the wood work on the frame and the projecting ends built in the brick work. This is another expense which does not obtain with a solid wall.

As a rule, wooden window sills are employed in veneered houses, the use of stone being almost prohibited because of the shallowness of the reveal. If stone sills are used, it is quite evident the cost of sills and of setting them will exceed the cost of the same sills if used in a solid wall. The window and door frames required for a veneered house will cost just as much and in most cases a trifle more than will corresponding frames for a solid wall, and the chances of a tighter connection to the wall are greatly in favor of the latter.

The opportunities for fashioning ornamental brickwork on a veneered building are so few and expensive that they are rarely embraced, unless the ornamentation is of the crudest and most primitive sort—conditions that do not obtain in solid brick walls. The arching over windows and doors in veneered work is of the flimsiest kind, and the least disturbance in the building is sure to make itself felt in these weak spots by cracking or displacing joints, as it is impossible to properly bond or tie the work at these points.

Inside the brick veneer there is erected a frame studded skeleton. On the studding is nailed 1-inch pine or hemlock square edged boards. Sometimes the stuff is dressed and matched, which adds to the cost. At other times it is nailed on the studding diagonally, with a view of giving strength to the structure. When this is done and the frame is boarded on both sides, the boards are so nailed that the joints cross each other, thus forming a double bracing. In the Northern, Northwestern and Western States and the Canadas the outside boarding is covered with felt or building paper before the brick work is commenced, and some builders also line up the inside of the house with suitable paper under the lathing. This, when carefully done, makes a warm wall, but it takes a great deal of time and care to paper around the openings and well in between the joists, and in contract work it is next to impossible to get workmen to make wind tight joints with the paper at these points.

It is easy to see that the labor and materials used in the construction of the necessary frame ready to be veneered would cost very much more than the extra bricks and labor required to make the wall a solid one, and the walls of a veneered house, built as they ought to be, cost from 15 to 25 per cent. more than would gocd solid 9 inch walls.

Some of the Defects.

Now, then, let us see some of the defects of a veneered house, and what is likely to result from these defects. Everybody knows that wood expands and contracts with every change of atmospheric conditions, thus causing a quiet but sure tearing away of the bonding connecting the two materials together, a condition that in the end must bring ruin to the building. It is almost impossible to fit bricks around window and door frames sufficiently tight to keep out wind when the wall is only 4 inches thick. If, however, in veneering, care is taken and labor expended in having the joints between the frames and boarding properly covered with paper, well tacked on, it is possible to make the joints fairly tight, and they will remain so until the paper becomes broken or falls away from the brick from decay or other causes. This expenditure of labor and time, however, adds materially to the cost of the veneering. That brick veneering is a sham goes without saying, for the experienced eye knows as soon as it looks at the building that it is veneered. A wall showing nothing but stretchers cannot deceive even the apprentice boy, and if, as I have known in several instances, an attempt is made to cheat the eye by making every sixth course of bricks appear as headers, by using "bats," a glance at the reveals and at the ornamental work will convince the experienced eye in a moment as to the true character of the walls.

After a careful consideration of the whole matter, and from facts gleaned from actual observation and experience, I have arrived at the conclusion that there is nothing to be gained, but considerable lost, both in economy and in efficiency, from building brick veneered houses instead of houses with solid brick walls.

Bronze Doors for the Congressional Library.

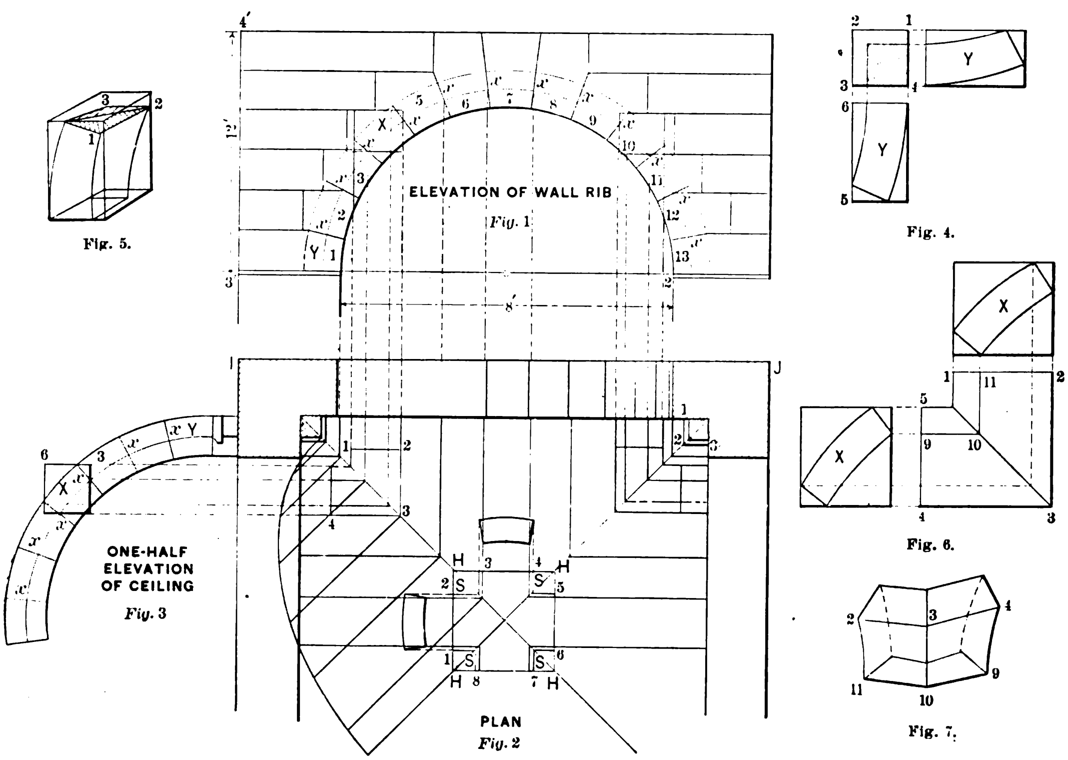
The last of three fine bronze doors for the Congressional Library Building in Washington has been finished, and was recently on exhibition at the foundry of John Williams, 556 West Twenty-seventh street, New York City. These doors are among the best examples of artistic bronze work ever made in this country. They were designed by Edward Pearce Casey, and work was begun on them nearly two years ago. The doors weigh three tons, and are 14 feet 3 inches high by 8 feet in width. In the center of the arch or tympanum of the last door is a seated female figure typifying Writing, flanked by winged genii. Surrounding this central group are figures representing four nations or peoples whose writings have had most influence on civilization—the Egyptian and Hebrew on the right, the Greek and the Christian on the left. The large panel in the right door represents Research; that on the left Truth. Above and below these large panels are smaller panels, those above decorated with wings and mountain laurel wreaths, being arranged to admit light, and those below showing figures of children supporting cartouches, which bear the symbols of Truth and Research.

SETTING OUT A PLAIN GROIN.*

THE subject treated in this article is one that is looked upon as being difficult to get out and expensive to cut, and consists of the intersection of two semi-cylinders, or arches, of a given thickness with the same radius or hight, forming in the plan where they intersect a straight line connecting opposite angles and in elevation a half ellipse. The only difficult part of the problem is the groin or angle stones between the springer and keystone, but when worked with a system and a knowledge of how they should be cut they become in the hands of a good mechanic as easy as an ordinary arch stone. There is a lack of such work as stone groins, vaultings, &c., that could be used to a great advantage in many of the large buildings throughout the country, enhancing their architectural effect without any great expense. In some of the vestibules of business blocks, or intersections of corridors in large halls, there is no prettier view than a series of groins, the soffit either plain or cut in panels, instead of a flat, dark ceiling. The ceilings need not be semicircular but segmental, which makes the expense much less on account of smaller stones being used. In this explanation of the diagrams we shall deal only with the ceiling raised above the wall rib, but if the surfaces of the groin were in the same plane the method of getting out the angle stones would be the same.

We will now proceed to lay out the groin, assuming that the diagrams represent the drawings furnished by the architect to the foreman, of which he is supposed to get out in stone what is shown on paper, and be able to lay out on the drawing board the full size so he can obtain pattern for the stone cutter. It is not really necessary to lay out the whole work, the face patterns being all that is required. The plan can be drawn to a scale 3 inches, or 1½ inches would give the sizes near enough to work from. Fig. 1 represents the wall rib, with a radius of 4 feet. The first step is to draw a semicircle and divide it into 13 parts, as shown. From center draw lines through the several divisions, which will give the joints of the outside or wall rib. Divide the distance, 8' 4', which is equal to 12 feet, into six courses, each 2 feet high, as shown at *o*, *o*, *o*, &c. Through the points draw lines parallel to the springing line touching the radiating joints of wall rib. Attach a piece of ashlar to each and draw plumb joint, as shown, this completing the face patterns of the wall rib. The keystone and Nos. 6 and 8 have no ashlar attached. The rest of the wall can be filled in to suit. The dotted curved line on the elevation shows the ceiling line. With a radius of 5 feet, strike a semicircle, the joints of which lie in the same plane as the wall rib, and the distance between the dotted lines will present the hight of the ceiling stone.

To draw the plan, Fig. 2, proceed as follows, taking a quarter of the plan, as all the parts are a repetition of the same: Draw a line, I J, parallel to the springing line, equal to the width of the elevation. From I and J draw lines perpendicular to them and set off the thickness of the wall rib equal to the depth of arch stone. Drop lines from the wall rib to plan to give soffit joint line of wall rib.



Setting Out a Plain Groin.—Diagrams Showing Method of Construction.—Scale, ⅛ Inch to the Foot.

In the elevation of ceiling, Fig. 3, which is divided into the same number of parts as the wall rib, drop lines from *x*, *x*, *x*, &c., from ceiling soffit lines of Figs. 1 and 3, as shown, until they meet in plan. Draw a line through the several points and we have the plan of the intersection of the two arches.

In order to cut the stones we will start with the springer at Fig. 4. Let 1 2 3 4 be an enlarged plan of the springer with the face molds. The size of the stone required is 1 2 x 3 4 x 5 6. The first work will be to cut the bottom true; next the two joints 1 4 and 3 4 square from the bottom. Then apply the face molds on each joint. Work a draft through 1 2 and 2 3 square from the joints, as shown in Fig. 5. Then from 1 and 2 draw a hard line, after which work the top beds of springer;

* Copyrighted, 1897, by Donald Fraser.

1 2 and 2 3 will be the intersection of the top beds and soffit. Work the soffits last and the stone is finished.

To cut an intermediate angle stone the process is about the same, but we will go over it to make it plain. Let X in each of the elevations be the stone required. Inclose it with lines, after which drop lines from each to the plan, when 1 2 3 4 will be the size of stone required. The hight will be equal to 6 3.

Fig. 6 is an enlarged pattern of the same. The first work will be to cut the joints 1 2 and 4 5 square with each other. Apply the joint molds X and be careful to get them in the same plane of each joint. Next work a draft through 4 3 and 2 3 square from each joint. Now draw a hard cutting line through the drafts, as 2 3 and 3 4; next work drafts through 9 10 and 10 11; draw hard lines, as shown in Fig. 7. With the joint molds marked on and the hard lines 4, 3, 2 and 9, 10, 11 one can work the beds and soffit. This is the only true and practical method, as the workman has no levels to watch or get out. It also joins the miter at the intersection of the beds. All the other groin stones are cut the same way.

The keystone is next in order. Get the size of stone from the plan and the elevation, as H, H, H, H of Fig. 2, for the length and breadth and stone No. 7 of Fig. 1 for the hight. First work four drafts around, as H, H, H, H. Let them be straight and out of wind. Lay out the soffit with rough lines and knock out some of the rough at S, S, &c. Next join the ends 1 2, 3 4, 5 6 and 7 8. Apply the keystone pattern on the joints. Now work drafts through 2 5, 1 6, 4 7 and 3 8. Draw hard lines through and they will give the lines by which to cut the soffit. Next work the soffit through one way, then hold a straight edge across from corner to corner and draw lines crossing one another. This will be the miter line formed by the intersection of the key patterns. The joints will miter as they are cut. I have endeavored to simplify the problem so that it will be within the understanding of any mechanic.

ACOUSTICS OF BUILDINGS.*

Musical Requirements.

It should be noted that an auditorium that is practically all that could be desired for speaking is not always acoustically satisfactory for music, while one that is satisfactory for music is nearly always good for speaking, hence the musical requirements should be considered, in arranging the church. Any one will bear witness to the fact that in some halls or auditoriums they can enjoy music much better than in others, although the proportions appear the same and the acoustics equally perfect. The reason of this is that in the one instance the musical lover is physically in vibratory sympathy with the rendering, and the key of the room is in harmony, while in the other case there is a discord. As each note has a different period of vibration, which is of different length, the shape and proportions of the auditorium should be a multiple of the unit of vibration, which will then produce the last vibration in full, and the key of the room should be a natural key. Should the proportions not be proper, the last wave, not being full, will cause a discord which will be reflected to meet the next wave, or the one will neutralize the other and will result in deaf spots ; as the lengths of sound waves vary with each note, these deaf spots will vary with different tones.

One vexing condition has been settled by the use of the incandescent electric light, thus avoiding the stratification of the atmosphere heated by the lamps or gas. With a room in which the cubic space exceeds 300 feet per capita too great resonance need not be feared ; and if the room is large every means of increasing it must be employed. As the proportion decreases, the resonant surfaces must be replaced by those of less resonance, until the conditions demand hard, smooth, non-resonant surfaces. With a minimum of 150 cubic feet per capita curtains made of sound absorbent material are sometimes necessary in smaller rooms to reduce resonance. This is a delicate matter—to properly place the proper amount of proper material, without muffling the sound ; there is also difficulty in adjusting an auditorium so that the same result will prevail with a large as with a small audience, or a well filled house *vs.* empty seats.

No Rules Apply.

It is impossible to lay down any rules as to proportion, size or materials to be used in securing a perfect auditorium. In some instances the hardest reflecting surface may be necessary, such as smooth hard cement plaster ; in others rough, soft, porous plaster. The steel ceiling may be an essential, or a serious damage ; it may want space back of it, or require felt deafening ; in some instances it may be necessary to construct ceilings and walls in panels of wood, those most remote being thinner and of the more easily excited surfaces. In a large room, surmounted by a dome, it may be necessary to maintain an artificial stratification of the air or an air ceiling. The shape of the ceiling or rear wall may be such as to reflect the sound direct back to the phonic center; this is a most disastrous fault, making speaking very difficult, the words coming from the speaker's mouth meeting the reflection of preceding words, making it almost impossible to utter them.

In a large and misproportioned auditorium remedial measures, such as sounding boards, stretching of wires or heavy curtains, may be warranted. These only tend to neutralize bad results, and do not remedy defects. No rule can be given for the location, number or tension of the wires ; this can only be determined by experiment. Hence no set of rules can be laid down which will insure perfect results at the hands of an amateur. Perfect acoustics may be the result of accident ; the successful practitioner should demonstrate by numerous and varied applications that it is not accident, but a consequent result.

Experience Is Essential.

In practice one may be called on to produce some special form or character of auditorium, say the cruciform, with large and lofty dome over the intersection ; a form notorious in nearly all its existing examples for poor acoustic properties, sometimes so bad as to render the room almost valueless for the purpose ; the great problem is to secure perfect results in the face of almost total failure in all existing examples. A knowledge of the laws governing the production and propagation of sound, the intensity, amplitude, reflection, refraction, diffraction, resonance, temperature, air movement, condensation and rarefaction, enables us to secure perfect acoustical results in a room of almost any form, without additional expense, if combined with construction, but if not inherent is practically beyond remedy. Thus two buildings may be erected practically the same, the one a success because of perfect inherent properties, and the other a total failure. Numerous instances of this character are in existence. No man can sit in his study and formulate a theory which will assure positive results. In every profession and business experience is essential, and experience is only gained by repeated and sometimes disastrous experiment. A theory which is based on a long line of successful experiments, as the result of extensive practice, gives all the assurance possible that it is not merely theory but established principles that govern, and that like causes will always produce the same results.

* Continued from page 34, February issue.

THE form of a roof often has much to do with the draft of a chimney. The flat roof offers no resistance to the passage of the air, but as the pitch is increased the current is more disturbed until with a high pitched and many gabled roof it is broken into innumerable eddies, some of which are sure to curl down and force the smoke and gases in the flue into the rooms below. Chimneys on such roofs should be built higher than ordinarily.

COLONIAL RESIDENCE OF MRS. LIZZIE A. HUNTER, ON PRICE HILL, CINCINNATI, OHIO.

JOHN P. STRIKER, Architect.

SUPPLEMENT CARPENTRY AND BUILDING, MARCH, 1898.

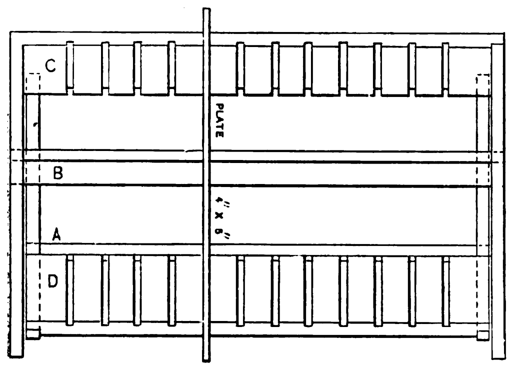
CORRESPONDENCE.

Making a Pantagraph.

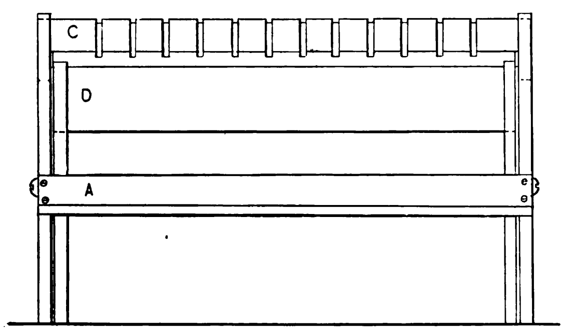
From C. E. G., *Frederick, Md.*—Will some one who knows kindly explain how to make a pantagraph, and also how to use it; or in other words, tell all that is worth knowing about a pantagraph ? I have made and used one, but it is not entirely satisfactory.

Folding Rack for Photographic Negatives.

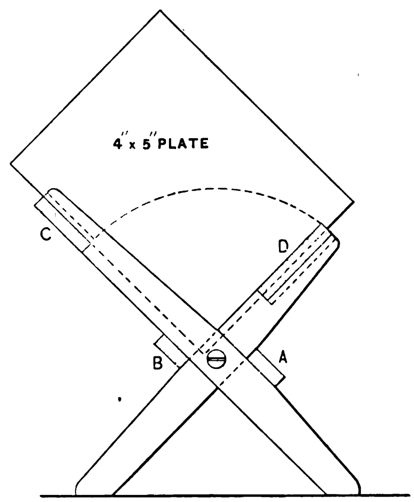
From FRANK J. GRODAVENT, *Helena, Mont.*—No doubt many readers of *Carpentry and Building* are interested in the line of amateur photography and may, therefore, regard with favor the sketches which I send of a folding rack which I have made for holding negatives. The material used is cherry, and it is varnished with Elastica so that the wood will not absorb water. I use the rack for



Plan View.



Side Elevation.



End Elevation.

Folding Rack for Photographic Negatives.

4 x 5 and 5 x 7 plates, and when not in use it can be folded up so as to occupy small space. The sketches so clearly indicate the construction that they are self explanatory.

Rule for Boring Sash.

From J. A. R., *Germantown, Pa.*—I would like to know through *Carpentry and Building* the rule for boring sash to be hung with weights. I have some old sash which were put in stationary and have never been bored.

What a Correspondent in India Thinks of "Carpentry and Building."

From J. H. K., *Tchauthayona, via Pegu, Myitkyo, P. O., Burmah.*—I wish to say that *Carpentry and Building* has been a great help to me, and while I am a missionary under the auspices of the Methodist Episcopal Mission Society, it has fallen to my lot to do a great deal of building out here, and I do not know what I should have done were it not for the paper. I am now about to build a boat, and have sent for the issues of the paper published in 1895 containing the articles treating on boat building.

Note.—The above extracts from the letter of a correspondent in India are presented for the purpose of showing the light in which *Carpentry and Building* is regarded by its readers in remote sections, and also the fact that there are few, if any, parts of the civilized world which it does not reach.

Wood Construction.

From W. T. G., *Burlington, Ky.*—I was greatly interested in the letter of "Student" published on page 173 of the volume for last year, and I hope that he may be prevailed upon to write during 1898 a number of articles on the subject of wood construction. I feel very sure that such articles would prove of interest to a great many readers, and I trust that "Student" will find both the time and the inclination to prepare something for us in this line.

Note.—We indorse the suggestion of our correspondent, and hope that "Student" will take up the matter at his early convenience.

Sill and Subsill for a Circular Tower.

From H. W. G., *Keokuk, Iowa.*—I have seen a great deal in the paper about weather boarding a circular tower, and I would like to have some of the readers tell me how to get out the sill and subsill for such a structure.

Plans of a Bay Window.

From L. W. C., *Gaspe, Province of Quebec, Canada.*—I have taken *Carpentry and Building* only nine months, and find it a valuable paper. I would like to have published the following question : Will some of my brother carpenters or architects furnish for the Correspondence department a complete plan of a bay window and exterior finish of same suitable for a country house of two stories with hip roof, the end of the house being 25 feet wide and 18 feet high ? The bay window is to be in the center of the lower story, and not run the full hight of the wall. I wish to obtain the ideas of others, as I am only a beginner.

Laying Out Angle Newels on Platform Stairs.

From H. W. G., *Keokuk, Iowa.*—I have been a reader of *Carpentry and Building* since the early part of 1894, and am inclined to ask a few questions. In the first place, will some of the readers tell how to lay out in the quickest way angle newels on platform stairs—that is, to chamfer, flute or cross cut between the rails ?

Position of Leather Belt on Pulley.

From C. E. G., *Frederick, Md.*—I desire to ask which side of a leather belt should run next to the pulley. I have reference to any machine that is driven by leather belting.

Note.—There seems to exist a difference of opinion in regard to this matter, some advocating the hair side and some the flesh side to be used in contact with the face of the pulley. The majority, however, seem to incline in favor of the hair side, but we should be glad to know what our readers have to say in regard to the matter, and therefore present the inquiry to them.

Building an Octagon Silo.

From G. A. R., *West Springfield*.—Will some of the readers of *Carpentry and Building* inform me of the best method of building an octagon silo, 40 feet high and 20 feet across?

Note.—Our correspondent will find some very valuable information on the subject indicated in a little pamphlet, entitled "Silos and Silage," issued by the Secretary of Agriculture, Washington, D. C. The matter is contained in what is known as "Farmers' Bulletin No. 32," copies of which can be had free on application to the Department.

Board Puzzles.

From STEEL SQUARE, *Johnston, R. I.*—I have watched the columns of the paper for some time to discover if any of the readers would present solutions of the puzzles which were offered by "D. H.," Jackson, N. Y., in one of the early issues of last year, but thus far I have seen nothing in the line indicated. I have therefore taken up the subject and in my way offer solutions which may possibly be interesting to others. The first part of the puzzle was to cut the board shown in Fig. 1 of the sketches into three pieces, so that when rearranged they would form a perfect square. The solid lines in Fig. 1 show where I make the cuts and Fig. 2 indicates how the three parts are put together so as to form a square. The second portion of the problem is more complicated, for the reason that "D. H." asked how to cut the board shown in Fig. 3 into four pieces and also into five pieces so that in both cases the parts when put together would form a square. The dotted and solid lines of Fig. 3 show where the cuts are made, Fig. 4 indicating how the four pieces, represented by letters, are put together to form a square, and Fig. 5 showing how the five pieces, indicated by figures, are joined together in the shape of a square. There may be other ways of solving these problems, and if so I trust the experts will come forward.

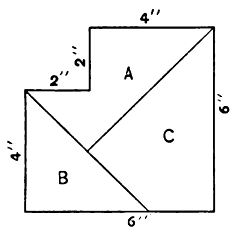


Fig. 1.—Board to be Cut in Three Pieces to Form a Perfect Square.

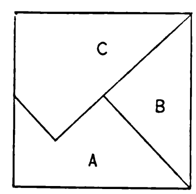


Fig. 2.—Showing Pieces Arranged in the Form of a Square.

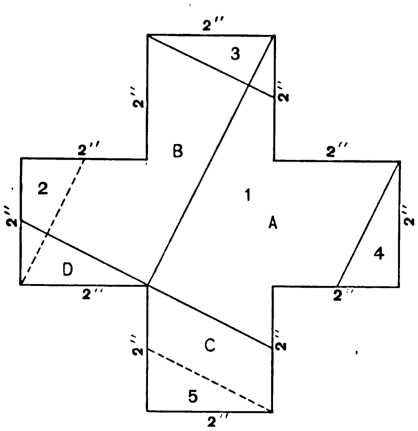


Fig. 3.—Showing Board Cut in Four and Five Pieces.

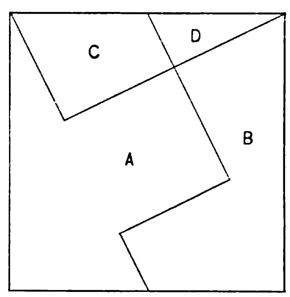


Fig. 4.—Square Composed of Four Pieces.

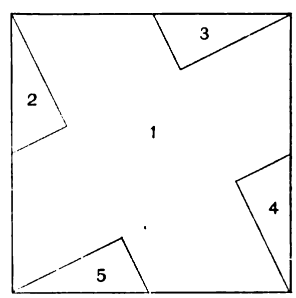


Fig. 5.—Square Made From the Board Cut in Five Pieces.

Board Puzzles.—Showing How the Problems May be Solved.

Remedying Leaky Chimneys.

From A. W., *Winnebago City, Minn.*—Will some one tell me how a chimney should be fixed so as to keep out the rain? In this locality about nine out of every ten chimneys leak.

Note.—We should suppose a very effective means of remedying the difficulty complained of by our correspondent would be to place a stone cap supported at about the hight of half a brick or more over the top of the chimney. There are various ways of preventing rain entering chimneys, and we shall be glad to hear from our readers on the subject.

Proportions of Barn Ventilators.

From WILLIAM A. WARREN, *West Liberty, Iowa*.—The general rule for building ventilators on common farm barns is one-tenth the length of the barn, the ventilator from base or cone of roof to the plate being a cube. Below the base should be 4 inches wider with water table. On large or long barns I build them less than one-tenth. On a barn 40 x 60 feet I would suggest a 5 foot cube.

Finding the Strength of Timbers.

From A. H. L., *Lancaster, N. Y.*—I have been a reader of *Carpentry and Building* for the last seven years, and have been greatly interested and benefited by it. I would like to have some of the readers give through the Correspondence columns a way to obtain the strength of timbers.

Note.—We would suggest to our correspondent that the most satisfactory method of finding the strength of timbers is to make use of some of the architects' handbooks which are now on the market. In Kidder's "Architects and Builders' Pocket Book," the price of which is $4, he will find all the data necessary to figure the strength of timbers of all kinds and sizes. We, however, present the inquiry to our readers, and shall be glad to have them express their views on the subject.

Laying Out Segment of Circle Without Using the Radius.

From WILLIAM T. DAVIES, *Somerville, Mass.*—Will some of the able readers of the paper tell me how to lay out the segment of a circle the radius of which is 250 feet, the method being applicable to all cases?

Design for a "Flat" Building.

From FLATS, *Wakefield, Mass.*—Will some reader help me to a good plan for a three-story block of six flats, each with five rooms, pantry and bathroom? The building is to face north, and to be placed on the line in the corner of a large lot. There is light at the front, rear and at one side. There is a possibility of the line wall being built against by my neighbor. What puzzles me is how to light the inside without a very wide building and a light shaft. Will some one who is familiar with this class of building please give me a plan ?

Cuts for Valley Rafters Between Roofs of Different Pitch.

From H. N. M., *Manset, Maine.*—Will some of the readers of *Carpentry and Building* please tell me their methods of obtaining the lengths and cuts of valley rafters between two roofs of different pitch ?

Note.—The communication from "O. L. W.," which follows, offers a solution of the problem which may be of interest.

From O. L. W., *Dallas, Texas.*—In looking over the several answers to the problem submitted by "F. R." in *Carpentry and Building* for October, I find that they all advise using the length of the valley rafter and its run to obtain the top bevel to fit the ridge. As this is correct only when the pitches are the same on each side of the valley, I offer the following as being correct in all cases: Referring to the sketches which I inclose, we have in Fig. 1 the valley A B and the run of the common rafters A C and A D, of unequal lengths. To obtain the cuts for the top of the valley rafter draw A E and A F at right angles to A B, extending them to the ridge line. Now A E and the length of the rafter on the square gives the cut A B E, and A F with the rafter gives the cut F B A, marking on the side representing the rafter. The lengths of these auxiliary lines may be obtained by laying the square on

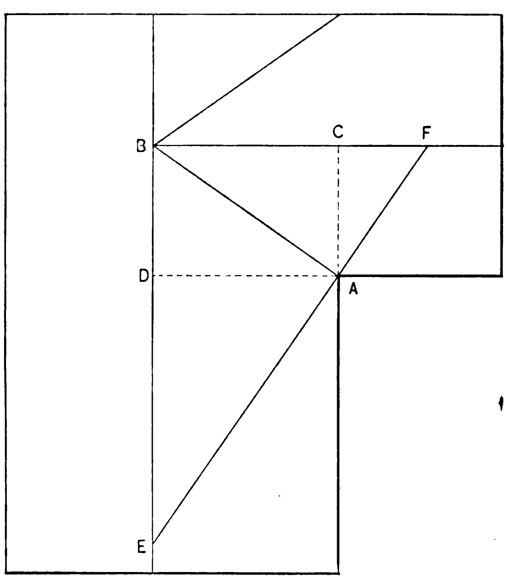


Fig. 1.—Plan of Roofs, Showing Position of Valley.

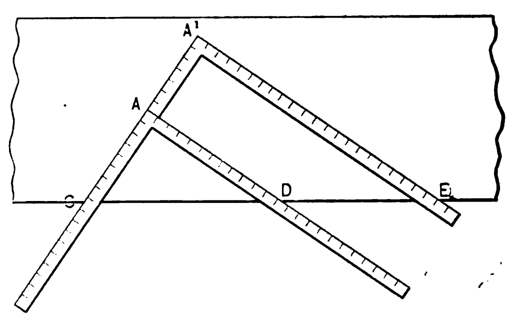


Fig. 2.—Showing Method of Using the Steel Square.

Cuts for Valley Rafters Between Roofs of Different Pitch.

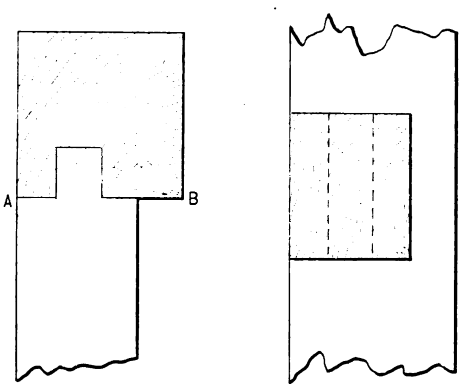
the roof plan and noting their lengths by the scale of the drawing, or, better yet, by a little simple proportion, as exemplified in Fig. 2 of the sketches—A C : A D = A B : A E.

That is, take the runs of the common rafters, as A C and A D, on the square, place them on the edge of a board and mark along A C; then slide the square on the line A C until A¹ C equals C D; then will A¹ E equal A E of Fig. 1. For the valley jacks use the length of rafter over A D with run A C for the angle D A B and the reverse for the opposite side. It is seldom if ever that a drawing is necessary.

Note.—We also have a solution of the problem presented by "F. R." from a correspondent signing himself "A. H. K." of Byron, Ill., the answer being similar in its general scope to that of "H. T. W." of Crawfordsville, Ind., published in the December issue.

Question in Tower Framing.

From DOWN SOUTH, *Poplarville, Miss.*—I come like many others with "information wanted." I send sketches showing the corner post of a tapering structure or tower and a cross tie or girt framed in, together with an elevation of the same. The face of the girt is to be fair with the face of the post, and what I want to know is the best



Question in Tower Framing—Plan and Elevation of Corner Post with Girt Framed In.

and simplest way of getting the bevel to cut the shoulder of the tenon on the line A B. I want a principle that will apply to any taper. Mr. Hodgson, in his "Steel Square and Its Uses," approaches the subject, but dismisses it by practically saying "Build one yourself and find out all about it."

Weather Boarding a Circular Window.

From H. T. F., *Ontario.*—In reply to "O. P. G.," Elkader, Iowa, I may say that one of the best methods of preparing siding to bend around a sharp curve is to "split" it into strips about ⅛ inch thick and bend four thicknesses together round the work. By using a temporary cylinder, bending the first thickness and fastening it in place temporarily, then springing the next thickness over it, and so on until the proper thickness is obtained, he will have his stuff bent ready to nail in place. This is the method chiefly adopted in Europe. Another way is to steam the siding until quite soft and nail in place while hot, using straight grained stuff, or cracks and splits will be the result. Another method is to use some pliable wood for the purpose, such as oak, hoop elm, and even butternut; but in all cases the wood must be moist before being bent. The first method is decidedly the best, but is expensive. The second does very well, but if not properly cared for after being put on the siding is apt to crack and check. The third method, when well done, answers the purpose.

Laying Copper Valleys.

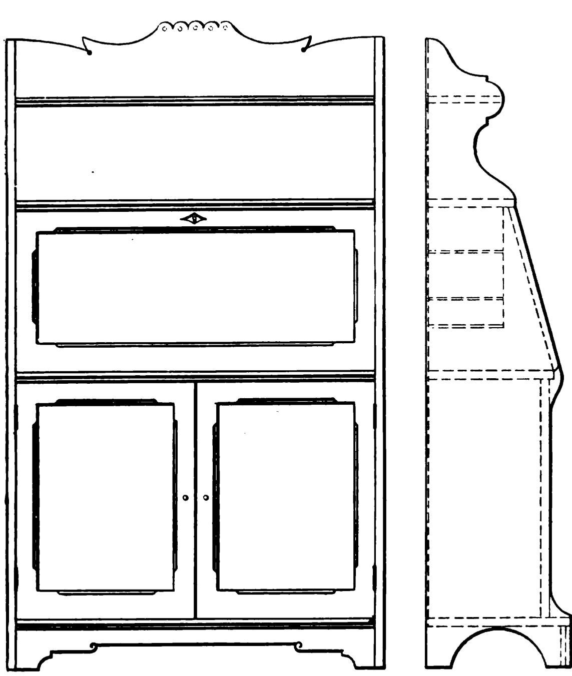
From C., *Mansfield, Ohio.*—Will some reader of the paper kindly inform me through its columns what is the best way to put in new copper valleys on a slate roof, having two-thirds pitch? Shall I take off the slate on each side of the valley or cut the copper in pieces 10 x 14 and slide each piece up under the slate? There will be 16 valleys to be renewed, each about 16 feet long, and I would like to hear from some one who has done work of this kind before what is the best and safest way to do it.

Construction of Carriage Shed.

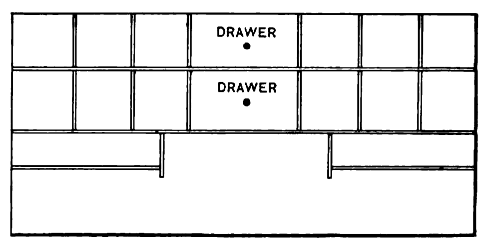
From J. A. R., *Germantown, Pa.*—I would like to see published in the Correspondence department of the paper plans for a carriage shed such as are to be found close beside churches and used for sheltering horses and carriages during church services. I would like to see good plans, accompanied by dimensions and a description.

Oak Writing Desk and Bookcase.

From H. T. W., *Crawfordsville, Ind.*—I send herewith sketches of an oak writing desk such as were requested by



Front and End Elevations.—Scale, ¾ Inch to the Foot.



Detail of the Pigeon Holes.—Scale, 1 Inch to the Foot.

Oak Writing Desk and Bookcase.—Design Submitted by "H. T. W."

"A. M. H." of Wilkes-Barre, Pa. This desk may be made easier and cheaper by using curtains below and leaving the desk lid plain. The back is wainscoted with thin ceiling strips. The desk lid is hinged on the inside to the shelf. The sketches show a detail of the end and also of the pigeon holes. The latter are to a scale of 1 inch to the foot, while the front and end views are ¾ inch to the foot.

Paper on a Metal Roof.

From X. Y. Z., *Indiana.*—Please tell me through the columns what use paper is under a metal roof. Does it prevent the moisture from accumulating or does the paper absorb the moisture, and if so why will not this damp paper be injurious?

Answer.—The idea of putting paper or any insulating material under a metal roof is not to absorb the moisture but to prevent the warm air inside of a room or building coming in contact with the cold metal, and thus condensing the moisture upon it. A covering of paper underneath a metal roof, being a good non-conductor, will remain more nearly the temperature of the room than would the exposed metal, consequently the moisture will not be condensed. Our correspondent has often noticed, undoubtedly, the drops that form in summer time on the outside of an ice pitcher. If he will wrap a piece of flannel around that same pitcher he will find that no moisture is condensed, nor will the flannel be wetted.

Position of Door Knobs.

From D. W. C., *Brooklyn, N. Y.*—In answer to "A. W.," Winnebago City, Minn., I would say that a door knob should be placed so that the bottom of the lock will be even with the top of the lock rail, thus saving a tenon.

Constructing Veneered Doors.

From WILLIAM T. DAVIES, *Somerville, Mass.*—Will some of the readers of large experience tell me how I may know what thickness of veneer to use in connection with veneered doors when different kinds of wood are used on either side, so that the door will be sure to stand true—that is, not warp? I think if the subject of door making was considered by my brother chips it would interest a great many who peruse the Correspondence columns.

Note.—We think our correspondent will find the matter one largely of individual judgment, which can only be obtained through long experience. As he intimates, however, the subject is one which is likely to interest very many of the readers of this department, and we therefore present it to the end that those who have had practical experience in veneer door construction will forward their views for publication.

String Board for Stairs.

From GEORGE ABREY, *Memphis, Tenn.*—In the July number of *Carpentry and Building* "T. A. B." of North Bolton, N. Y., asks information relative to putting a molding edgewise on curved stair strings. Now he doubtless would have received some light on the subject ere this had he been a little more explicit and given the scale to which the sketch was made, the radius of the curves and the width of the molding. Yet it may not be too late to venture a wrinkle on the subject of bending. Assuming the run and the rise to be respectively 17 feet and 15 feet, and the scale 1 inch to the foot, the bottom radius would be approximately 12 feet, which would give a spring of about 11 inches in 9 feet of the molding. If this is the curve we are to obtain, select a straight grained piece of the molding, wrap up the part to be bent with several thicknesses of sacking, pour on copiously boiling water for 15 minutes, and while this is being done the helper can bend it round a rude form made to correspond with the radius desired. The latter can be struck with a batten on a few rough boards laid on the ground joists, setting a shore under the ceiling joist to prevent it from canting over. The concaved edge will be in compression while the convex edge will be in expansion, and thus the curve will be obtained. Put it on hot, commencing at the ground floor line, making one joint about two-thirds of the way up the string. Treat the top piece in the same way.

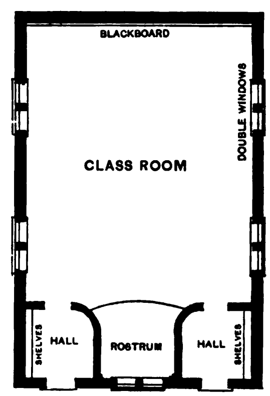
Hanging Sash Doors.

From D. C. W., *Brooklyn, N. Y.*—I notice in a recent issue of the paper one of the correspondents wants to know how to properly hang a sash door. I would say that for an outside door place the putty side out. Some builders think otherwise, because they say a burglar could take the glass out without making any noise. In the case of a bathroom or hall door I would say place the molded side in the hall. On a first-class job I always take the putty off and replace it with a bead of the same material as the door.

Design for a Country School House.

From SCHOOLMASTER, *Elida, Ill.*—There is one particular branch of rural architecture which cannot fail to have impressed every traveler in this country, and that is the school house. In many farming communities where handsome residences and commodious barns are the rule the school house is a little dry goods box affair stuck on some bleak hillside. I happen at present to be teaching in a school house which is an honor and not an eyesore to the district. I send a plan and also a sketch of it to *Carpentry and Building* in the hope that when some of our rural carpenters are called upon to build a school house they will be able to persuade their patrons to put up something more substantial and comfortable than is usually done. The building shown has a hall for the boys and one for the girls, as indicated on the plan, the space between being utilized for a rostrum. The floor is double and the blackboard extends across the rear of the building and on the side walls as far as the rear windows. Seats are provided for 40 scholars, but the space is ample for a dozen more. The windows are provided with good strong shutters on the outside and with curtains on the inside. The total cost was about $1200—surely not a heavy burden for any well to do district.

General View.



Floor Plan.

Design for a Country School House.

Proper Cuts for Valley Rafters.

From P. Q., *Lansing, Mich.*—I have been a constant reader of *Carpentry and Building* for some time, and I am very much interested in the questions and answers which appear in the Correspondence department. Noting the quandary of "F. R.," San Francisco, Cal., I thought I would give him a rule which I used in my practice for the past ten years, in connection with all hip and valley work. My steel square gives me all the bevels with a formula that I learned some years ago—that is, knowing my rise and run I can get all bevels in hip or valley rafters, also the cuts of hips and valleys at the ridge or the plate line. It is only necessary to know how much the valley rises to the foot run. For instance, if my roof is a square pitch the hip or valley will be 12 inches rise in 17 inches. I therefore slide my square back to 12 inches on the blade and note what I have on the tongue. I divide that on the tongue of the square by 4 and subtract the quotient from 12, which is the remaining number on the tongue and 12 on the blade, cutting on the blade. Again, say that the rise of the hip or valley rafter is 8½ inches. Now, 4 is into 8 twice or 2⅛ inches. Subtract 2⅛ inches from 12 (as 12 and 12 is a square miter—that is, it would be a square miter if on a level), and we have 9⅞ inches. Then 9⅞ and 12, cutting on the 12 or blade, will give the cut desired. The jacks and cripples can be cut with the same rule, as I have never found it to fail in cases where the rise is 12 inches or less to the foot run.

Sand Cement.

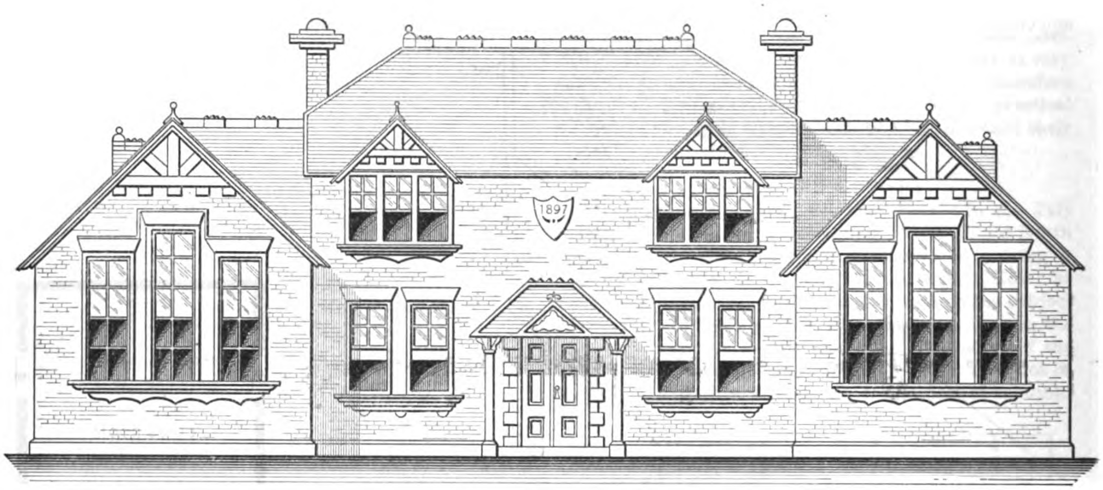
The engineering public is always interested in the improvement of cement, and one of the most likely directions for such improvement at present seems to be the use of sand cement. Concrete is a mass of coarse stone or gravel whose interstices are filled with sand, which in turn has its interstices filled with cement. The finer we grind the cement the more completely is the surface of each sand grain covered with it, and the stronger the resulting mass. Now, says Prof. Cecil B. Smith, in the *Canadian Engineer*, let us go one step further and we have sand cement. Let us take a mixture of say one to one of Portland cement and pure sand (silica sand), and regrind this mixture into an impalpable powder, in which the cement gets ground very fine and the sand itself is as fine as ordinary cement. If we mix this sand cement in the proportion of say one sand cement to three ordinary sand, we obtain a mortar nearly as strong, and indeed some claim fully as strong, as an ordinary mixture of one cement, three sand.

PROF. CHARLES R. RICHARDS, director of the Department of Science and Technology at the Pratt Institute, Brooklyn, which includes the trade and manual training schools of that institution, has been appointed to the chair of manual training in the Teachers' College of Columbia University, New York. Professor Richards was graduated from the Massachusetts Institute of Technology in 1885 and was connected with the New York Teachers' College before it became a department of Columbia University.

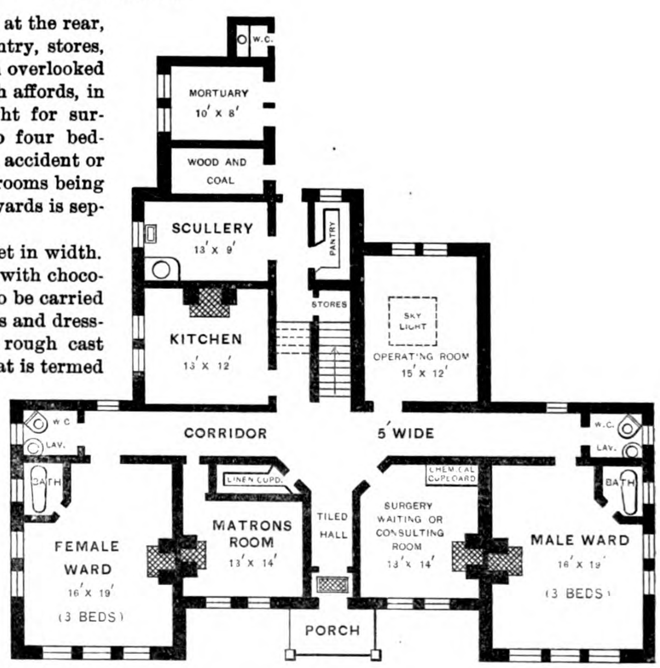
AN ENGLISH COTTAGE HOSPITAL.

THE advantages of public hospital accommodations in the smaller cities and towns of the country are being more and more recognized, and buildings providing such facilities on a comparatively small scale are rapidly increasing in number. The design which we present herewith is from the boards of an English architect, Ernest G. Davies by name, and is intended to meet the requirements of a small town. The front elevation gives an idea of the general appearance of the building, while the floor plan shows the disposition of the various rooms. It will be seen that on the main floor there is space for three beds in each of the two wards, and in addition there are matron's room, operating room and waiting, consulting or surgical room, according to circumstances. In connection with each ward is a bathroom and lavatory, the former being entirely independent of the latter. The building also has an extension at the rear, where are located the kitchen, scullery, pantry, stores, &c. An important point which has not been overlooked is the skylight over the operating room, which affords, in connection with the side windows, ample light for surgical work. The second floor is divided into four bedrooms, one of which might be utilized as an accident or private ward in case of emergency, the other rooms being for matron, nurse and servant. Each of the wards is separate from the other and well ventilated.

The entrance hall and corridors are 5 feet in width. The walls of the building are of glazed brick with chocolate colored dado. The design is intended to be carried out in red brick facings with terra cotta sills and dressings, the gable ends being half timbered and rough cast between. The roofs, which are flat, are of what is termed brindled tiles. The nature of the design is such as to make it well adapted for a country district, as extensions can be made at any time and the wards enlarged to give accommodations for more beds if necessary. The architect estimates the cost of such a building to be about $6250.



Front Elevation.



Main Floor Plan.

An English Cottage Hospital.

Tests of Flooring Material.

The Boston *Journal of Commerce* gives the following interesting results of a thorough and careful investigation recently carried out as to the comparative durability of different flooring materials. In the tests an ordinary iron rubbing wheel was used, like that employed by stone workers for rubbing a smooth surface on marble or sandstone, and the samples to be tested were fastened to blocks of sandstone, laid face downward on the rubber wheel, which revolved at the rate of 75 revolutions a minute, being supplied with sharp sand and water. The blocks to which the floorings were cemented were of equal weight, so that the rubbing was effected under nearly the same pressure in all cases. Curiously enough, the material which resisted best this severe trial was india rubber tiling, which, after an hour's rubbing, lost only 1-64 inch of its thickness, and next to this, English encaustic tile gave the best results, losing only 1/8 inch in an hour's treatment. The artificial stone, known as "granolithic," was third, losing 3/8 inch, while North River bluestone lost 9-16 inch. All the marbles wore away very rapidly. A piece of marble mosaic disappeared entirely in 35 minutes, while solid white Vermont marble lost 3/4 inch in an hour. Most of the wood floorings resisted abrasion better than the marble ; thus white pine lost only 7-16 inch under treatment that removed nearly twice as much from solid marble, yellow pine about like white, and oak lost more than either of the pines.

WHAT BUILDERS ARE DOING.

THE architects of Bridgeport, Conn., have more or less work under way, and the majority regard the outlook good for considerable building during the coming spring and summer. Most all of them concede that the outlook is better than it was a year ago.

The Master Carpenters' Association and the lumber dealers are said to have come to a reciprocal agreement whereby the members of the former have agreed to purchase exclusively of certain lumber dealers, and are to receive a discount upon supplies purchased.

The Master Builders' Exchange at their annual meeting held January 25 elected the following officers for the year:

David C. Mills, president; Chas. Bottomly, first vice-president; M. E. LaForge, second vice-president; W. S. Darling, secretary; Joseph M. Sanger, treasurer.

Board of Managers: H. M. Purdy, L. H. Mills, Charles Boteford, Robert Whalen

A banquet and entertainment were enjoyed after the business meeting. The exchange is reported to be in a flourishing condition, with a membership of 70, no debts, and a good sum in the treasury. The opinion of those present at the meeting was that the coming season would be better than ever as regards the building trade.

Buffalo, N. Y.

The annual election of the Builders' Exchange recently held resulted in the choice of the following officers:

Edward M. Hager, president; John W. Henrich, vice-president; John C. Almendinger, secretary; Frank T. Coppins, treasurer.

Trustees for Three Years: J. H. Tilden, Chares Geiger, Peter Ginther.

For Two Years: James N. Byers, William H. Schmidt, George L. Irlbacker.

For One Year: Nicholas Niederpruem, E. P. Smith.

Arbitration Committee: Carl Meyer, B. I. Crooker, William Pinck.

A lunch was served to the members between the hours of 12 and 2 p.m. upon the day of the election. The annual meeting was held a few days subsequent to the election. Addresses were made by Henry Rumrill, Jr., the retiring president, who was presented with a loving cup by members of the association. The newly elected president, Edward M. Hager, made a brief speech. He said that the past year had been a bad one, but that the indications for improvement were good. He cautioned the builders against taking contracts below cost and ascribed the past bad season to be in a measure due to underbidding of competitors.

Chicago, Ill.

The Building Trades Club held its third annual dinner in the club rooms at 188 Monroe street, on January 29. There were 70 present, the affair being larger than any previously held.

President D. V. Purinton, who presided as toast master, spoke of the desirability of the establishment of the club in a home of its own, which should be erected in the downtown district, and spoke of the duty of making the club a permanent and successful organization.

Judge Gibbons spoke on "The Judiciary in Relation to Building." Addresses were also made by W. L. B. Jenney on "The Architect and Builder;" S. S. Kimball, president of the Builders' and Traders' Exchange, on the subject of "Clay," in which he took occasion to mention the pleasant relations of the two organizations. Thos. C. Macmillan spoke on "The Press," and Joseph Downey, first president of the club, traced the growth of the club from its first formation from a few individuals up to the present position with 125 members and $5000 in the treasury.

The Carpenters and Builders' Association recently elected the following officers and directors for the year: Frank E. Doherty, president; Robert Munro, vice-president; John F. Neagle, secretary; Cesaire Gareau, treasurer.

Directors for Two Years: W. F. Behel, T. A. Collins, Alexander M. Ross.

Directors for One Year: J. W. Andrews, John Ramcke, W. Irving Clark.

Arbitration Committee: Frank E. Doherty, W. F. Behel, Murdoch Campbell, Robert Munro, Angus J. Ledgerwood.

Members of the Builders and Traders' Exchange recently elected officers and afterward held a banquet in the exchange rooms of the Chamber of Commerce. The new officers are:

S. S. Kimbell, president; Daniel Freeman, first vice-president; George Jackson, second vice-president; I. D. Richards, treasurer.

Directors: Henry Appel, Charles C. Muller, William M. Crilly, E. B. Myers, Alexander Gordon.

Inspectors of Election: H. W. Barker, W. H. Martin, John W. Snyder.

Twenty-six master carpenters met February 3 and formed an organization for mutual protection, the step being taken as the result of disastrous competition. A committee was appointed to see if an agreement can be made between the Carpenters and Builders' Association and the new organization. It was also decided to employ union men only.

The Commission appointed by Mayor Harrison to revise the building ordinance was recently reported as having nearly finished its labors. According to the new ordinance building permits will not be issued on specifications of architects unless the latter figure their weights, and architects will be held responsible for strains and weights.

Cincinnati, Ohio.

The Builders' Exchange, at a recent meeting, voted that the association have only one secretary, and he receive a salary subject to increase proportionate to the increase in membership which he can bring about. The initiation fee has been reduced from $20 to $5.

A regular Nominating Committee was appointed, consisting of L. B. Hancock, Alex. Wells, Sam Tappin and A. H. Clark.

The Cincinnati Chapter of the American Institute of Architects, at a recent meeting, listened to a very interesting paper on the subject of "Oil Paints," which was read by Allan G. Meakin, representing the Master House Painters' Association. Discussion followed. The painters are anxious that the architects adopt a uniform specification so that they may hereafter bid on the same quantity and quality of work.

Cleveland, Ohio.

Practicaly all the plastering contractors have agreed to the increase in wages, and will pay the journeymen $2.50 for a day of eight hours. The painters and decorators are demanding an eight-hour day and 27½ cents per hour as a minimum wage for all journeymen painters, decorators and hardwood finishers. It is also demanded that all overtime be paid time and a half and work on legal holidays be paid double time. The painters claim that they will have little difficulty in enforcing their demands.

Detroit, Mich.

A conference was recently held between a committee from the Builders' Exchange and representatives of the Bricklayers' Union. The condition of the times, prospects for building for the spring and wages paid to labor there and elsewhere were discussed.

The men wish for an increase of 50 cents per day to begin March 1, but members of the exchange think that close competition and lowered profits make the demand inopportune. Another conference will be held.

Milwaukee, Wis.

The annual meeting and election of officers of the Builders and Traders' Exchange resulted as follows:

H. Wallschlaeger, Jr., president; E. J. Roberts, first vice-president; P. L. Petersen, second vice-president; John Langenberger, treasurer; G. J. Kraus, secretary.

Directors for Three Years: H. S. Pelton, Thomas R. Bentley, John Bonnett, Charles B. Kruse.

A banquet and reception with music and other entertainment were afterward enjoyed. Remarks were made by Mr. L. A. Clas, the outgoing president, who made an appeal for greater activity. Among the members and officers Mr. Wallschlaeger, the new president, and Mr. E. S. Elliot also spoke.

New York City.

The building situation is comparatively quiet at the present time, although architects are busy on work which indicates a considerable degree of activity as soon as the season opens. The number of new buildings projected is not quite up to the record of a year ago, the figures being 379 as compared with 506 for the same period in 1897. The estimated cost of the new buildngs projected this year is placed at $10,886,575, as compared with $12,128,300 a year ago. In the Borough of Brooklyn the cost of projected buildings for the first month and a half of the new year is $1,863,900 as against $1,194,137 for the same time in 1897.

A very enjoyable "stag" affair occurred on the evening of February 9 at the Building Trades Club, when several hundred members and invited guess were present. It was one of those delightful social entertainments for which the club is well known, the guests being entertained with a varied programme including vocal and instrumental music, imitations, legerdermain, &c. This was followed by a collation which was served in the best style of the club steward.

The annual meeting and election of the club occurred on February 15, when the following ticket was selected:

Henry Tostevin, president; John L. Hamilton, first vice-president; Warren A. Conover, second vice-president; William K. Fertig, secretary and treasurer.

Managers for Three Years: Charles L. Eidlitz, George Moore Smith, James Thomson, John R. Radley, Samuel I. Acken, Jr.

Managers for One Year: Henry P. Robinson, Thomas F. Byrne.

At a recent meeting of the Joint Committee on Building Code held in the Builders' League Building on 126th street, the committee appointed to consider methods of procedure to carry out the objects of the organization reported a number of suggestions which were discussed at considerable length. At the conclusion of the remarks the following committee was appointed to wait upon the Board of Buildings: John P. Leo, Lewis Harding, Charles Andruss, Merrill Watson, Geo. A. Just, Henry M. Miller, Leonard K. Prince, T. F. Byrne, W. S. Miller, Henry M. Tostevin, Wm. J. Fryer and Albert E. Davis.

Newark, N. J.

At the annual meeting of the Builders and Traders' Exchange the following officers were elected:

J. D. Higbie, president; Hugh Kinnard, vice-president; W. W. Schouler, secretary; A. C. Courter, treasurer.

Board of Managers: Henry Dickson, W. G. Weaver, Thomas Boyle, George S. Clark, Theodore Gibson, Thomas O'Connor, J. W. Shaw, D. M. Lake, W. T. Hughes, C. C. Leason, H. Woodward, A. H. Vreeland.

A repast was served, and the exchange is reported to be in a flourishing condition.

The Master Masons' Association, at a recent meeting, discussed the report that the journeymen bricklayers and masons were to ask for 50 cents an hour and only a half day Saturdays. Some of the members stated that their business would not warrant such a demand. The new officers of the association are:

Henry Dickson, president; E. M. Waldron, vice-president; Frank Marsh, recording secretary; J. W. Shaw, financial secretary; George Clark, treasurer.

Executive Committee: Albert Straedling, James Moran, William Tenny, Cornelius Vanderhoof, R. R. Coursen.

New Bedford, Mass.

At the annual meeting of the Builders' Exchange recently held the following officers were elected:

Z. B. Davis, president; William B. Jenney, vice-president; Martin H. Sullivan, secretary; Charles S. Paisler, treasurer.

Directors: A. E. Buffington, Charles G. Randall, E. F. Penney, James H. Murkland, Charles E. Pierce.

Philadelphia, Pa.

But few important permits are being taken out from the Building Inspection Bureau these days, the large operators being apparently "frozen up" by the severe weather that has now set in, putting a stop temporarily to enterprises of this character. Considerable work, however, is outlined for the coming spring, and architects and builders are busy getting things in shape for the advance movement all along the line as soon as conditions become more favorable.

The Board of Directors of the Master Builders' Exchange have elected the following officers:

Charles H. Reeves, president; John Atkinson, first vice-president; Peter Gray, second vice-president; John S. Stevens, third vice-president; William Harkness, secretary; William B. Irvine, treasurer.

Trustees: George Watson, Stacy Reeves, John S. Stevens.

The report of the Board of Directors for the year 1897 shows a surplus of $4802.26. There are 100 corporate and 115 non-corporate members, a total of 215. J. J. Ryan, George Watson, Jacob Myers, John S. Stevens, David H. Watts, Cyrus Borgner and William B. Irvine have been made directors.

The Master Carpenters and Builders' Company have elected the following officers for 1898:

Stacy Reeves, president; Rush J. Whiteside, first vice-president; George Watson, second vice-president; Charles G. Wetter, secretary; Thomas H. Marshall, treasurer.

Directors: Stacy Reeves, George Watson, James Johnston, Charles G. Wetter, John O'Donnel, John Duncan, A. R. Raff, J. L. Little, William Nutz.

A donation of $100 has been voted by this organization to the Master Builders' Mechanical Trades School. Members of the old Carpenters' Company have also contributed, individually, $130 to the school.

The annual meeting of the Master Painters and Decorators' Association of Philadelphia was recently held. Encouraging reports were heard from the recent State Association Convention at Pittsburgh. The following officers were elected:

Charles H. Fowler, president; Samuel W. Rudolph, vice-president; George Butler, secretary; Francis F. Black, financial secretary; Jos. B. Scattergood, treasurer.

Directors: P. J. Branken, William McCarter, J. H. Clifton.

Auditors: Julius Mounteney, J. H. Clifton, John Maxwell.

The T Square Club has recently been holding an exhibition at the Academy consisting of a fine collection of architectural drawings, both domestic and foreign sources being drawn from, including designs by English architects and by pupils in the Ecole des Beaux Arts, Paris. The Massachusetts Institute of Technology, University of Pennsylvania, Columbia University, the Chicago and Cleveland Architectural Clubs, besides many of the leading architects of the United States, are represented.

Pittsburgh, Pa.

Work among building trades is reported as being active, and prospects for spring and summer are bright according to the views of the journeymen.

The eleventh annual convention of the Master House Painters' Association of Pennsylvania, recently held in Pittsburgh, Pa., elected the following officers:

F. A. Ballinger, president, Philadelphia.
John Dewar, vice-president, Pittsburgh.
William Snyder, secretary, Mahanoy City.
William Wolfinger, treasurer, Reading.
Titus Berger, chairman of Apprenticeship Committee and Organizer, Pittsburgh.

During the convention an address by Geo. B. Henckel of Philadelphia, on "Competition in Composition of Paints," was delivered, and visits to the Armstrong & McKelvy Lead Works in Allegheny, and to the Sterling White Lead Works, New Kensington, were made. One of the features of the convention was the exhibit of work of apprentices.

Scranton, Pa.

Building matters are not very brisk just at present, although builders are looking for a decided improvement during the coming summer. A small strike began on February 12, and at the time of going to press had not been settled.

The Builders' Exchange recently held their meeting for the election of officers, resulting in the choice of Conrad Schroeder for president; Thomas H. Sprouks and J. B. Woolsey, vice-presidents; B. F. Laudig, secretary, and George W. Finn, treasurer. The exchange has made a better showing the last five months than at any time since its organization, the increase in membership being over 25 per cent.

St. Louis, Mo.

The St. Louis Builders' Exchange recently held its annual meeting, and nominations for officers were made. The year's receipts are in round numbers $3964, and the expenditures $3951. Twenty members added makes the membership 120.

At the election held a week later the following officers were elected:

H. C. Gillick, president; L. B. McFarland, first vice-president; H. L. Block, second vice-president.

Directors: Theo. Stockhoff, Patrick Mulcahy, Stephen O'Connor, Thomas J. Ward, F. P. Hunkins, T. F. Hayden.

Arbitration Committee: John A. Lynch, H. Thompson, Charles X. Gauthier, T. P. McKelleget, Jere Fruin, C. E. McEwing, C. W. S. Cobb, Joseph Doyle, John G. Hewitt.

Committee of Appeals: H. A. Boeckler, J. C. Hartnett, John M. Doyle, L. Kennah, P. St. John, J. H. Daues, Frank Farrell, E. R. Darlington, John Murphy.

Refreshments were served.

St. Paul, Minn.

The report of Building Inspector Kingsley for the year 1897 shows a slight falling off in permits issued as compared with 1896, the total cost of the new buildings being $329,688 less than for the previous year. The Fourth Ward leads in total valuation, and June claims the lead as to cost among the months.

Inspector of Buildings Haas has appointed the following as his staff of assistants: Henry Smith, James Silk, D. J. Harrington, John Christensen, John Henlein and Leslie Parlin.

Springfield, Ill.

A permanent organization of carpenters, builders and planing mill men was effected early in the past month, and the following officers elected:

H. H. Biggs, president; H. O. McGrur, vice-president; C. Davenport, secretary; C. A. Power, treasurer.

The organization is the result of a desire to differentiate between contractors and small jobber. Contractors for other work, tinners, plasterers, painters, &c., were present upon invitation, and the work of perfecting an organization of subcontractors to affiliate with the general contractors and mill proprietors is being undertaken. The exchange has decided that it will not recognize the demand of the journeymen carpenters for an eight-hour day.

Toledo, Ohio.

Permits were issued for 1897 amounting to $1,363,755, this being $241,953 in excess of the permits for the year previous, but is $57,780 less than those for 1895. As the permit estimate is considered to average only three-fifths of the actual value, it is stated that the building during the year 1897 amounted to about $2,000,000.

Members of the Builders' Exchange are reported as enthusiastic for the centennial. At a special meeting they voted to donate a sum of money toward the entertainment of guests, but as it was at a special meeting, the vote will probably require ratification at a regular meeting.

Toronto, Ont.

At the annual meeting of the Builders' Exchange the report of the Board of Directors and also that the treasurer were presented, showing the affairs of the association to be in a satisfactory state. The election for officers resulted as follows:

Thomas Cannon, Jr., president; H. Martin, first vice-president; Thomas Christie, second vice-president; D. Williams, treasurer.

Board of Directors: George Henry, James Crang, John Maloney, Joseph Russell, John Aldridge.

Wilmington, Del.

The Wilmington Builders' Exchange has elected:

C. I. Swayne, president; F. C. Simpson, L. W. Brosius, Joseph S. Hamilton, vice-presidents; W. H. Foulk, secretary; Henry Evans, treasurer.

Encouraging reports of the year's work have been submitted by the president, secretary and treasurer.

Real estate dealers report a scarcity in the supply of houses which rent from $12 to $25 per month.

Worcester, Mass.

At the annual election of the Builders' Exchange the following officers were chosen:

John H. Pickford, president; B. W. Stone, vice-president; Frank H. Goddard, treasurer.

Trustees for Two Years: Geo. W. Carr, L. P. Allen, B. C. Fiske.

For One Year to Fill Vacancy: Frank A. Stenberg.

Chas. C. Brown continues as secretary.

The membership of the exchange is 103, eight new members having been admitted the past year.

After the business meeting refreshments were served to the members.

Notes.

The Master Tinners and Roofers' Association of Wheeling, W. Va., recently celebrated the first year of existence by a successful banquet. The exchange is reported to be in a prosperous condition. The officers are:

B. F. Caldwell, president; L. C. Driehorst, secretary; W. L. McNeely, assistant secretary; Philip Albinger, treasurer.

An encouraging outlook for carpenters, builders and material men is reported from Milford, Del.

The Bangor (Pa.) Slate Roofers' Association have elected the following officers:

Elkanah Drake, president, of Newark, N. J.; Wm. Bray, vice-president, of East Bangor; Thomas Ditchett, secretary and treasurer, of Bangor; Horatio Miller, inspector, of Bangor.

Executive Committee: R. S. Brown of Easton; Cotton Amy and James Masters of East Bangor.

Advices from Allentown, Pa., indicate a more active condition of the building trades considering the season of the year than has been experienced heretofore. Prospects for a busy spring and summer have never been brighter.

The Builders and Traders' Association of Appleton, Wis., recently elected the following officers:

W. S. Patterson, president; John Hackworthy, vice-president; P. H. Ryan, secretary; Aug. Knueppel, treasurer.

Directors: W. H. Carter, C. I. Smith, Chas. Pingel, Aug. Greinke, Aug. Gmeiner.

Master stone masons of Kansas City, Mo., have recently been discussing the formation of an organization.

ESTIMATING A BRICK HOUSE.—X.

BY FRED. T. HODGSON.

THE kitchen is fitted up with all modern kitchen appliances, and has, besides a range, a 52-gallon copper boiler, sink, splashboard, drawers and other appurtenances. Fig. 16 shows the manner in which the sink is fitted up and gives sizes and full dimensions of work. Off the kitchen, on one side, is a pantry of good dimensions and which I will deal with separately, and to the right of the sink is the culinary closet. This closet is fitted up with drawers, racks, shelves and pastry mixing board. There

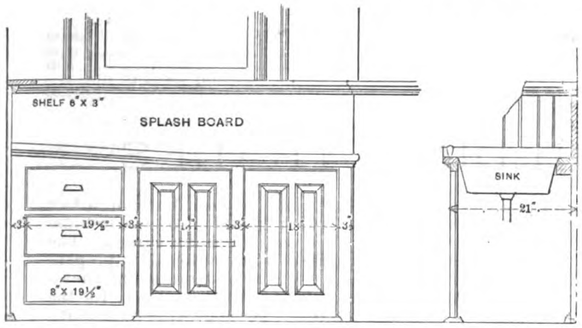


Fig. 16.—Elevation and Section of Kitchen Sink.—Scale, ⅜ Inch to the Foot.

days. The hardware, including drawer pulls, hinges, snaps, nails and screws, would cost about $1. I do not include the sink, as that is generally furnished by the plumber. Besides this work there will always be more or less shelving and hook racks required in a kitchen, and I have always made provision for at least $5 worth of extra work, usually found necessary before the room is in a proper condition to please the cook. This extra work will consist of corner shelves, pot hooks in various places, racks for dishes over sink, divisions in drawers and many other things not much in themselves, but which are important to the ruler of the kitchen, and which are time and material consumers; therefore, after every possible, and I might say impossible, thing has been provided for in a kitchen, it is always well to add in another $5 to please the cook, and it pays all round.

Pantry.

We now take up the pantry, which measures on the floor 7 x 7 feet, exclusive of china closet and cubby attached. On the rear end is a cupboard extending across the whole length, as may be seen in Fig. 17. This cupboard, including doors, drawers and finish, is 8 feet 6 inches high, finished with molded cornice on top. The dimensions of doors, drawers, divisions, stiles, &c., are all shown in the drawings by figures in feet and inches. The work is supposed to be done in pine, and if so I would

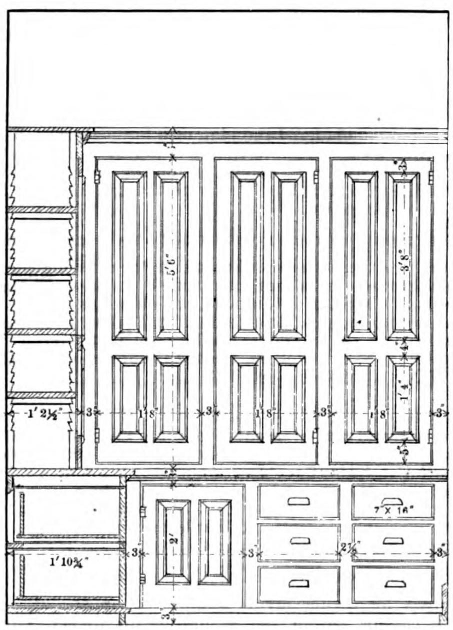


Fig. 17.—Elevation in Pantry, Looking Toward the Dining Room.—Scale, ⅜ Inch to the Foot.

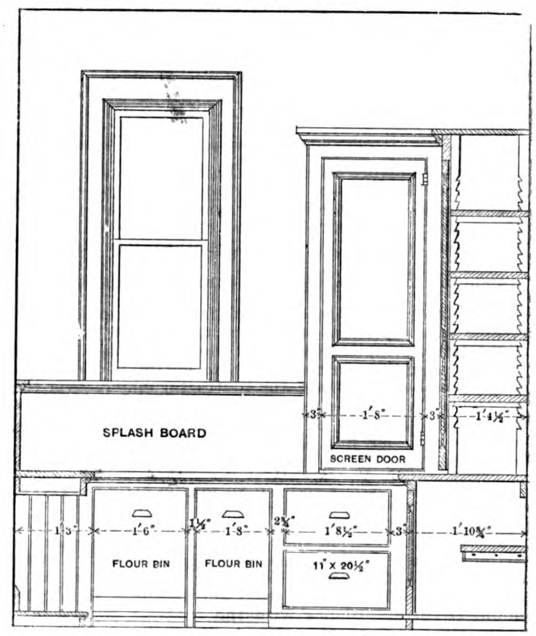


Fig. 18.—Elevation in Pantry, Looking Toward the Window.—Scale, ⅜ Inch to the Foot.

Estimating a Brick House.—X.

are four drawers for flour, meal, sugar, &c., and a spice case made either with a nest of drawers or with tin cases incased with wood, set in between the shelves. There will be required about 200 feet of stuff and six days' labor to fit up this closet. The necessary hardware, nails, tinware, screws, &c., will cost about $3. As the kitchen is wainscoted, it will be necessary to wainscot this closet, and I would suggest that it be done in hemlock, as hemlock is the most difficult of wood for mice or rats to gnaw through, owing to its splintery nature. The cost of wainscoting is not included in the above estimate. The sink complete will require about 40 feet of stuff to make it, and to prepare the stuff, make and fit the drawers, make and hang the doors, build in frame, put up splashboard, shelf and top, will take one man about two and a half

suggest that it be not painted, but simply varnished with white shellac—varnishing in three coats. If the material used is nice clear stuff, and the varnishing is neatly done, the pantry will be a paragon of neatness and healthfulness. Paint of any kind should never be used in a pantry if sweetness and purity are sought.

No backing other than the plastered wall will be required, so that we need not count for such in the cost. In measuring up I find this cupboard will require close on to 300 feet of good stuff for doors, drawers, shelving and moldings, and it will take one man six days to make and fit them, set up the work, fit on hardware and have all complete ready for the varnisher. To this must be added the cost of four pounds of nails, four pairs of butts and screws, four closet snaps, drawer pulls and molding brads.

From these figures the cost may readily be obtained as follows :

300 feet stuff at $30 per 1,000	$9.00
6 days' work at $3	18.00
4 pounds of nails at 5 cents	.20
4 pair of hinges at 8 cents (brass)	.32
4 closet spring snaps at 12 cents	.48
Drawer pulls (bronze)	.60
Brads, screws, &c	.20
Total	$28.80

This is a reasonable estimate for the work.

The side of pantry against the outer wall is finished with drawers, screen door and shelves, and splashboard under window, as shown in Fig. 18. To complete this part of the pantry will require about 125 feet of clean white pine, one pair of hinges, three drawer pulls, 5 feet wire screen, three pounds of nails, screws, brads, &c., and cupboard snap. To complete the work will require about two and one-half days' work for one man. This will make the cost of this side of the pantry foot up as follows :

125 feet of clear pine at $30 per 1,000	$3.75
1 pair of hinges	.18
3 pounds of nails	.15
Wire screen	.50
Brads, screws, pulls and snap	.42
2½ days' work at $3	7.50
Total	$12.40

There are shelves placed in the cubby, an opening and drop door into china closet with necessary trimmings and finish These are not shown in the details, but as they must be provided to make the work complete I estimate that to provide the stuff and do the work in the same style as that shown will require $5. We have then for the total cost of fitments in the pantry, exclusive of door and window finishings, the following figures :

For cupboard	$28.80
For bins and wall fittings	12.40
Extras on cubby, &c	5.00
Total	$46.20

LAW IN THE BUILDING TRADES.

EFFECT OF ASSIGNMENT OF BUILDING CONTRACT.

An assignment of a building contract by the contractor operates not merely as an assignment of the moneys thereafter to be earned, but of the whole contract, with its obligations and burdens.—State *vs.* School Dist., Sup. Ct., Neb., 71 Northwestern Rep., 727.

CONTRACTOR ENTITLED TO BENEFIT OF DELAYS BY ALTERATIONS.

A contractor who agreed to complete a building by a given time, under a contract providing that alterations were not to affect its validity, nor occasion any additional charge except the cost of alterations, was entitled to the benefit of the delay occasioned by alterations made at the request of the owner.—Mason *vs.* Rempe, Tex. Ct. Civ. App., 41 Southwestern Rep., 694.

ACCEPTANCE OF OWNER FINAL.

Where the owner accepts the building as completed he cannot avoid payment of the price due under the contract on the ground that the building was not yet accepted by the architect as required by the contract.—Wilkins *vs.* Wilkerson, Tex. Ct. Civ. App., 41 Southwestern Rep., 178.

DEDUCTIONS BY OWNER WHO COMPLETES CONTRACT.

A contract to construct a building for an entire sum, payable on completion, but providing that on failure of contractor to complete the work the owner may do so at the expense of the contractor, is not entire, and on such completion by the owner the contractor may recover the contract price, less the reasonable cost of completing the building and damages by delay and irremediable defects. —Arndt *vs.* Keller, Sup. Ct., Wis., 71 Northwestern Rep., 651.

SUB-CONTRACTOR NOT ENTITLED TO PERCENTAGE RETAINED.

The fact that a building contract provided that the owner, a school district, should retain 15 per cent. of each partial estimate, made as the work progressed, to insure the district that all claims for labor and materials were paid by the contractor, and that the building should be completed in accordance with the contract, gives a sub-contractor no right of action against the district for money so retained, though from estimates based on labor and materials furnished by him.—School District *vs.* Thomas, Sup. Ct., Neb., 71 Northwestern Rep.

MUTUAL AGREEMENT AS TO ALTERATIONS EXTENDS TIME.

Where the parties to a building contract by agreement made alterations therein which necessitated a greater time for the completion of the building than that fixed in the contract as originally made, a stipulation in the original contract, providing for demurrage for delay in completion at the time specified, did not apply to a delay caused by the alterations.—Wilkens *vs.* Wilkerson, Ct. Civ. App., Tex., 41 Southwestern Rep., 178.

FEES FOR PLANS AND SUPERINTENDENCE.

An architect contracted with a party to furnish plans for a two-story building, and to superintend the construction of same, for 4 per cent. of the lowest bid therefor, which was $12,000. After receiving the plans and bids the party did not erect the building, but afterward instructed the architect to prepare plans for a three-story building, which was done, and the owner let the contract for construction for $17,000, and requested the architect to superintend the work, which he did until the foundation was nearly completed, when he was discharged. The court held that if the architect was employed to prepare plans for the first building, with no understanding that a second building might be substituted without pay for the first plans, he was entitled to 2½ per cent. (the customary charge) on the $12,000 for the preparation of the plans, &c., and 4 per cent. on the $17,000, the construction price of the second building, provided he was discharged without cause ; but if he was properly discharged, he was entitled to only 2½ per cent. of the construction price of both houses. —Hand *vs.* Agen, Sup. Ct., Wis., 71 Northwestern Rep., 899.

OWNER ENTITLED TO EXPENSE OF CHANGING PLANS.

A lot owner who after notice that part of his lot was to be condemned changed the plan of a building which he was erecting, so as to omit that portion of the lot to be condemned, is entitled to compensation for the expense so occasioned.—*In re* Trustees Brooklyn Bridge, Sup. Ct. N. Y., 45 N. Y. Supp. Rep., 484.

ARCHITECT HAS NO LIEN FOR PLANS IN MASSACHUSETTS.

An architect is not entitled to a lien for drawing plans and specifications for a building, under the laws of Massachusetts (Pub. St. c. 191, sec. 1), which gives a lien to any person to whom a debt is due for " labor performed or furnished . . . and actually used in the erection of a building."—Mitchell *vs.* Packard, Supreme Jud. Ct. Mass., 47 Northwestern Rep., 113.

WHEN CONTRACTOR TAKES PRECEDENCE.

Where one advanced money to the owner of a building, and took a mortgage on same while the contractor was erecting it, he is affected with notice of the contractor's lien, and the latter is not lost by reason of the contractor taking the notes of the owner secured by mortgage on the building. —F. and M. National Bank *vs.* Taylor, Supreme Ct. Tex., 40 Southwestern Rep., 966.

RIGHTS OF ADJOINING LANDOWNERS.

Where a lot owner erects a building on one side of same he cannot enjoin the adjoining lot owner from erecting a high board fence on his line, although it shuts off the light and air from such building.—Triplett *vs.* Jackson, App. Ct. Kans., 48 Pacific Rep., 931.

IOWA PARTY WALL LAW VALID.

The law of Iowa (Code sec. 2019) which provides that a party wall may be built on an adjoining lot to the extent of 9 inches without the consent of the owner, but that he shall not be liable for any of the expense for building same, unless he makes use of it, is not unconstitutional as not being taken under due process of law, or as taking private property without compensation —Swift *vs.* Calnan, Supreme Court Iowa, 71 Northwestern Rep., 233.

OWNER'S DEALINGS WITH SUB-CONTRACTOR.

An owner may contract with a sub-contractor for extras, without regard to the provisions relating to extras in the contract between him and the general contractor; and the furnishing of extra labor and material by a sub-contractor at the direction of the owner creates a contract on sufficient consideration to render the owner liable to him for such extras.—Foley *vs.* Tipton Hotel Company, Supreme Court Iowa, 71 Northwestern Rep., 236.

CONSTRUCTING A PLANK FRAME BARN.

BY JOHN L. SHAWVER.

IN Fig. 10 is shown a side view of a barn with two driveways and bay at either end. A A are duplicated on inside of posts with bridge blocks at dotted lines. B is main plate, C is purline plate of two 2 x 8 plank set at right angles with roof and also braced at right angles, D is roof supports forming the arch of the barn, and E the collar beams. Fig. 11 shows interior bent of a "ground" barn with decks above driveway. Should stables be desired in one or both ends joist bearers may extend entire width of barn.

There are doubtless many who would like some evidence of the strength, durability and popularity of this system of barn building, and I therefore submit a few facts in relation to these points.

First Test of Strength.—A small model made of linden strips 3-16 inch thick and ½, ⅜ and ¼ inch in width, made on a scale of ½ to 12 and representing a barn 40 x 60, with 8-foot basement and 20 foot superstructure, was found strong enough to support four men of average weight.

Second Test.—Several years ago a number of persons at a barn raising were discussing the frail appearance of the frame, and a test was made with chains and levers in an effort to crush the frame by drawing at opposite angles, but without the slightest effect.

Another example is found in a barn which was put up with a minimum quantity of spikes because the owner did not wish to take time to go to town for more. The barn has been standing 14 years, within which time a number of destructive wind storms have passed over it without damage, though much damage to fences, forests and buildings resulted in the vicinity.

As evidence of the rapidity with which the framing may be done, I will refer to a basement barn 40 x 80, 24 feet to the square, recently erected in Union County, Ohio. I began with three carpenters on Wednesday morning, and on Saturday of the same week the barn was raised complete. We were compelled to work under the disadvantages of considerable mud on the newly graded foundation site, necessity of carrying the timber some distance, and the short days of mid November. None of the hands had any previous experience in this work, so had to learn as they proceeded.

A large dairy barn was built the last week of October, 1896, just out of New York City. It is 100 x 36, with 8-foot basement and 16-foot superstructure. We had four house carpenters and two laborers. Began work Monday morning but were delayed by the non-arrival of the spikes till nearly noon. The basement bents were each 100 feet in length and there were nine bents in the superstructure. Both basement and superstructure were raised on Friday of same week in six hours with the help of 30 men.

Still another example may be given to show the difference between the plank frame and the mortise and tenon frame. With three helpers I framed a barn 40 x 72, with 20 foot posts, while two carpenters, one of them a foreman, framed the sills for a corn crib 5 x 40.

The system has been introduced into 32 States and some fair sized barns have been built in this way. One in Kentucky 56 x 100, one in Colorado 60 x 70, one in Wisconsin 40 x 120 with wing 40 x 60, one in Ontario 56 x 96, and one in Virginia 60 x 100. I have yet to learn of any who, having built strictly to specifications, are dissatisfied with the frame. On the contrary, we are frequently in receipt of letters from those who have thus built stating that they are delighted not only because they have saved both money and timber but at the same time have obtained a thoroughly strong frame without the usual interior timbers, which are so much in the way in handling hay or grain.

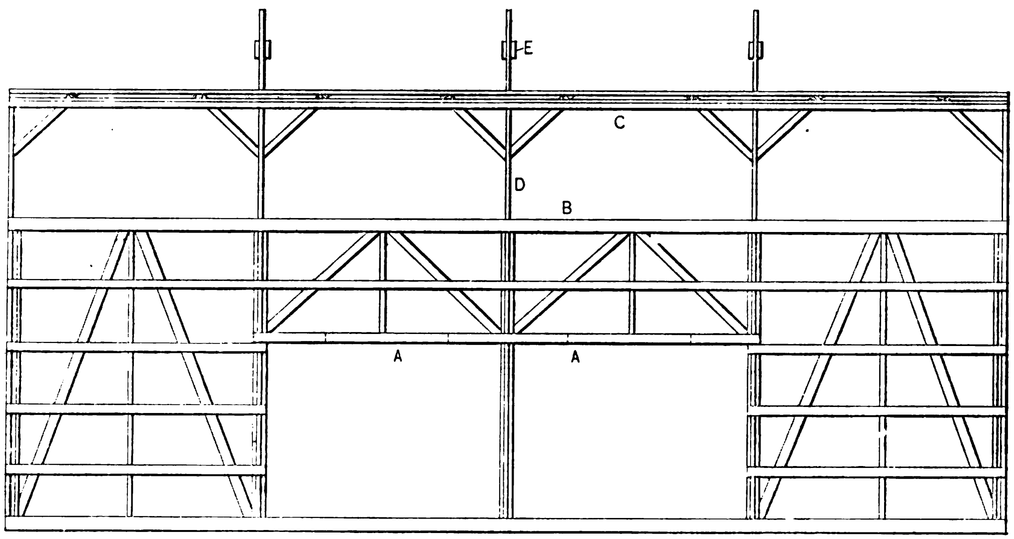


Fig. 10.—Side Elevation of Barn Having Two Driveways and Bay at Either End.

Constructing a Plank Frame Barn.

I shall be glad to have the friendly criticisms of practical builders given in the columns of *Carpentry and Building*. Any suggestions which may lead to further improvements in the system will be appreciated very much, and due credit will be given to those who suggest them. It will be seen that the system is especially adapted to large grain and hay barns, to covered barn yards which are becoming so popular in many sections of the country, to tool sheds, tobacco barns, amphitheatres, &c.

While there is not so large a saving in the timber of the basement as in the superstructure, there is yet a fair saving of timber even here, and at the same time there is great saving of labor. The timbers are employed only where they can serve a useful purpose, and special effort is made to so place the timbers as to secure the maximum amount of strength with the smallest possible amount of timber.

IN painting brick work it is of great importance to see that the bricks are thoroughly dry, and they should, therefore, not be touched after a storm or heavy rain. The best time to paint this class of work is in a hot summer. These remarks apply equally to stone work.

AWARDING BUILDING CONTRACTS.

MOST buildings at the present day are planned and constructed on what might be called a mercantile basis, the dominant idea being to obtain the greatest possible results with the least expenditure of money; in fact, in a large proportion, if not a majority, of cases it is necessary to cut down figures which have been obtained in competition, in order to make the two ends meet. But while such is the ordinary and every day experience, there is, fortunately, a growing demand for well and thoroughly built buildings, particularly in the cases of the best domestic work, where the owner is willing to pay a fair price for what he receives. In such instances, if the architect desires to take advantage of his opportunity he must certainly adopt a different policy in obtaining estimates and awarding the contract from the method usually pursued.

The unfortunate and inevitable consequences of close competition in awarding building contracts have been already pointed out, and it naturally follows, if work can be given out on some other basis, the results, all other things being equal, will prove of material benefit to the owner and will place the architect in the best possible position to obtain the most satisfactory results in all directions.

Methods of Figuring.

There may be said to be three ways in which work can be figured besides the usual way of obtaining competitive estimates from several parties. 1, to have the work done by the day; 2, to have the work figured by some one person without letting him know that it is being done without competition, and, 3, to call in the contractor—who, all things considered, seems to be the best qualified to execute the work at hand—and tell him frankly if he can give a satisfactory figure he can have the contract. Whatever advantages the first method may have, there is one serious objection to it for which there is no apparent remedy, and which consequently renders it impracticable except in rare instances. The fatal objection to day work lies in the fact that the journeymen employed on the job always learn in some unaccountable way of the manner in which the job has been let, and work with the idea that it is for their employer's interest as well as their own to make the work last as long as possible. Such inertia it is practically impossible to overcome; and this condition alone, and without various contributing causes, is sufficient reason why day work infallibly overruns the most liberal preliminary estimates. And this, says a writer in the *Brickbuilder*, is a sufficient reason for not adopting this method except, as has been said, under peculiar or unusual conditions.

The second and third methods are practically the same, except in the first case the true facts are only partially known to the contractor, but it is doubtful if the results justify the mild deception which is practiced when the architects pretend that the work is to be figured in competion; in fact, it is quite questionable whether the average builder can be kept in blissful ignorance of the true state of affairs, and if he learns or even surmises the true facts of the case he is much more liable to recognize and improve his chance for liberal profit than if the true conditions were presented for his consideration. It is an indisputable fact that the average man meets the opportunity which has been given him outright much more fairly, squarely and liberally than he does the one which he has won in rivalry. The spoils of war, even in such mild encounters as the competition for building contracts, seem to carry certain rights, which are unfortunately and unjustly looked upon as inherent, which cannot be easily changed, and which work to the ultimate disadvantage of both the owner and the architect. It is sufficient, in support of this fact, to call attention to the practice of figuring work at cost and depending upon extras and other similar tricks of the trade to acquire a profit, and it can be seen that if a reputable contractor is given the opportunity to include his profit in the original proposition he is in honor bound to do additional work at fair prices.

The Contractor.

As plans and specifications near completion, and the architect has mastered the details of the problem, he naturally considers to whom he would award the contract if left free to do so, and instinctively, as a rule, he makes up his mind that, all things considered, there is some one individual or firm who are better fitted to do this given piece of work than any other. Let the architect lay these facts clearly before the owner, and if he is clear sighted enough to realize his opportunity he will allow the work to be given out without the usual competition which so often handicaps all concerned at the very start. Another advantage, and by no means an unimportant one, in awarding work in this manner lies in the fact that it is much easier, when proceeding under this plan, to regulate and control the sub-contractors, the importance of which is readily recognized by any one who has had experience in building.

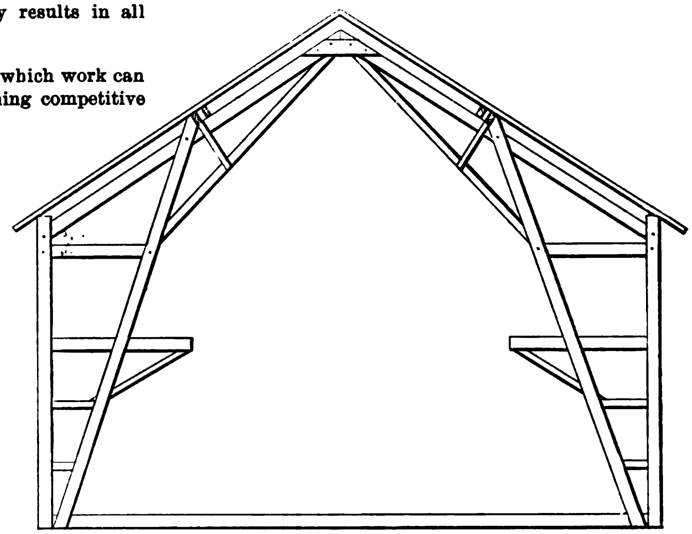


Fig. 11.—Interior Bent of "Ground" Barn With Decks Above Driveway.

Constructing a Plank Frame Barn.

The great objection which is urged against this plan of awarding contracts without competition is the prevalent idea that no client would listen to such a proposition; in fact, we are often given to understand that it would weaken the position of the architect to suggest such a radical proposition. But if the proposed building has been worked out in such a way that sharp competition is not necessary to bring the figures within the limits, it is reasonable to suppose that an intelligent owner can be made to see what will result in a substantial benefit to himself. This method of procedure is at least worth a fair trial in all cases where it promises to bring about improved relations and a better standard of work. And every case which is successfully carried out creates a precedent which makes it easier to accomplish the desired ends in the future.

IN the peristyle of a house at Pompeii recently excavated two fine wall paintings have been found, probably transferred there from some other building. One of them represents a poetess reading to a female musician; the other a young girl leaning against a pillar, and conversing with a girl seated and wrapped in a large mantle.

Effect of the Hights of Walls on the Amounts of Heat Transmitted Through Them.*

It is known, as a result of experiment, that the heat which passes per hour through a wall separating a hot fluid from a cool one can be expressed by the equation

$$Q = k\ (t_1 - t_2)\ S$$

in which Q is the quantity of heat, in heat units, transferred per hour from the hot to the cool fluid; k is a factor whose value depends upon a consideration that will be discussed later; t_1 is the temperature of the hot fluid; t_2 is the temperature of the cool fluid and S is the area in square feet of the surfaces of the wall in contact with the hot and cool fluids.

The experiments of Peclet and others have shown that the value of k depends upon the nature of the hot and cold fluids; upon the separating wall, the nature of its surface, the materials of which it is made, its thickness and its figure; and somewhat upon the difference $t_1 - t_2$. The value of k depends upon two things—the loss of heat by radiation, and the loss by direct contact. The loss by radiation depends upon the temperature, t_2, of the surrounding bodies, and the loss by direct contact depends upon the temperature of the air in direct contact with the separating wall, which may be higher or lower than the temperature of the surrounding bodies. The greater the difference between the temperature of the warm fluid and that of the cool air in direct contact with the separating wall the greater will be the loss by direct contact and the greater will be k for a given value of t_2; and the less this difference the less will be the loss by direct contact and the less will be k.

Experiments of Peclet.

Peclet made a great many experiments from which to determine the value of k. Most of his experiments were made with steam or hot water as the hot fluid and air as the cool fluid. When steam was used the temperature t was uniform throughout the hot fluid, as it depended simply upon the pressure of the steam; and when water was used it was kept agitated, so that it would have as nearly as possible a uniform temperature throughout. The temperature, t_2, of the cool air surrounding the radiator containing the steam or hot water was measured at some distance from the radiator and not directly at the surface of the radiator. As a result of his experiments Peclet found that, for the same value of t_1 and t_2, k was less for a high wall than for a low one of exactly the same material and thickness. The explanation for this is that as the air in contact with the separating wall is heated it rises along the surface of the wall, and as it rises it continues to be heated until finally, when it reaches the top of the wall, it is much hotter than it was when it was at the bottom of the wall. The higher the wall the higher will be the temperature of the air when it reaches the top, and, therefore, the higher will be the average temperature of the air in contact with the surface of the wall. The higher the average temperature of this air the less will be the average difference between its temperature and that of the steam; and therefore the less will be the amount of heat lost by direct contact of the air and the less will be the value of k.

The conclusions arrived at by Peclet through his experiments are corroborated by experience. It is well known that the air leaves a high radiator at a higher temperature than it does a lower one, when both are supplied with steam at the same pressure, and that a high radiator loses less heat per hour per square foot of surface than a lower one.

I find that many French, English and American writers, reasoning, apparently, from the results of Peclet's experiments and from experience with radiators, say that the value of k for a high wall or window of a building will be less than for a lower one of the same kind and thickness. Some writers make the deliberate statement that a high wall or window will transmit less heat from a room, with given inside and outside temperatures, than a lower one of the same kind, area and thickness. This, I contend, cannot be true, as it is based upon an assumption of conditions that are never realized in practice.

Temperature of the Air.

The air on the outside of a wall or window of a heated room is of almost a uniform temperature. It is hardly probable that, on a cold day, when the wind is blowing, there is any appreciable current of warm air rising along the outside of the wall or window of a heated building. I have never been able to detect such a current on a cold day; and yet such a current of warm air is supposed to exist by many writers.

The temperature of the air inside of a heated room is not uniform at different hights from the floor, but is least near the floor and gradually increases toward the ceiling, where it is greatest. So far I have been unable to establish any law for this increase. It depends upon the outside and inside temperatures and upon the method of heating. It is greater in cold weather than in mild weather, and is greater for a hot air system than for direct steam or hot water radiation. It may depend also upon the part of the room at which the temperatures are measured. That the air near the ceiling of a heated room is much hotter than that near the floor is well known to all who have had occasion to stand on a step ladder in a warm room. Hence the conditions that actually prevail in a heated room are:

A uniform temperature of the air on the outside of the wall and a gradually increasing temperature from the floor to the ceiling of the air on the inside. And for a temperature of about 70 degrees 4 or 5 feet from the floor the average temperature of the air inside of the room increases as the hight of the wall is increased. Therefore, the higher the wall or window surfaces of a room the greater will be the amount of heat lost per hour through them, and the greater must be the value of k used in the formula for calculating the heat lost.

German engineers, as a rule, increase the calculated heat loss for rooms whose exposed walls are higher than 12 or 13 feet by an amount which depends upon the hight of the walls.

J. H. Klinger, in his pocket book for heating engineers, advises that the calculated heat loss of a room be increased by 3 per cent. of itself when the walls are between 13 and 14½ feet high; by 6.5 per cent. when they are between 14½ and 18 feet high, and by 10 per cent. when they are higher than 18 feet.

H. Recknagel, in his pocket book for heating engineers, advises that the calculated heat loss of a room be increased by 10 per cent. of itself when the walls of the room are more than 13 feet high.

H. Rietschel, in his treatise on heating and ventilating, calculates the temperature of the air at the ceilings of rooms, when their hights exceed 13 feet, by the formula

$$t_1 = t + 0.03\ (h - 13)\ t.$$

t_1 is the temperature of the air at the ceiling; t is the temperature of the air about 5 feet from the floor, or head high, as Rietschel says, and h is the hight of the room from the floor to the ceiling.

He takes the average temperature of the air in the room as

$$\frac{t_1 + t}{2} = t + 0.015\ (h - 13)\ t.$$

If the hight of the room is less than 13 feet he takes the temperature at head high from the floor as the average temperature. The temperature t_1 must never be taken as greater than 1.5 t.

Calculating Heat Loss.

Rietschel uses the average temperature of the air in the room when calculating his heat loss. The writer has found that the increase of temperature of the air in a heated room varies from ½ to 2 degrees for each foot of hight above the floor, and that for rooms whose hights are about 12 feet the average temperature of the air may be taken as equal to the temperature measured 4.5 or 5 feet from the floor. When a room is heated by hot air it is probably safe to say that when the temperature of the air in the room is 70 degrees 5 feet above the floor the temperature at a distance h from the floor is about $65 + h$. If h is taken as the hight of the ceiling above the floor, the average temperature between the floor and the ceiling is about $65 + \frac{h}{2}$.

For work in connection with ordinary dwellings or schools it makes very little difference whether a high wall or window transmits more or less heat per hour than a lower one of the same kind and thickness, as the walls of the rooms are usually not much higher than 12 feet, and the average temperature of the air is about the same as the temperature observed about 4.5 or 5 feet above the floor. But for work in connection with churches and other buildings in which the hights of the rooms are quite great it becomes important to know whether the heat loss of a high wall is or is not different from that of a lower wall of the same kind, area and thickness; and if the heat loss is not the same for the high as for the lower wall, it is of the utmost importance to know whether it is smaller or greater.

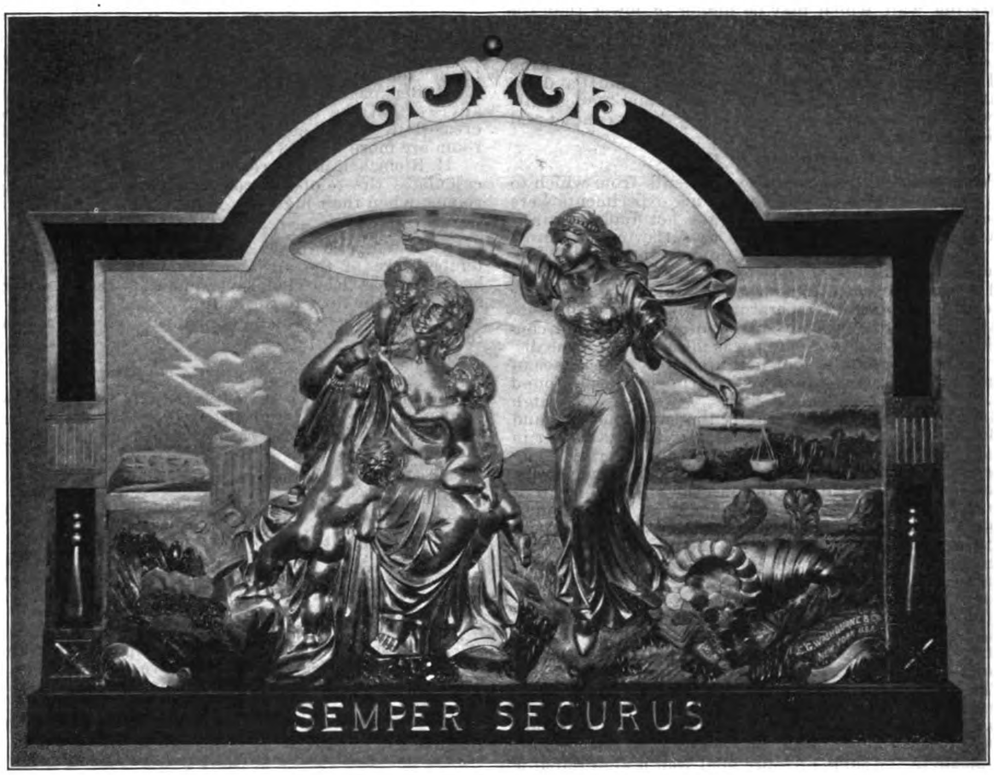
Writers on heating seem to have divided themselves into two classes: those who consider that the high wall transmits less heat and those who consider that the high wall transmits more heat. I am inclined to think that the second class is the smaller, yet I am sure that their view of the matter is the correct one; the high wall transmits more heat than the lower one.

My attention was first called to the different opinions of engineers on this matter by the editor of one of our weeklies running his blue pencil through an article I had written, in which I stated that the heat loss of a high wall is greater than that of a lower one of the same kind, area and thickness. As you all know, an editor, armed with a blue pencil may be an exceedingly inconvenient opponent, but I had the temerity to try to convince him that I was right, and finally succeeded in having the blue pencil mark erased.

* Read by J. H. Kinealy, St. Louis, Mo., at the New York meeting of the American Society of Heating and Ventilating Engineers, January 25-27, 1898.

Handsome Specimen of Wood Carving.

We have no doubt that many of our readers will be interested in the reproduction presented herewith of a piece of wood carving which is regarded as among the finest specimens of its kind ever turned out. It is in the nature of a sign for an insurance company in South America, to which place it was shipped just before the beginning of the new year. It measures about 11 x 8 feet in size, and is intended to stand on the corner of a building at an elevation of about 25 feet above the street level. The design is a *fac-simile* of the policy heading of the Garantia da Amazonia (Amazon Life Assurance Society) of Para, Brazil, and the figures, which are finished in gold, are nearly life size. The carving is executed with careful fidelity to details, and has a maximum depth of nearly 12 inches. The sign is made entirely of pine wood with a background painted in colors to represent nature. The carving was done entirely by hand, the work being that of E. G. Washburne & Co. of 46 Cortlandt street, New York City. There are two other very fine signs in the city of Para, one of them having been made in Paris and the other in London, but the president of the company named is authority for the statement that the sign here pictured is far superior to anything of its kind in Para.



Handsome Specimen of Wood Carving.

Ventilation of School Houses.

Prof. Alexander Chaplain of Easton recently read a carefully prepared and instructive paper before the annual meeting of the Association of School Commissioners of the State of Maryland at Baltimore on the following subject : "In the Construction of New Schoolhouses, with Limited Means, What Is the Best Plan for Ventilation ?" Professor Chaplain's views met with unanimous approval. In part he said :

If fresh air is introduced into a room a corresponding provision must be made for the escape of foul air, for only as much air can be brought in as the ventilating shaft discharges foul air. The ventilating flue, therefore, should be large enough to insure the free circulation of the pure heated air through the room in the full measure and capacity of the cold air box and the heating apparatus. Uniform and reliable ventilation can only be secured by expensive appliances and fan machinery, which cannot be thought of for our ordinary and simple school buildings. But when it is asserted by those who have given the subject most attention that one-half of the diseases which afflict the human race can be traced directly to the breathing of impure air, and that children are many times more sensitive to atmospheric poison than adults, it is a crime for those who have charge of planning and constructing our school houses to neglect to provide them with at least some simple and economic means of ventilation.

The Philadelphia Exposition of 1898.

A charter has been issued to the Philadelphia Exposition Association, a corporation who are to manage the affairs of the Exposition of Manufacturers of the United States to be held in Philadelphia next October under the joint auspices of the Philadelphia museums and the Franklin Institute of that city. The incorporators, who will also form the first Board of Directors, are P. A. B. Widener, who will be the president of the association; William L. Elkins, John Birkinbine, John H. Converse, Edwin S. Cramp, Thomas Dolan, Dr. William Pepper, Mrs. Sara Yorke Stevenson, A. B. Farquhar, W. W. Foulkrod, J. C. Strawbridge, William P. Wilson, Daniel Baugh, Sydney L. Wright, Joseph S. Harris, Louis J. Matos, William M. Watts, Wilfred H. Schoff, John R. Savage, C. A. Green, G. H. Leaf, A. Sydney Millward, Henry C. Corfield, E. H. Barclay and Arthur Brock. The working force of the organization will be organized immediately, and all preparations pushed forward with vigor. It is intended to erect a main building on ground in West Philadelphia donated by the city to the Philadelphia Museums for the erection of permanent buildings. The main building will be constructed in such a manner that it may be subsequently used for the Philadelphia Museums. Other temporary buildings will be put up also. The capital stock with which the association starts is placed at $300,000.

The Builders' Exchange

Directory and Official Announcements of the National Association of Builders.

Officers for 1897-8.

President,
Thos. R. Bentley of Milwaukee, Wis.

First Vice-President,
Wm. H. Alsip of Chicago, Ill.

Second Vice-President,
Stacy Reeves of Philadelphia, Pa.

Secretary,
Wm. H. Sayward of Boston, Mass.

Treasurer,
George Tapper of Chicago, Ill.

Directors.

Baltimore, Md.	S. B. Sexton, Jr.
Boston, Mass.	C. Everett Clark.
Buffalo, N. Y.	Charles A. Rupp.
Chicago, Ill	Wm. M. Crilly.
Detroit, Mich.	John Finn.
Lowell, Mass.	Wm. H. Kimball.
Milwaukee, Wis.	W. S. Wallschlaeger.
New York City	Chas. A. Cowen.
Philadelphia, Pa.	Geo. Watson.
Portland	George Smith.
Rochester, N. Y.	John Luther.
St. Louis	P. J. Moynahan.
Worcester	John H. Pickford.

Attitude of National Association of Builders Toward Local Exchanges.

For the benefit of builders' exchanges throughout the country whose members are not familiar with the attitude of the National Association of Builders toward local organizations under the new constitution adopted at the last convention, the following extract from the secretary's report at that time is reprinted. Although the report was addressed to the members of the National Association, and was presented before the action which created the present constitution was taken, it states so clearly the attitude of the association to-day toward builders everywhere throughout the country that it is deemed worthy of repetition:

In the light of our experience I reach the conclusion that inasmuch as the National Association is purely an educational institution, it defeats its own purposes when it demands anything of anybody, either an individual or an organization. Its function is purely a moral function, its motto is to give, and the local bodies are the channels for its giving. Inasmuch as we seek only to benefit and improve conditions for the individual, the form of organization under which any group of builders seeks the aid of the National Association should not affect us so much as to prevent us from placing ourselves in a position where we can help to improve and educate the individual and thus lay the foundation for improving the local organization of which he is a part. We should do all that we possibly can to improve the form under which local bodies organize, but to do this we must put ourselves in a position so that we can get at the individuals who compose the organization. Therefore, however badly formed at present an organization of builders may be, it is still within the scope of the work of the national, and our doors should be open to it. The fact that builders have come together in an organization, however crude, however insufficient, is an evidence in itself of recognition of the desirability of organization and a tacit admission that conditions can be bettered by associated effort. This fixes at once its claims upon us for all the assistance we can give, and this assistance can be best rendered under the fraternal relations of membership. Let us then strip away all obstacles that prevent us from getting in close touch with each and every organization of builders throughout the country. Let our sole request of them be that we be given an opportunity to continue our work in their behalf and with their aid to ever widen our field of usefulness.

This elimination from our constitution of everything that seems like an attempt to control the form of organization of local bodies will relieve us of one of the obstacles which has prevented us from increasing our constituency and enlarging our field of usefulness.

Experience shows that almost all local exchanges are predisposed in favor of some certain form of organization which they believe is made necessary by local conditions, and while the National Association need not be deterred from expressing its views as to what it may deem a better form of organization for local bodies, it should not defeat its own purpose by refusing admission on that account. All organizations should be welcomed in the belief that time, experience and the influence of the congregate body—that is, the national—will produce such modifications as may be wise and essential.

Organization in the Building Trades.—III.

The condition in the minds of many members of builders' exchanges throughout the country, which is fatal to the success of such organizations, is the belief that when a form of organization is set up all the ends sought should immediately be accomplished without effort of any kind on the part of the members beyond the payment of the admission fee and annual dues. The reverse, however, is the fact. With the creation of a form of organization, the adoption of a constitution, election of officers, &c., the real work is only just begun. The actual work of organizing begins after the lines upon which it has been determined to proceed toward organization have been laid down. Organization cannot be "resolved" into existence; no intentions, however excellent, can of themselves create organization. Action alone—action by every individual who seeks the protection and influence which true organization insures—can bring about the harmony, uniformity and strength which are its component parts.

When a builders' exchange is created it is obvious that the members are not fully aware of the methods best calculated to protect them from the damaging conditions whose existence caused them to turn to organization for protection. The establishment of an exchange is but an evidence of a desire on the part of certain builders to join together in an effort for the better protection of the whole, but it is plain to be seen that this desire cannot bear full fruit without years of patient and consistent effort on the part of all concerned. The habits of distrust and disregard for each other's welfare, against which an exchange stands as a protest, are the outgrowth of generations of individualism, during which many builders considered any means which would secure a contract as being legitimate. No pains were spared to secure contracts by whatever means so long as they were successful, and little or no regard was paid to the effect upon future business, until in these latter days competition is often little better than an idle farce, in which the honorable competitor consents to be a party to his own business destruction.

Nothing could be more unnatural than to expect that the minds of all members of a builders' exchange (which at the first is but an experiment at best) should suddenly with one accord become firmly fixed on a course of business conduct out of keeping with the traditions of the past, and so perfect in operation as to insure success at once. No building contractor who starts with little or no capital can reasonably expect to attain complete business success in a single effort, and yet the builders who form the average exchange expect to attain instant, or at least quick, success with little or none of the capital required to insure success in organization.

The capital required to insure organization, and when organization is attained success will follow, is, first, a realization that nothing can be accomplished without action, and that the obligation to act is equal upon all members; and afterward patience, consistent patience to plod along from day to day supported by the knowledge that every day's effort improves the conditions under which business is transacted, makes it safer, its profit surer, and increases steadily and surely the pleasure of finding that competitors can still be friends and business something besides slaughter.

Through the work of the National Association the experience of builders in their efforts at organization has been thoroughly investigated and thoroughly sifted until the forms of action it recommends represent a composite refinement of all the beneficial methods undertaken for the betterment of the business up to the present time. The conferences of builders, actual contractors, the pick of the several cities they represented, that have been brought about by the annual conventions of the association have resulted in defining specifically that which constitutes good and that which constitutes bad action on the part of a builder, until it is no longer possible to say that no fixed and honorable code of business practice exists. The principles upon which the recommendations of the National Association are based are equally applicable to business conditions in any city in the country, there being few, if any, local conditions which would require that they be changed even in the method of application.

As has been previously announced in this department, the reports of past conventions and other printed matter will be furnished gladly to any builder desiring the same upon application to Wm. H. Sayward, secretary, 166 Devonshire street, Boston, Mass.

New Publications.

MODERN AMERICAN DWELLINGS WITH CONSTRUCTIVE DETAILS. *Carpentry and Building* Series No. 2; size, 9 x 13 inches; 202 pages; illustrated by 33 half-tone engravings and 127 full page plates of details; bound in heavy board covers. Published by David Williams Company, 232–238 William street, New York City. Price, $2, post paid.

This is the second in the *Carpentry and Building* series of studies intended for practical builders, who are often called upon to act as their own architects in the erection of dwelling houses. The studies represent the efforts of numerous architects scattered over a wide range of country, and the selection embraced within the covers of the volume includes 37 designs of suburban dwellings ranging in cost from $2000 to $5000. In connection with the various designs are given floor plans, elevations, and a good assortment of details, together with brief extracts from the specifications. In nearly every case a half-tone reproduction from a photograph shows the appearance of the completed structure. The studies presented will be found particularly adapted for execution upon suburban sites, and in the smaller towns and villages of the country. The figures of cost which are given in each case apply to the locality in which the author resides and are given merely as a guide to the builder for the reason that the cost will vary with the location and style of finish. This volume in connection with No. 1 of the series, which embraces designs costing from $600 to $1500, will be found of special value to those who contemplate building for themselves or who desire an interesting series of studies in conveniently bound form for the inspection of prospective clients.

THE GEORGIAN PERIOD: Being measured drawings of Colonial Work; Part 1; 33 full page plates; published by the American Architect and Building News Company.

This work, as its title indicates, consists of measured drawings of colonial work by various well-known architects. The 33 plates constituting the first part illustrate the details of some of the early houses erected in the New England States, covering such subjects as the Royall Mansion at Medford, Mass., built in 1737; the pulpit in the old meeting house at Sandown, N. H., date of 1774; King's Chapel of Boston, 1749; Porter House, Hadley, Mass., 1713; Hazard House, at Newport, 1740; Fairbanks House, at Dedham, 1636, and the Josiah Dwight House, Springfield, Mass, 1764. There are also details of furniture, staircases, mantels, doorways, &c., making a very interesting collection. The greater portion of the value of the publication, however, is said to lie in Part II, now in course of preparation. This, we understand, will contain not less than 48 sheets of measured drawings, a large part of which have never before been published, and a number of gelatine prints. The plates illustrate the details of domestic and public buildings in the New England, Middle and Southern States.

THE STRENGTH OF MATERIALS. By Mansfield Merriman, Professor of Civil Engineering in Lehigh University. Size, 5 x 7½ inches; 124 pages; 40 illustrations; bound in cloth. Published by John Wiley & Sons. Price, $1.

This little volume is in the nature of a text book for manual training schools, and within its covers the attempt is made to give a presentation of the subject of the strength of materials, beams, columns and shafts which may be understood by those not acquainted with the calculus. The author has had particularly in mind the students in the higher classes of manual training schools, and it has been his aim to treat the subject in such an elementary manner that it may be readily comprehended by them, while at the same time covering all the essential principles and methods. The work is comprised in nine chapters dealing mainly with questions of strength, the subject of elastic deformations occupying a subordinate place. In the first chapter elastic and ultimate strength are considered, after which the author takes up general properties such as average weights, testing machines and various materials. Chapter III deals with moments for beams; Chapter IV, cantilever and simplebeams, while Chapter V has to do with columns or struts. The following chapters consider the torsion of shafts, elastic deformations, resilience of materials, and finally miscellaneous applications. All the rules for the investigation and design of common beams are presented; by simple algebraic and geometric methods, no Greek letters being used. Scattered through the book are numerous tables which will be found of special interest in this connection.

CONTENTS.

CARPENTRY AND BUILDING

WITH WHICH IS INCORPORATED
THE BUILDERS' EXCHANGE.

DAVID WILLIAMS COMPANY, - PUBLISHERS AND PROPRIETORS
232-238 WILLIAM STREET, NEW YORK.

APRIL, 1898.

Columbia's New University Hall.

It is probably safe to say that University Hall, which is now in course of construction on the new site of Columbia University in New York City, will when completed be the largest college building in this country, if not in the world. According to the plans and specifications of the architects, McKim, Mead & White, the main entrance will have a Corinthian portico of Stony Creek granite, supported by 14 columns, each 4 feet in diameter and 32 feet in hight. The dining room will extend back 120 feet, its width corresponding to that of the portico, and be finished in oak and stone. At the right and left will be private dining rooms, club rooms, cloak rooms, &c. The termination of the dining hall will be the proscenium arch of the academic theatre. The latter will be arranged in classic form and will be finished in heavy oak and stone, resembling, both in its arrangement and finish, the Chamber of Deputies in Paris. It will have a seating capacity of 2500 and access will be had by means of corridors extending to the right and left of the dining hall as well as by means of elevators. The entire building will be 250 x 160 feet in area and semicircular in form. As the ground is sloping at this point the hight of the building at the rear will be 100 feet and in front 70 feet. That portion of the building above the upper level will be in the Italian Renaissance style of architecture and finished with Harvard brick and Indiana limestone. The building will also contain in its completed state a gymnasium, a swimming pool and a power room. The latter, now practically completed, is 160 x 90 feet in size and 32 feet in hight. A gallery which extends entirely around the walls of the power house supports conduits containing steam pipes and electric wires which distribute heat and light throughout the entire plant. The gymnasium, which is rapidly nearing completion, will be one of the most complete of its kind in the world, and will contain a well banked and padded running track, locker rooms, shower baths and a visitors' gallery. An interesting feature in connection with the gymnasium is the floor, which will be of 3-inch maple planking, dovetailed and keyed together with mahogany keys, set in such a way as to form a pattern. Light will be admitted through 12 arched windows, each 22 x 12 feet. The stationary gymnasium apparatus will be fastened to a heavy oak wainscoting extending entirely around the sides of the room. There will be in addition to the gymnasium proper boxing and fencing rooms and in the basement the swimming pool, the latter being modeled after the ancient Roman baths and constructed almost wholly of white marble.

A Novel Educational Enterprise.

The intelligent enterprise which characterizes the management of the International Correspondence Schools of Scranton, Pa., has taken a novel direction. With the obiect of calling public attention to the educational work they are doing, they have caused to be built a handsome railway car, which is about to be dispatched on a tour through the manufacturing centers of the country. The car, which is fifty feet long and ten feet broad, is fitted with living accommodations for eight persons, including R. J. Foster, the president of the schools, his assistant, John G. Forsythe, and six instructors. The scheme proposed is to locate the car for a time in the immediate neighborhood of large manufacturing establishments and give to those interested a practical demonstration of the work of the schools. For this purpose the car is equipped with a large reception room fitted with bookcases, tables and chairs and all requirements for reading and writing. A large store of books and school supplies is to be carried, covering the wide range of technical subjects in which instruction is offered by the schools. The fittings of the car, both outside and inside, are of the most elaborate and attractive description, and inscriptions on the exterior are calculated to draw the attention of the public to its mission in a most effective manner.

Some New Office Buildings.

The colony of towering office buildings in the lower part of the city is soon to be augmented by a 15-story structure, which will be erected at the northwest corner of Broadway and Reade street. The property is owned by the Hemingway estate of Boston, and the management have commissioned Clinton & Russell, architects, to prepare plans for a $400,000 limestone and granite structure. The plans have also been filed with the Bureau of Buildings for a 14-story structure intended to be used for office purposes, which will be erected by the Astor estate in accordance with drawings prepared by Architect George B. Post of this city. The structure will be known as the Vincent Building, and will have a frontage of about 51 feet on Broadway and nearly 111 feet on Duane street. It will cost in the neighborhood of $350,000, and will have elevations of limestone with bluestone trimmings. The construction will be in charge of the Tidewater Building Company, recently incorporated to carry on improvements for the Astor estate.

New York Public Library's Danger.

It looks now as if there might be some considerable delay in the commencement of the work on the new public library which is intended to occupy the site of the old reservoir, at Fifth avenue and Fortieth to Forty-second streets in this city, owing to the refusal of the Mayor and the Board of Estimate to issue city bonds for the $150,000 required to pay the expenses of tearing down the reservoir and putting the site in condition for building operations. It is stated that the Mayor's refusal is based on the Comptroller's report that when the city bonds already authorized are issued the constitutional capacity of the city to incur debt will have been exhausted. It appears that under the consolidation agreement between the trustees of the Astor, Tilden and Lenox Library funds the uses to which the money was to be put were stated specifically, as well as were those of what the city was to do in return for the benefits that would accrue from the consolidation. If, therefore, the city is not able to carry out these provisions of the agreement the other parties in interest are left free to withdraw from it, and should this be the case' it is [illegible] of a great public library for New York City would fail—a fact greatly to be regretted.

The Peruvian Exposition.

There was opened during the past month at Lima, Peru, under the auspices of the Government, a permanent exposition of manufactured articles designed to exhibit the latest improvements in machinery for agricultural, mining and manufacturing purposes, such as may be suitable for use in Peru. The exposition will also embrace all kinds of novelties for domestic use, also for water service, lighting, transportation, or, in fact, any new inventions or devices applicable to the country. The exhibitors are allowed space free of all charges, and all goods imported for the exposition and which are not sold after being exhibited will be transported to Callao gratis. It is reported that the European manufacturers have already availed themselves freely of this opportunity for increasing their trade in Peru, and in order that the United States may also share in its benefits Frederick Bergmann, Peruvian Consul-General in New York City, has announced that he will forward, free of charge, to Lima any small packages that manufacturers or merchants may desire to send for exhibition. Mr. Bergmann, whose address is 15 Whitehall street, New York, is also ready to furnish manufacturers with all information regarding the enterprise.

The Boston Mechanics' Exhibition.

The Massachusetts Charitable Mechanic Association of Boston has issued the prospectus of the twentieth annual exhibition, which is to be held in October and November of this year.

The rules provide that the building will be open for the reception of exhibits from September 12 to October 8, the exhibition opening on October 10. Each exhibitor is required to pay an entrance fee according to the location and character of the exhibit, the minimum being $5. Power to drive machinery is furnished free, the speed of the main line of shafting being 200. The arrangement at the exhibition has been placed in the hands of an Executive Committee consisting of Horace H. Watson, chairman ; Samuel N. Davenport, treasurer, and Henry D. Dupee, secretary.

Concrete and Cement Work.

In estimating the cost of concrete work much depends upon the cost of the raw materials used, the kind of concrete made, and the use to which it is to be put. In building operations concrete is used for several specific purposes, as follows :

1. Footings and foundations of walls.
2. For cellar walls.
3. For the walls of superstructures.
4. For the filling of arches in fire proof structures.
5. For cellar floors and walks.

Concrete is prepared in several ways and of several materials, Portland cement being the base, as follows :

	Parts.		Parts.		Parts.		Parts.
Cement	1	Broken stone	3	Gravel	1	Sand	3
Cement	1	Broken bricks	3	Gravel	1	Sand	3
Cement	1	Cinders	4	Gravel	1	Sand	2
Cement	1	Pebbles	2	Gravel	2	Sand	3
Cement	1	Broken stone	3	Cinders	2	Sand	2
Cement	1	Coarse slag	3	Fire clay	1	Sand	3

Portland cement used in all cases, mixed with clean water.

To the cost of the several ingredients to be worked into the concrete, add the labor of preparing and the cost of mason's wages in placing in building, as follows : A good laborer will prepare a cubic yard of concrete ready to put into a wall or footing in one and a half hours ; a mason will place and ram a cubic yard in half an hour. Concrete is generally measured by the cubic yard or by the superficial yard, according to the kind of work, and the cost is gauged by the cost of material and labor. Cellar bottoms and walks are generally prepared by the use of from 2 to 6 inches of concrete, on the top of which is finished from ½ inch to 2 inches of top dressing compound of one part of best Canadian portland cement and one and a half or two parts of coarse, sharp sand. The cost of this class of work, says a writer in one of our Canadian exchanges, varies from 50 cents to $1.25 per superficial yard, the latter sum being for the best work made not less than 6 inches thick and built on a good gravel or shale base, rating cement at $3.50 per barrel and sharp, clean sand at $1 per cubic yard, mason's wages at $3 per day and laboring man at $1.25 per day. Any change in these prices will, of course, affect the cost per yard of the work.

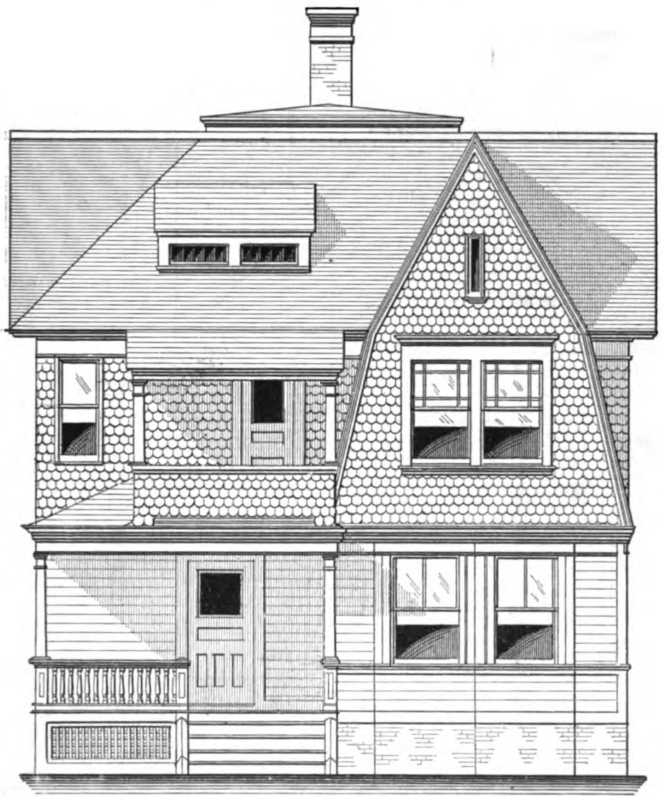
The Flying Buttress.

The Gothic architects in their love of vaulted roofs soon became confronted with structural difficulties. In edifices of moderate hight these were more or less easily surmounted; but the case became different when great altitude was desired, as in the French churches with their lofty clerestories and large windows for the display of colored glass. If stone vaults had to be poised in the air, there would be a thrust somewhere which had to be guarded against. The architects of Italy sought for this solution in the adoption of iron tie bars, avoiding buttresses. But in Italian Gothic mediæval principles were rather passively tolerated than actively loved in the land which cherished the memories of Rome and Greece. Here the horizontal principle predominated in architecture, and the elaborate groined roofs of northern art found no home. Simple vaults were raised upon walls of no great elevation, and such thrusts as resulted was provided for by the simple expedient above referred to. The northern mediæval architect scorned such a device. To him it seemed unreasonable that his work should need adventitious aid to enable it to stand. It should be complete in itself and built of homogeneous material. Thus arose the invention of the flying buttress. Accustomed to break the surface of his walls by the ordinary solid buttress, it was in his eyes only a natural development to extend it upward and connect it by means of an arch with the roof which required its support. By this method the whole mass of the building became self sustaining, each part lending to every other that support which might be locally wanting in its own construction. The buttress, in whatever form, is therefore an example of the adoption by architecture of a utilitarian feature and of the incorporation of such a feature into a style. Like all other things, says a writer in one of our exchanges, it ceases to please when exaggerated, but as used by English mediæval builders it adds in no slight degree to the picturesqueness of their work. The vaults in English churches are seldom so ambitious or the clerestories so developed as in foreign examples, and the flying buttress has therefore been kept with us under the restraining influence of moderation. An example to the contrary is found at Notre Dame, in Paris, where the flying buttresses around the apse not only obscure and confuse the architect, but even suggest the existence of weakness by bringing before the mind too obviously the necessity of unusual means of support. In such a case as this it is the buttress which becomes the principal feature of the design and reduces the building which it serves to subordination, a total inversion of the relations which ought to exist, for utility here becomes a burden and injures, from the artistic point of view, that which it should assist. Difference of opinion will, of course, exist as to the æsthetic value of the buttress. To those whose taste leads them in classic directions the buttress will seem to be fatal to breadth of effect. Others, again, will censure it as suggestive of weakness in the wall to which it is applied. Looking, however, to the predominance of the vertical principle in northern mediæval architecture, the buttress seems to be the natural result of such a principle and thus to take its place readily in a style which expresses vigor rather than repose.

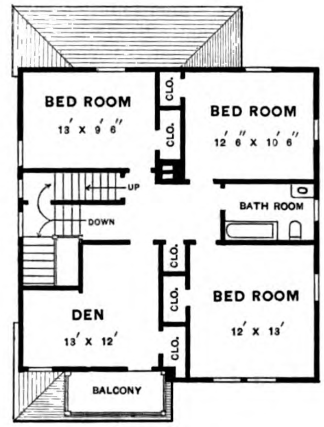
COTTAGE AT MERIDEN, CONN.

THE subject of our half-tone supplemental plate this month is a neat two story frame dwelling, of a design well suited for execution upon a suburban site. The picture shows the first story covered with weather boards, while the second story and gables are treated with shingles, those on the front gable being of an ornamental nature. A neat balcony over the front porch, the double window in the parlor and the broken roof effects constitute some of the more noticeable features of the exterior treatment. The floor plans presented herewith show the arrangement of the interior of the building, while the details indicate some of the features of construction. The house occupies an advantageous site on Wilcox avenue in Meriden, Conn., and was erected not long ago for E. T. Sills of that place. The timber expert in that line. The cellar in the house is cemented and contains the heating apparatus, the house being heated by a Winthrop hot air furnace made by the Dighton Furnace Company of Taunton, Mass. The plumbing is of the exposed type, ventilated, and the fixtures nickel plated.

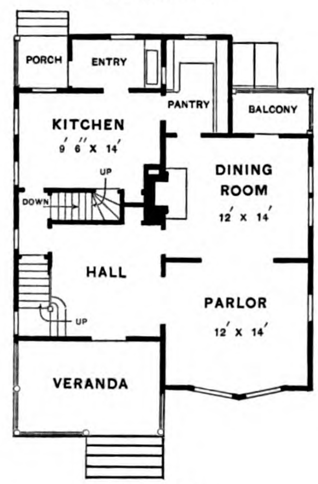
The house was built a short time ago in accordance



Front Elevation.—Scale, ⅛ Inch to the Foot.



Second Floor.



First Floor.

Scale, 1-16 Inch to the Foot.

Cottage at Meriden, Conn.—D. Bloomfield, Architect.

employed is spruce, the sills being 4 x 6 inches; the first and second floor joist, 2 x 10 inches; the attic joist, 2 x 8 inches; the posts and girts, 4 x 6 inches, and the studding, 2 x 4 inches. The plates are 2 x 4 inches, doubled, while the rafters are 2 x 6 inches. The building is sheeted on the outside of the frame with matched spruce covered with water proof paper, on which is laid pine clapboards and shingles, as shown on the elevations. The sides and gables of the house are covered with 16-inch red wood shingles, and the roof with 18-inch shingles.

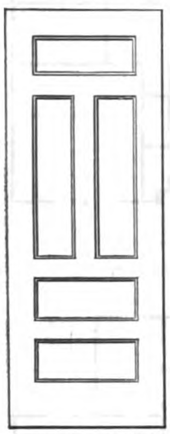
The floor in the first story is double, the finished floors throughout being laid with No. 2 North Carolina pine ⅞ x 3 inches. The finish of the first floor, second floor hall and bathroom is in brown ash, while for the balance of the house it is heart clear white wood. The dining room has a fire place with tile hearth, tile facings and an oak mantel with bevel plate mirror. The house is wired and fitted for electric gas lighting, the wiring being done by J. H. Churchill of Meriden, Conn., an

with plans furnished by D. Bloomfield, architect, of 129 State street, Meriden, Conn., the builder being O. D. Penfield of that place.

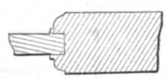
Steel Roofs for Mill Buildings.

At one of the meetings of the Engineers' Society of Western Pennsylvania an interesting paper on "Steel Roofs of Mill Buildings" was presented by A. E. Duckham. The roof covering on mill buildings, boiler houses, coal tipples, &c., he explained, is usually corrugated iron laid directly on the purlins; or in some cases, to prevent condensation of moisture in the atmosphere, which in case of machine shops might injure the machinery beneath, it is laid on board sheeting. There is also an "anti-condensation" corrugated iron covering used by an Eastern bridge company on their buildings. By this method the purlins are spaced about 27 inches apart, while upon them is laid galvanized wire netting. Upon this two layers of asbestos paper are placed. Then on top of this we have two layers of tar paper. Upon all this the corrugated iron is laid. The asbestos paper renders the roof fire proof, and the tar paper prevents moisture going through, if any should condense on the under side of the corrugated iron. The corrugated iron generally used for roofs is No. 20, and for the sides No. 22. The usual covering width is from 24 to 26 inches. The usual lap is one and a half corrugations on side, 6 inches on end for roofs; and one corrugation on side, 4 inches on end for siding. The length of sheets varies from 5 to 10 feet—foot lengths being in stock at the mill. The corrugations are generally 2½ inches apart.

The "clips" used to fasten the corrugated iron to the purlins are usually No. 18 hoop iron, ¾ inch wide, and are fastened around the purlins. A bundle weighs 100 pounds, and contains 800 feet. In ordering we allow one clip per foot of purlin or girt. The clips are about 12 inches long for angle supports. The rivets are 3-16 inch in diameter, the heads are flat, with burrs, and galvanized.



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



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

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

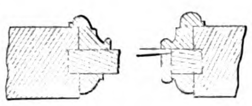
Cottage at Meriden, Conn.—Side Elevation and Miscellaneous Details.

The lengths are ⅜ inch on sides and ends of sheets, ½ inch on corners of sheets and clips for Nos. 20 to 24. We order eight long and seven short per bottom sheet, six long and nine short per top sheet, five long and nine short per intermediate sheet, six short per foot of "ridge roll" and two short per foot of cornice. The ridge roll may be made from a 15-inch sheet—5-inch apron, and 3 inches across roll. The rivets are driven cold. one man standing under the roof, holding the clip and rivets in place, while another on top punches the holes and drives the rivets. The corrugated iron may be galvanized, painted or both. One gallon of thick paint in cold weather will cover from 400 to 500 square feet; 1 gallon of thin paint in warm weather will cover 600 to 700 square feet. If the pitch of the roof is great, the I-beam purlin is braced by a bent plate. The corrugated iron at the sides of the building should not project too far (about 1 foot will do), as the wind is liable to tear it loose. At the ends of the building it is bent over and fastened.

Novel Spire Construction.

A curious method of construction, which is said to have been much in use in Ireland upward of a century ago, came to light recently in connection with the attempt to straighten the spire of a church in the county of Cork. After the spire had been examined by an architect, and the contractors had set about taking it down, with the view of rebuilding, the surprising discovery was made that it could not be taken down except it was done *en masse*, as the stones of which it is built were hermetically bound to each other with a combination of molten lead and sand, which rendered it absolutely impossible to separate one stone from another, the whole spire being, as it were, one solid block. On further and closer inspection it was found that the entire building was erected in a similar manner, no other mortar or binding substances of any kind being used save the sand and molten lead. A huge iron shaft runs through the top portion of the spire on which the stones were slipped like rings and irrevocably riveted with lead and sand. Under this extraordinary circumstance the idea of taking down the tower had to be abandoned as being quite impracticable, if not utterly impossible, but the desired end is said to have been satisfactorily attained by an ingenious and clever method adopted by the contractor and his staff, particulars of which are unfortunately not supplied.

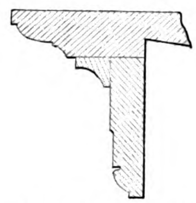
The fire loss of the United States and Canada during the month of February as compiled by the New York *Journal of Commerce* reached a larger total than for a number of recent months, amounting to $12,629,300, as against $8,676,000 in February, 1897, and $9,472,000 in January of this year. The principal loss during the month was at Pittsburgh, where a cold storage plant and other buildings contributed nearly $2,000,000.



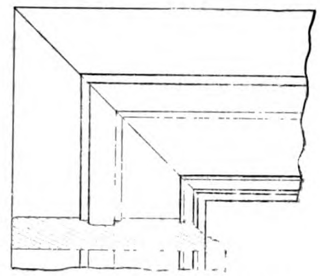
Detail of Front Door.—Scale, 3 Inches to the Foot.

Base.—Scale, 3 Inches to the Foot.

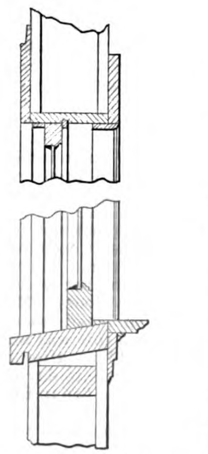
Section of Wainscot Cap.—Scale, 3 Inches to Foot.



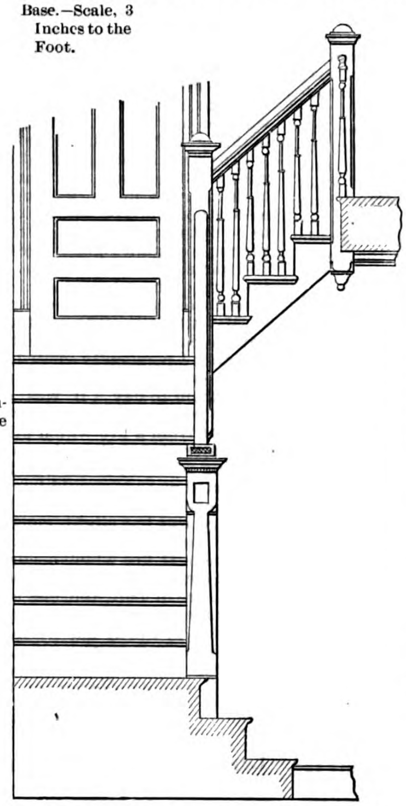
Detail of Window Stool Finish.—Scale, 3 Inches to the Foot.



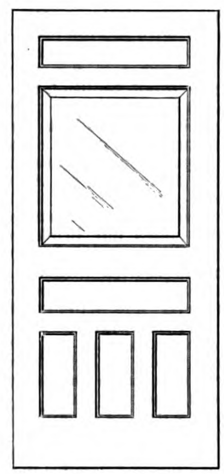
Detail of Casing.—Scale, 3 Inches to the Foot.



Vertical Section through Windows.—Scale, 1 Inch to the Foot.

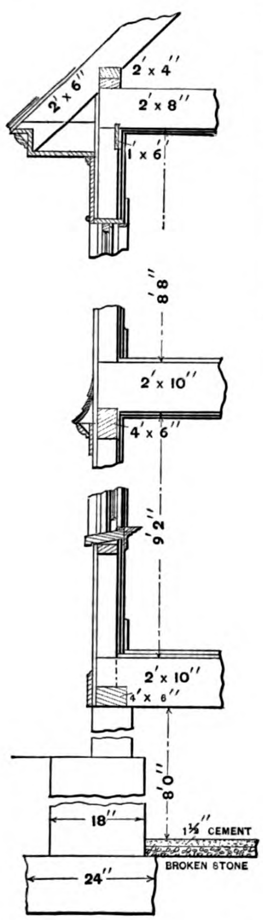


Front Elevation of Main Stairs.—Scale, ⅜ Inch to the Foot.

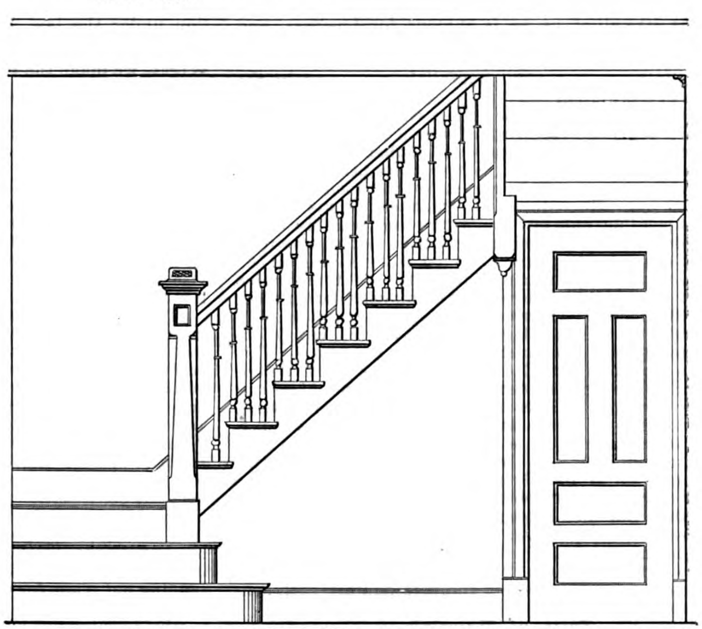


Elevation of Front Door.—Scale, ⅜ Inch to the Foot.

Details of Veranda Cornice, Columns, Balustrade, &c.—Scale, ⅜ Inch to the Foot.



Vertical Section through Wall of Building.—Scale, ⅜ Inch to the Foot.



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

Miscellaneous Constructive Details of Cottage at Meriden, Conn.

BURNED CLAY AS A FIRE PROOFING MATERIAL.

AT the recent convention of the National Brick Manufacturers' Association held in Pittsburgh, Pa., one of the many interesting papers presented, and which developed a spirited discussion, was that by W. D. Henry of the city named, dealing with the question of burned clay as a fire proofing material. This has such a bearing on current building operations that we give space to the following extracts :

Our leading architects, realizing that buildings must be built fire proof, naturally looked to burned clay as the material most adaptable for this purpose. For the support of this material iron beams are used, and instead of the heavy brick and stone walls which we were formerly accustomed to seeing we now have the steel frame buildings, with iron beams for joist, and tile (burned clay) for filling in between these joist, made hollow to decrease the weight and form a level ceiling for plastering, to form the floors and divide the building into compartments, and last, but most important, to protect the iron and steel from the action of fire, as we all know the result of iron when it comes in contact with intense heat.

We in the burned clay business hear people ridicule fire proof buildings, and when a fire occurs they say, "There is another fire proof building for you!" Ask these people how this building was fire proofed and they will say (if they have investigated) it was with heavy timbers, and finally inform you it was slow burning. A slow burning and a fire proof building are just as different as a brick house is from a frame one. A building made of steel beams, properly erected, filled in and protected with burned clay (hollow tile) can be made as fire proof as the kilns in which we burn our brick and terra cotta, or the furnace in which the iron is heated to be rolled.

The only known material with which this can be done is burned clay—that is, hollow tile or brick. Of course this must be made properly, and if the tile is not made to cover the iron in the very best manner, and to stay there under all reasonable conditions, the desired result is not accomplished, or if it is made so light in weight and of such a brittle character that upon the least test it flies to pieces, then it is not of the proper kind.

Tile should be made with heavy webs, with rounded corners and of a porous nature, which then affords a material not only of sufficient strength but of a toughness which allows of contraction and expansion without injury to the material.

Making Tile.

To make tile in this way means that the manufacturer must have a price which will justify him in using heavier material, especially where freight is one of the greatest items of cost; but this he seldom secures. It is usually the owner who is to blame, not the architect. The owner tells his architect he wants a building of such dimensions, to cost so much. This cannot be built under a certain sum, but he thinks it can, and sometimes the architect agrees with him, knowing at the same time it is impossible, but, like all of us, he is anxious for business, and prepares plans and specifications, irrespective of the quality of the fire proofing required, which to my mind is one of the most important materials necessary in the erection of a building.

The specifications call for hollow tile, but no weight is specified; one manufacturer, if responsible, has just as good a chance as another; some one of them, having little to do and anxious for work, sharpens his pencil and figures how light in weight he can make his goods for this particular job. He reduces the thickness of his webs as much as possible, cuts out one or two and possibly all of them, and he finds his weight decreased per square foot, say, for example, 10 pounds. What is his saving on 50,000 feet, which is an ordinary job? It is 250 tons, which at $3 per ton freight means $750, without considering other savings in his manufacture.

There is no question but what heavy tile will withstand the action of fire much better than light ones. This has been proven in actual experience. The light tile fellow secures nearly the same price as the manufacturer of heavy tile, who believes in making his corners round, his tile tough, not brittle, and in every way giving a better and stronger job. This should not be any more than the iron manufacturer has a right to receive as much for a 10-inch beam, 1 foot long, weighing 25 pounds, as he does for one of the same depth and length but weighing 45 pounds. But such is competition among the tile manufacturers themselves. And the worst of all competition is what is known as the patent systems of fire proofing. However, I will say here, there are very few architects who ask tile manufacturers to compete against such constructions.

Tests of Materials.

There have been many tests of fire proofing materials, but it is the actual fires only of which I will speak; and as the Pittsburgh Terra Cotta Lumber Company, with whom I am associated, are manufacturers of both porous and dense tile, I can compare them without prejudice.

The actual fires which have occurred have proved much. There have been fires in many fire proof hotels, the Stillman Apartments, Cleveland, and Hotels Lincoln and Henry, Pittsburgh, all of which have had fires of greater or less magnitude, some having contents of rooms completely burned out, others their cellars badly damaged, others their storerooms destroyed, and who will venture to say if these buildings had not been fire proof they would not have been burned to the ground, yet they were practically uninjured, as the fire only got as far as one or two rooms.

The first and only fire of any great magnitude which came to my notice as occurring in a fire proof building was the one which damaged the Chicago Athletic Club building on November 1, 1896.

For the information of those who are not familiar with this fire, I will say that at the time it occurred this building was in an incomplete condition. There were many thousands of feet of unworked lumber which was to be put in place, piled on the different floors. Many of the most elegant rooms were to be, and had been, lined and paneled with hardwood finish, and this was what fed the fire. The tile arches in this building, after having gone through this severe test, remain there to-day intact.

My attention was next called to the fire in the Manhattan Savings Bank Building, New York City. This building I personally visited after the fire. It was not a fire proof building in the strict sense of the word as we erect them to-day. It was constructed with heavy iron girders, which were left uncovered and exposed to the action of heat from a fire which might originate from combustible material stored on the various floors, or from a fire occurring adjacent to the building. Had these girders been protected as they should have been, the damage would not have exceeded a few hundred dollars. As it was, the damage was but slight, considering the magnitude of the fire in the building in which it originated.

The next fire which occurred, and the most severe test ever given to fire proof construction, was the great Pittsburgh fire of 1897, the loss amounting to over $2,000,000. I will not attempt to go into the details of this fire, as Corydon T. Purdy has written fully on the subject, and I am quite sure you can secure a copy of his paper, which was read before the American Society of Civil Engineers, New York City, November 3, 1897.

Legal Status of Building Contractors in Illinois.

A firm of building contractors in one of the smaller cities of Illinois recently addressed a letter to the State Board of Examiners of Architects relative to their position under the law licensing architects in that State. From the reply of the secretary of the board, Peter B. Wight, we make the following extracts:

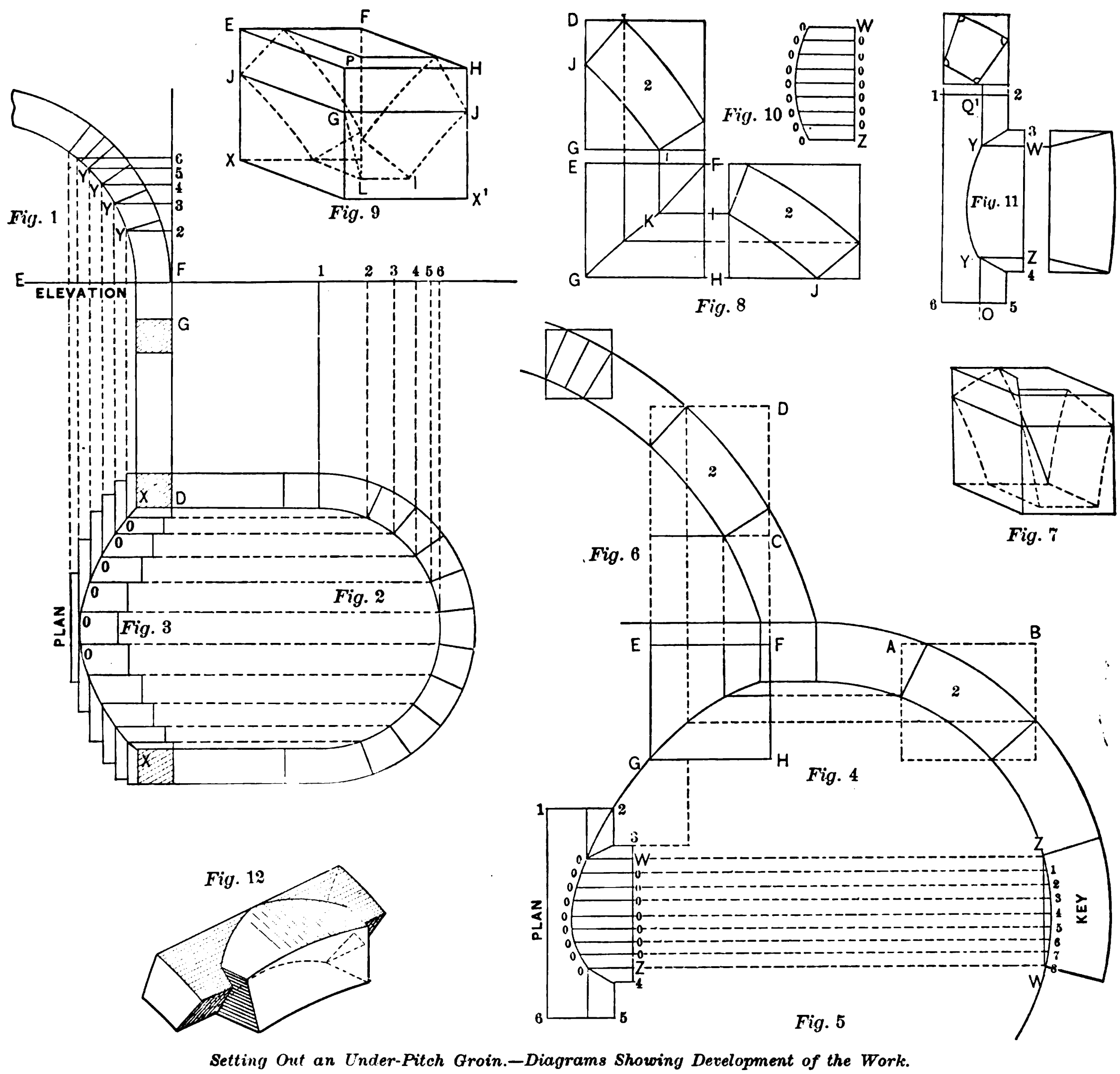
This law recognizes and protects your business as well as that of the professional architect, even though you have been in the habit of making plans for buildings that you erect. It also opens the way for a builder to become a professional architect by taking an examination; but few seem to have the courage to face a committee of professional architects, some of whom are of long standing and high attainments. The Attorney-General referred you to this office because he has given us an exhaustive opinion on the operation of the law, and while it is his duty to advise other State officers he is not obliged to interpret the law to citizens.

To answer your questions directly, I will say that you may continue, under the law and without license as architects, to prepare plans and specifications for buildings that you may be called upon by your customers to build. But you are not allowed to call yourselves, to advertise or put out any sign as architects, or to sign your plans as architects. You may sign them with your names as "builders" or "contractors," the object of the law being to protect the community against the acts of incompetent and irresponsible parties who have authority over the construction of buildings, and to fix the responsibility for error. You can see that there can be no question of divided responsibility when a builder erects from his own plans. The execution of plans made by you being thus restricted, you will therefore be prevented from sending out plans for competitive estimates by other parties, an act which, in view of the law that forbids other parties to carry out your plans, would be the assumption of the privileges of a licensed architect, and in a business sense would be a superfluity.

SETTING OUT AN UNDER-PITCH GROIN.*

IN this article we will deal with what is called an under-pitch groin—that is, a large vault or tunnel intersected by one not of the same hight. The method of cutting these stones is the same as the one described in the previous article, but is more interesting on account of the different shapes and hights of the arches. Instead of the groin being straight it assumes a curved line, which will be explained. The Niagara tunnel of the Power Company, at Niagara Falls, is an arch of this kind, the intersecting arch being pointed in elevation instead of round, as we have shown it. In this work the main body of each center from which the arch is struck draw the joint lines. From the several joints at the soffit draw lines parallel to G D, to touch the ground line of the large tunnel E F, as 1, 2, 3, 4, 5, 6. From F of Fig. 1 set off on the line F 6 the distances 1 2, 2 3, 3 4, &c. From the several points draw lines parallel to E F, to touch the soffit at Y, Y, &c., as shown in Fig. 1. Now through the points draw the joint lines.

We are now ready to draw the plan, shown in Fig. 3. Drop lines from the soffits of each arch till they meet at 0, 0, 0, &c. Draw a curve through points, when we have



Setting Out an Under-Pitch Groin.—Diagrams Showing Development of the Work.

arch is composed of brick, the angle only being of stone, which serves to strengthen it. Whether the beds are parallel one with the other the author cannot say, but it has been worked from a center as in the other groin. The problem is so liberally illustrated that there will be no difficulty in understanding the method of working the several stones. It would be well for a better understanding of this work, however, to draw one to a large scale and then cut out models from plaster or some soft stone.

We will let Fig. 1 represent the main arch, to be intersected by a smaller one, Fig. 2. The plan is represented by Fig. 3, showing the groin line curved, as X X. The first work will be to draw the arches so we can get the plan. As the smaller arch is the basis of construction, we divide it into any number of parts, as for example 11, and from the the plan of groin in the curved line X X. Draw joint lines on the soffit to any convenient length, which gives all that is necessary to find the size of each stone required and the pattterns to work them. We shall resort to a larger drawing to explain the working of these stones.

Let us assume that Figs. 4, 5 and 6 are all that are required to be able to finish the work. Fig. 7 is the springer finished. Notice that the hight of the springer of the small arc is not as great as the larger one, both having different radii, making a peculiar shape to the beds and forming a different angle from the preceding problem, but they will form themselves as the stone is worked. Examine Fig. 7 carefully and it will be understood better. The bottom bed of No. 2 will be the reverse of the top bed of springer.

We will now work stone No. 2 in the elevations. Inclose with square lines, as shown, and notice that in this arch stone they happen to be the same hight as A B and C. D. Transfer from the plan E F G H to Fig. 8, as shown. Also transfer the patterns No. 2 from each side of the arch to their respective places in Fig. 8. Work both joints E F and F H. In Fig. 9 is a diagram of the stone. Apply the joint molds, No. 2, of each arch and be careful that all the points are correct. It would be best before applying the joint molds to draw lines square from the joints, as H P and P E, and then the lines H X¹ and E X ; draw lines parallel to E P and P H, equal to the hight of stone required, as H X¹, then you will be sure of the molds being applied correctly. Now work drafts square from the joints through J G, holding the square on J X and drawing a line from each side, meeting at G ; this line will be the aris line of the top bed mold with the soffit. Work top beds. At the bottom work draft square from joints through I L ; draw a hard line through on each side till they meet at L, which will be the aris line of the soffit and bottom beds, and the reverse of the stone on which it sets. After the beds are worked, proceed to work one side of the soffit. Now take I K G H of Fig. 8 and work it through the same as an ordinary arch soffit. In this case we cannot hold an edge or rule across to find the miter line to return the soffit, but must develop a pattern that will fit the shape I K G H, on account of the groin line being curved on plan. As the method is the same for all soffit patterns it is necessary to develop only the key soffit as an illustration of all the others.

Find the stretch out of the soffit of the key, Fig. 5, from Z to W, which can be done by spacing or geometrically. In practice for the workshop pins are driven in at the several divisions and a flexible rod bent round and the divisions marked on. Transfer from the key, Fig. 5, to Fig. 10, the distances Z, 0, 0, 0, W, and from the several spaces draw lines prolonged from the key to the plan. Transfer Z, 0, 0, 0, 0, 0, as shown. Draw a curved line through the several points, and this will be the development of the part of soffit for key. The same rule applies for all the arch stones. Apply the soffit pattern for No. 2 stone, cut the soffit E G I K and the stone is finished.

The next work is the keystone. Transfer to Fig. 11 the plan of key, 1 2 3 4 5 6 of Fig. 5. First cut the joints 1 2, 3 4 and 5 6. Apply joint molds, taking care that they all line one with the other. It would be best to leave the joint patterns for the key inclosed, as shown, with the corners cut so the points could be marked on the joints and connected after the pattern is off; you will be able to get everything right. Square with the joint Z W cut drafts Z Y and W Y, then from the joints 1 2 and 5 6 work drafts Q Y, and connect Q Q with a hard line. Square from Z W and draw lines to meet at Y. Next work the soffit W Y and Z Y ; apply Fig. 10 to give the intersecting line of the two arches. Now work the other soffit and last the tops, as shown in Fig. 12, the miters of which will present themselves as they are cut. The groin arch is one of the most interesting problems in stone cutting and is worth the time of any one who is concerned in this kind of work. For draftsmen it is most invaluable. It will enable them to superintend the same and not leave it to be worked out in a haphazard way, occasioning a lot of work in trimming on the soffit, leaving it lumpy instead of a smooth, curved surface.

BUILDING REGULATIONS IN GERMANY.

APROPOS of the much discussed and widely agitated subject of tenements and high buildings in the United States, especially in the city of New York, where many of the new office buildings are 300 feet or more in hight and built on the steel skeleton plan, veneered with masonry, and in view of the assertion that the exclusion of light and air from the narrow streets must affect the health of the city, a few of the recently adopted laws governing the building of tenements and dwelling houses for those of moderate means in Germany may be of opportune interest to Americans. The Saxon Government, says United States Consul George Sawter, directs that in the laying out of new streets and sites for dwelling houses, builders must choose a position where direct exposure to sunlight may be had, not only in front but at the rear of the site as well ; therefore closed streets (streets with houses built in rows) shall be laid out from northeast to southwest or from northwest to southeast. Of course, in laying out building plans for the arrangement of street lines the special local conditions and hygienic demands are always first considered. Another important feature in the plans for building, especially in the erection of large dwellings, is the provision of squares in a sufficient number and size, as well as front gardens, with the culture of trees. Above all things, the boards of public works shall prevent, under all possible circumstances, the erection of new tenement houses, although they cannot in all cases be entirely excluded. For this purpose the authorities have arranged certain measures for the width and depth of a dwelling house of about 15 x 13 meters (about 49 x 42 feet), which as a rule must not be exceeded. The regulation governing the supervision of sleeping apartments in all kinds of dwelling houses, small hotels and lodging houses, in order to guard against and prevent overcrowding, and to promote sanitary conditions, is also important. It is required by law that a family lodging shall comprise at least a sitting room that can be well heated, a bedroom, and when practicable a kitchen, as well as the necessary space for cooking utensils, wood, &c. Sitting and bedrooms combined must have at the smallest calculation 30 square meters (323 square feet) of ground space, and must be provided with movable windows. The total surface of the bedroom windows shall in every case and at the lowest estimate amount to one-twelfth of the ground surface space of the room. All windows must open into immediate air, and at least one shall open into the street or a sufficiently large yard or garden. It is most desirable that every lodging, when the arrangement of rooms so warrant, should have two windows facing each other, so as to render a thorough airing of the apartments practicable. An apartment house is to be condemned as overcrowded and unhealthy when it does not afford at least 20 cubic meters (706 cubic feet) of breathing space for every adult, and at least 10 cubic meters for every child. The given capacities are the lowest estimates of space demanded by the new laws governing the building of dwelling houses. These rules are enforced by constant inspection by agents of the imperial board, and the law is carried out to the letter for the protection and comfort of the German people.

The problem as to "sky scrapers" is not a new one, for in ancient Rome it was necessary to curb the zeal of land owners and builders by decrees limiting the hight of buildings on the principal streets. As the architects of those days dealt only with solid masonry, their structures were certainly lofty enough. How one of those old Romans would open his eyes if told that nineteenth century America could bargain with a great ironmaster for the skeleton of a 24 story edifice at so much per ton, delivered and put together on his site in any big city, the various parts being brought together and fitted like a child's puzzle, so that the towering structure is reared with the speed of magic—in a night, as it were. Germany will have none of this new architecture, preferring the old, more substantial and solid styles. The Germans, with a desire to obtain the full worth of every pfennig expended, argue that the iron or steel in contact with mortar will inevitably become honeycombed with rust and ultimately will be unable to sustain the weight of brick and stone placed upon it. Considering, also, the danger to life and limb, the elevator accidents, &c., the conservative German is not enthusiastic regarding "sky scrapers."

ESTIMATING A BRICK HOUSE.—XI.

BY FRED. T. HODGSON.

The Conservatory.

WE have now to consider the conservatory, which measures on the plan 6 x 9 feet, with two projecting angles, 2 feet each, cut off. The hight averages 9 feet. It is closed in on one side, one end and the angles with glass, the roof being finished the same as the veranda. In a previous issue I gave the cost of floor, roof and foundation. The brick wall of the house forms one side and one end of this addition, the remainder being of glass. As will be seen by the section shown in Fig. 19, a solid wall of wood is built on the outside of the conservatory, running up above the floor about 2 feet, the top forming a regular window sill on which the sash rest. This leaves 6 feet 2 inches of sash in hight by 16 feet, less of course the five mullions. This would make nearly 100 feet of sash superficial, which, fitted in

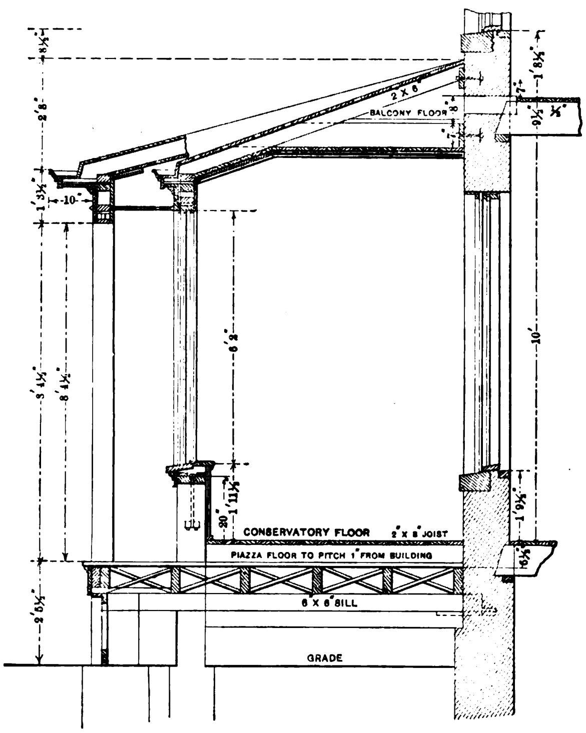


Fig. 19.—Section through Conservatory and Front Porch.—Scale, ¼ Inch to the Foot.

Estimating a Brick House.

place ready to receive glass, would be worth 10 cents per foot or $10 in bulk. Fitting up the low wall, paneling same inside and out, including material, making sash, sills and placing them, working mullions and fitting them in place and putting cornice and eave trough in place as well as furnishing same, would cost as follows:

Dwarf wall and paneling, 16 feet at 20 cents	$3.20
Sash sill, moldings, stool and apron, 16 feet at 10 cents	1.60
Cornice, fascia and eave trough, 16 feet at 30 cents	4.80
Mullions in place	4.00
Nails, &c	.40
Total	$14.00

Adding cost of sash as above, $10, we have a total for the cost of the conservatory exclusive of floor, roof and foundation, which was previously given, of $24.

I have now completed all I undertook to do in the way of estimating, with regard to the brick house, and I should be pleased to have any reader or readers point out omissions or correct any figures I may have set forth. It must be understood that I have not made any attempt to estimate on painting, glazing, polishing, plumbing, heating or electric work, only in so far as these trades required the assistance of the carpenter, and for any work he would likely be called upon to do under his own contract I have made reasonable allowance.

In all cases when prices of materials are given they have been based on those current in the neighborhood where these articles have been prepared and have not been given with a view to having them quoted by the estimator when making up his tender, but merely as an illustration of the manner in which he may arrive at approximately correct results.

I have gone over this building very carefully, item by item, and the intending estimator will see that the results have cost considerable labor, but not more than an estimate on any similar building would entail if the estimator had an earnest desire to obtain figures upon which he could rely. I might also state that I have found in an experience of many years that in ordinary dwellings, costing from $2000 to $15,000, the average time required to estimate will run from two hours for each $1000 for the first $3000 down to 30 minutes per $1000 for the more costly buildings. In other words, a building costing, say, $12,000 will require fully 12 hours' time to take out all the quantities and estimate all labor and materials required to complete the structure, and then the estimator must be fairly quick at figures and have his schedule of prices for hardware, glass and all other materials and labor ready at hand.

One of the great troubles with young and inexperienced estimators is that they will take home a set of plans and specifications, read over the latter hurriedly once, perhaps twice, take hasty measurements from the plans, also hurriedly count windows, doors and other openings, then figure for an hour or two and make up their tenders. If they get the work they sign the contract and then commence to study the specifications more closely in order to get at their exact meaning. Probably they then discover to their disadvantage that they call for more than they figured on in their tender. Even the drawings show some things that have been overlooked, so that at the very outset of the work the young contractor is handicapped. All this goes to prove that no one can be a successful contractor without he is careful at his figures, but it does not follow that all careful figurers make successful contractors. Without the care, however, the second is impossible.

Order in Estimating.

It will be well if the estimator will follow the order I have laid down in these papers when making out his estimate—that is to say, he should first begin with making out the cost of surveying and laying out the grounds for the foundation. Then follows the excavating, bearing in mind the distance the earth has to be conveyed, also the kind of earth to be excavated, and the cost of drainage, if such is required to be done. Next follows the stone work, and careful measurements should be made from the plans, taking in and making such provisions for waste and extras as I have pointed out in an early paper. Be sure of the cost of this work per cord or perch in the wall before closing a tender. This will be followed by the brick work, and I would suggest that the figures for these various works be kept in separate books, and marked so that they may be referred to again if necessary. In estimating the brick work be sure not to miss chimney projections, piers of verandas, porches and stoops. If the building is to be faced with pressed bricks backed with common stock, find out the difference in size between the two kinds of bricks, and if any difference does exist see how it is going to affect the work, and provide for it accordingly. Sometimes this difference is the cause of considerable trouble and expense. Figure up on the mortar required, and if colored mortar is going to be employed don't "jump" at the cost, but find out exactly. The quantity may be obtained for each 1000 of bricks in the early papers or from any builders' text book.

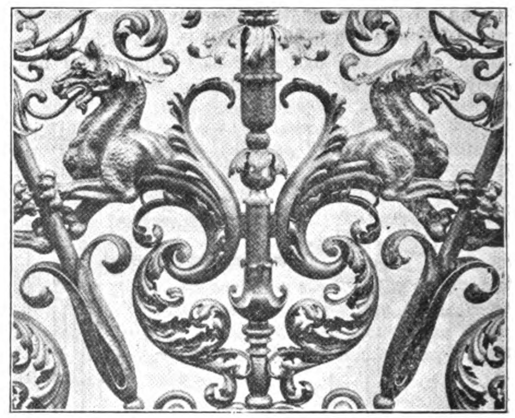
Timbers, joists, studding, rafters and other coarse lumber should be figured out exactly and classified according to price, so that the cost can be ascertained. Then follows the roof covering, shingles, slates or metal ; floors, bridging, trimmers, strapping or furring, lathing and plastering. Measure plans closely in every case and be sure you are right. Next estimate for labor in placing floor timbers, partitions, roof timbers and all other rough carpenter work. Then follow with estimate of all finished wood work, frames, sash, doors, wainscot, mantels, stairs, trimmings and fitments throughout. Stucco work and other ornamental plastering should come next, then all the painting, glazing, finishing and varnishing and every item that belongs to the painters' trade.

If, as is sometimes the case, the general contractor has to estimate on the plumbers' work, he should either consult a plumber or make himself conversant with the prices of labor and material current in this trade, and should be careful in obtaining lengths of piping, number of couplings, number of cocks, traps and other appurtenances, and should make ample allowance for breakages, misfits, extra digging and cutting and other similar shortcomings. If not master of all details in connection with plumbing, he should by all means employ a regular plumber to make out his estimate for this branch. The same may be said for the heating, for if a young contractor undertakes to do this work himself and employ regular tradesmen to perform it, he will very likely regret it. The same may be said of electric lighting or putting in electric bells. My advice in this matter is that experts in these trades be asked to submit figures for which they will agree to perform the work and furnish all necessary materials in conformity with the true intent of the plans and specifications.

After obtaining by careful estimation the cost of a building, a percentage for profit must be added. This percentage may be more or less according to prevailing conditions, but under no consideration should it be less than 5 per cent. or more than 25 per cent. on the entire cost of the building. If the figuring has been accurate, and the estimator is possessed of ordinary judgment, 10 per cent. will prove ample to give a fair and reasonable profit on the work.

Hammered Bronze Grille.

The use of the metals, artistically wrought, as a means of decoration, is an established feature of architectural work. The sharp, clear outlines and beauty of detail which may be obtained, combined with the delicacy of form and richness of color, render this more particularly adapted as permanent features of ornamentation. The rendering of ornamental work in the metals, particularly in iron and bronze, is one of the oldest established forms of art, and has been cultivated for many centuries on the Continent of Europe. Travelers in Italy, Spain and Germany have been particularly impressed and delighted with the countless beautiful examples of fine art expressed in those most imperishable mediums, and as a result their effectiveness in decoration is becoming more and more recognized by the architects and designers of this country. Of late years many pieces of artistic metal work have been designed and executed here, which in beauty and effect fully equal the work of the craft masters of the older countries. The semicircular fan grille here illustrated was produced by the L. Schreiber & Sons Company of Cincinnati after a year's labor. It is about 12 feet in diameter, and was hammered from the solid bronze. It was designed by F. M. Andrews of the firm of Williams & Andrews of Dayton, Ohio, and is intended for the Reibold Building of that city.



Enlarged Portion of Bronze Grille.

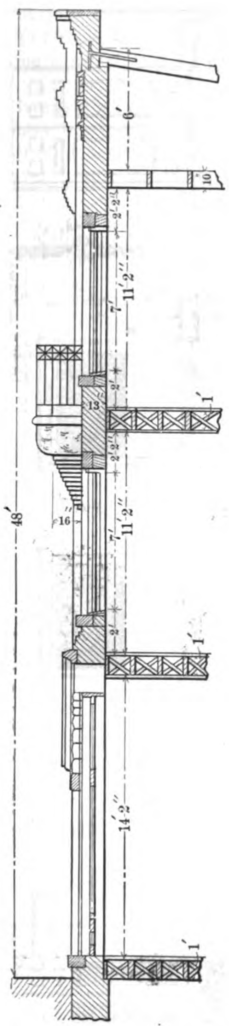
Semicircular Fan Grille.

Hammered Bronze Grille.

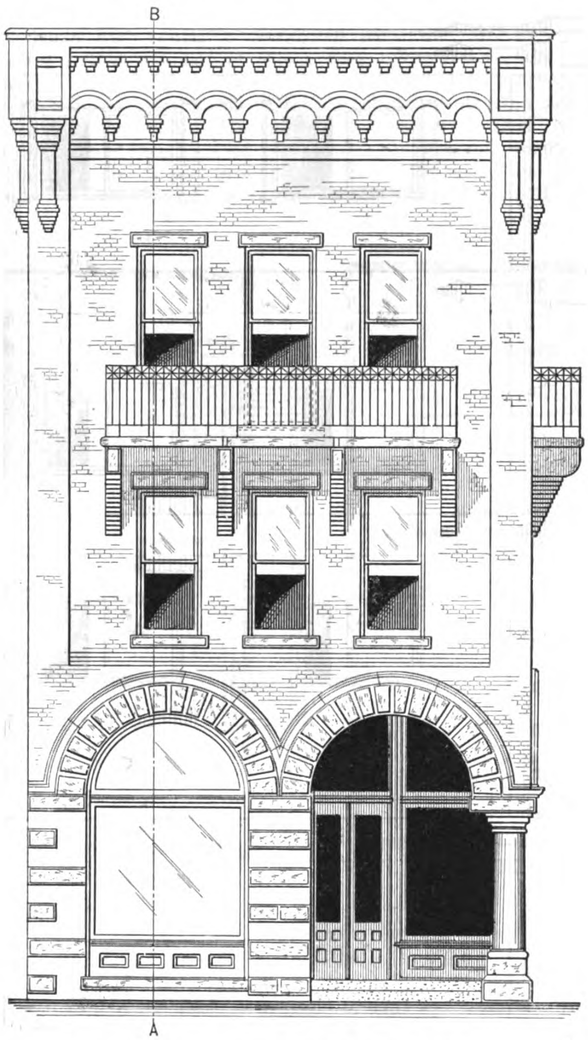
According to the recent report of the State Board of Mediation and Arbitration there were 243 strikes during the last fiscal year, the largest number of these occurring in the building trades. This number is stated to have been 36.

THE PIEDMONT BANK BUILDING.

WE have pleasure in laying before our readers illustrations showing the general design, arrangement and construction of the Piedmont Bank Building, which has just been erected at the corner of Union and Sterling streets, Morganton, N. C., in accordance with plans prepared by J. S. Zimmerman, architect in that place. The building is of brick with rock faced stone trimmings. The column at the corner of the building where is located the main entrance, together with the bays and jambs of the



Section of Bank Building on Line A B of the Elevation. —Scale, ⅛ Inch to the Foot.



Front Elevation.—Scale, ⅛ Inch to the Foot.

The Piedmont Bank Building.—J. S. Zimmerman, Architect, Morganton, N. C.

arches, is of dressed granite. The structure, it will be seen, is three stories in hight, arranged as indicated by the floor plans. It is the intention at present to use the first floor for store purposes with the idea of changing it so as to be used as a bank at a later date. The second and third floors are arranged for offices, finished in North Carolina pine, oiled. The finish in the first story is of oak with plate glass windows.

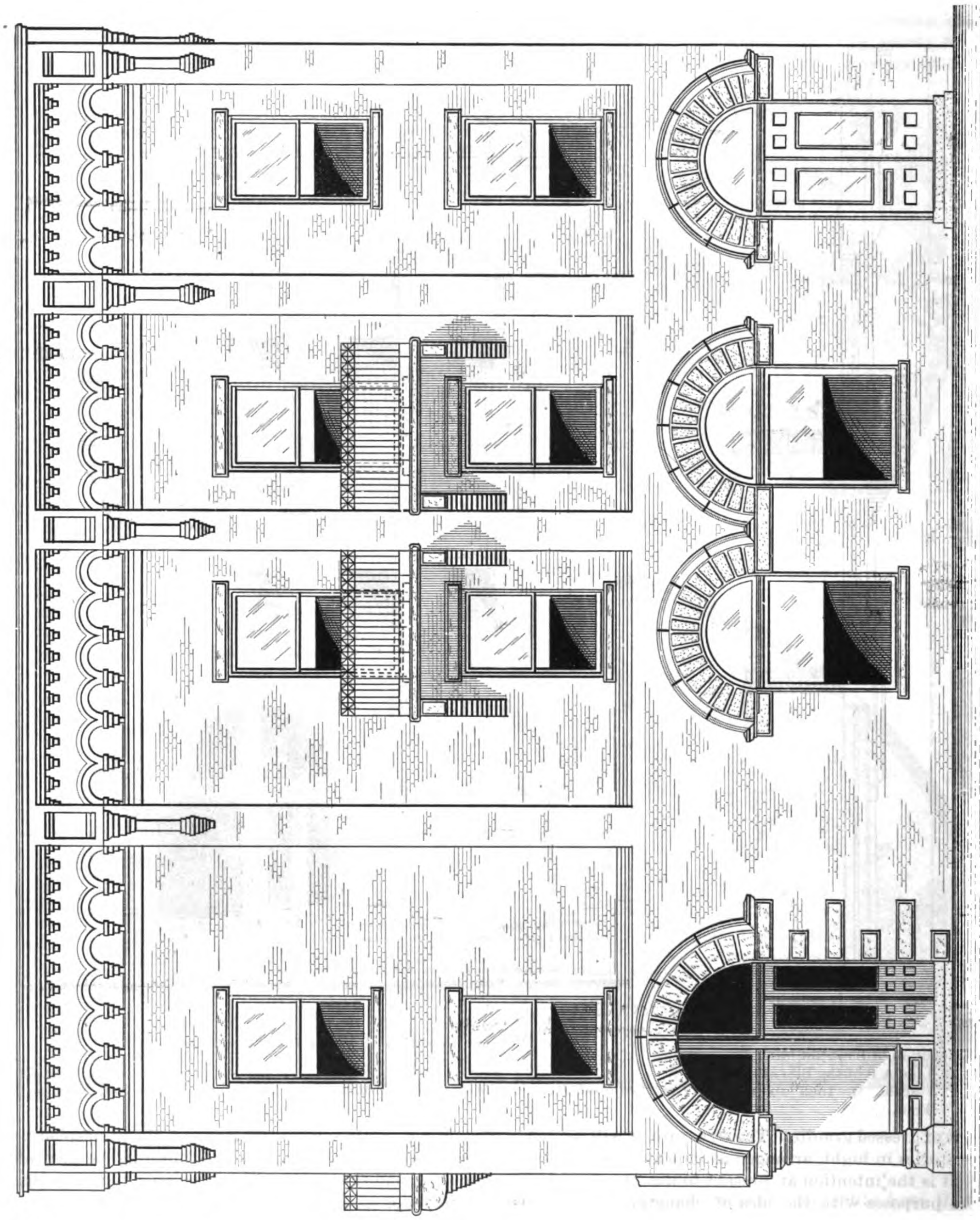
Blistering of Paint.

Unless caused accidentally by the action of heat or naturally by the sun's rays, helped along by pitch or oil in the wood, we may conclude that the blistering of paint is due to the presence of moisture in the wood, which was either there when the paint was put on or has gathered there since by leaks letting the water to the back of the wood, soaking it, and so forcing the paint to let go its hold. In house painting, says an English writer, much of this occurs from too much haste in painting unseasoned spruce clapboards or in painting them in the early morning after a very heavy dew has fallen, on a hot summer's evening, and before the sun has had time to dry them off. The grass about the building is wet; you could not walk through it scarcely without wetting your feet; and why should not, with some movement of the atmosphere, the sides of your newly clapboarded building be wet also? They are, and though barely perceptible to the feeling of the palm of your hand, nevertheless those clapboards, like a sponge, have absorbed a considerable amount of moisture, which can but have a deleterious effect upon your paint that you have put on before it has had time to dry out. New spruce clapboards should also stand a fortnight or so after being put on exposed to sunshine and storm so as to get well "tanned up" by the weather, and the grain opened so as to admit well the penetrating qualities of the paint; and, if dry when painted, your paint will stay there if good for anything and decently applied. Of course, it is understood that time enough must be given after a storm to have the work thoroughly dry before paint is put on, and this is usually done, but the other conditions above named are not always observed, and, as a consequence, somebody's paint is condemned when it is not to be blamed, but the one who used it is the guilty party.

I know of three double tenement two and one-half story new houses that were painted recently, two of them with a well-known and popular brand of ready mixed paint, and the other with lead and oil, all of which blistered more or less, and the ready mixed paint agent had to stand the cost of repainting his two houses because he guaranteed the paint not to peel, though it was no worse than the other one painted with lead and oil, and the contractor acknowledged the paint could not be at fault. Doubtless the trouble lay in one of the causes I have named and too much haste to get the paint on. When will the avaricious painter ever learn that "haste makes waste," and take time to do work as it ought to be done?

Then, again, a poor brushman is the cause of leakage in nail holes and around joints; he does not fill all these places with paint as he goes along so as to exclude the water that is sure to soak in later on. Here you may observe the difference between a good and poor workman; the former wipes his brush into all cracks, crevices, holes and cross grained places in his work as he goes along, not only making it look much better, but rendering it impervious to moisture, while all the poor hand seems to think necessary is to smutch over the work so as to give it the appearance of having been done over with the same color. Thoroughness and appearances are vastly different matters.

Finally, if the painter's attention has been called to some of his work which has blistered, let him prick the blisters, and if water runs out of them he may rest assured that there is a leak somewhere, letting the water in on the back side of his work; and it is only a question of searching until he finds it. It may be a leaky roof, in which only much painstaking will locate the spot.



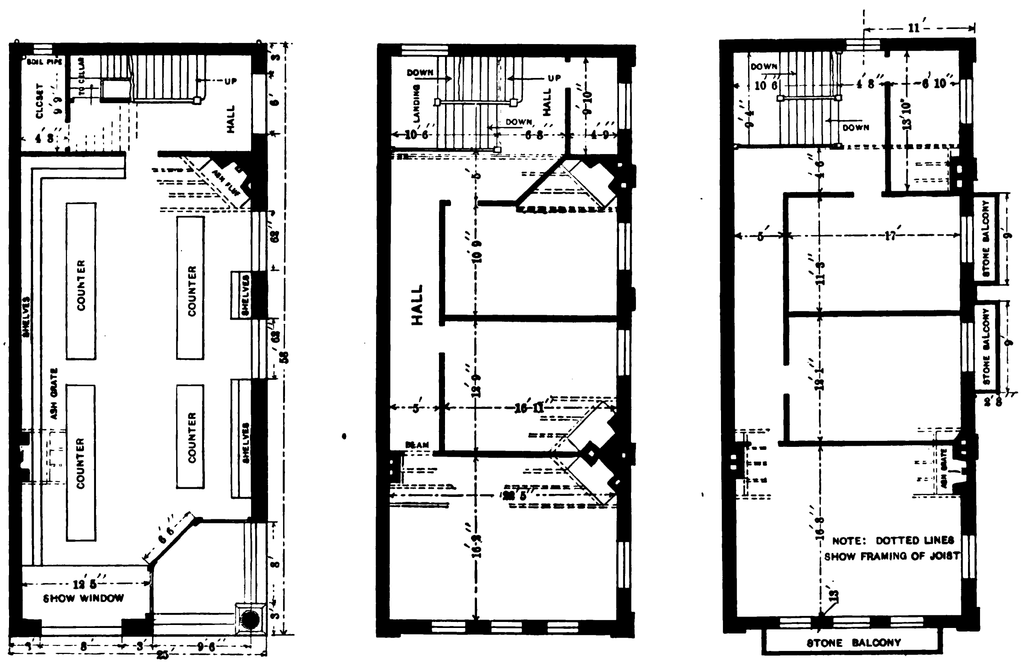
The Piedmont Bank Building.—Side (Right) Elevation.—Scale, 1/8 Inch to the Foot.

Fire Proof Construction for Theaters.

There is probably no place where fire proof construction is so essential as in the auditoriums of buildings, especially where large audiences are likely to gather. A very interesting account of how a wooden theater which the authorities had condemned as unsafe was converted into a fire proof structure, with a modern theatrical auditorium, is given in a recent issue of the *Wiener-Bauindustrie Zeitung*. The old building was a wooden hall 90 feet wide and 105 feet long, with exposed wooden roof trusses of simple construction. In the new building, which is now in course of construction, there are seven main roof trusses of 93 feet 6 inches span, from which hangs the frame work of the oval iron ceiling. The central portion of the ceiling is intersected on the lines of the two axes by cross vaultings, the whole forming a very compact system of frame work extending to the walls in a series of arches and lunettes. This is intended to be covered with a layer of concrete ⅜ inch thick, and the columns and cantilever beams which support the boxes and galleries are to be protected in a similar manner. In the center of the ceiling, directly over the chandelier, is a circular opening, together with a sheet iron ventilating shaft which communicates with the outer air for the purpose of ventilation as well as safety. The plans for the remodeled structure were prepared by Professor Ohmann and Herr Rudolph Krieghammer, architects.

Roman Buildings.

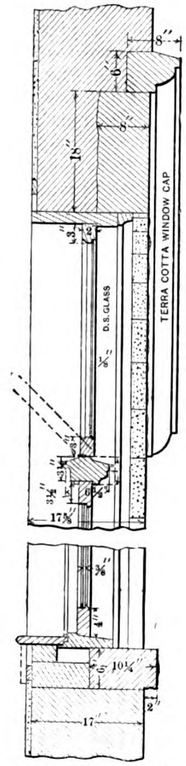
There is much to be learned from a study of the Roman methods of construction, and not the least interesting are the buildings intended for dwelling purposes. In discussing the subject of the roof, Winckelmann says that it was either entirely flat or more commonly had a flat timber work or terrace. In private houses all the cornice, on which the roof in part bore, was made of terra cotta, and in such a fashion that gutters might descend by it. Lions' heads for spouts was an Egyptian fashion, according to Plutarch, because the Nile overflows when the sign is Leo. Other accounts say that at Rome the conduits of the gutters in private houses were, in general, made with boards. Roofs of plates of silver, brass, &c., often occurred at Rome upon public or private buildings. Pliny mentions one which was fastened without nails, and could be taken to pieces at option. Pigeonholes in the roofs were common. The ceilings of Egyptian temples were either of slabs of stone, or sculptured, like the famous planisphere at Tentyra. The Greek temples at Athens had ceilings composed of marble slabs in compartments, and in the Temple of Minerva, at Syracuse, the long stones which connected the columns with the outer walls formed a ceiling in the style of a platband around the peristyle of the building. The ceilings of the most ancient temples were of wood, sometimes cedar or cypress, or vaulted. Those of apartments were horizontal, of wood, and when they were formed only of planks, of which they covered the joists, they were named by the Greeks *phatnomata;* but when they had ornaments in square compartments like those still in use in Italy, they were called *laquearia*. Those which had no ceilings or panels were, in general, ornamented with works in stucco, as in a bath near Naples, with Venus Anadyomene, the Tritons, &c. The figures and panels were often gilt. Chambers which had no ceiling were vaulted with reeds bruised and flattened. The square temples, says Winckelmann, have, in general, no windows, and receive light only by the door, in order to give them a more august air by illuminating them with lamps. Some round temples have a circular aperture at top. In houses the windows were in general placed high, very small and square; tiers of them occur at Pliny's villa, at Laurentum. The *valvatæ fenestræ* were also windows from the ceiling to the floor. Glazed and even bow windows have been found at Pompeii, but they were mostly closed with curtains, wooden shutters, or lattices hung upon hinges. It is not, however, true that the houses had no windows toward the street, though it was very unusual.



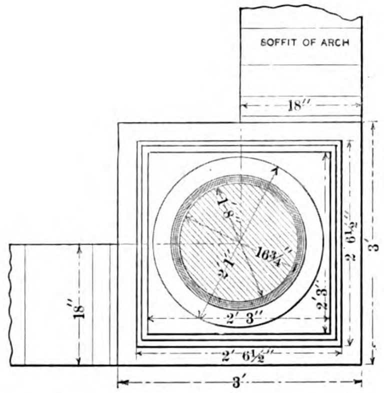
Main Floor. Second Floor. Third Floor.

The Piedmont Bank Building.—Floor Plans.—Scale, 1-16 Inch to the Foot.

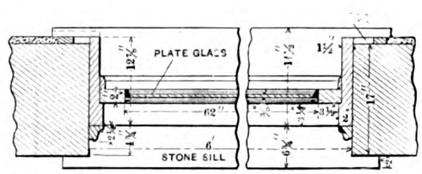
An eleven-story brick apartment house is soon to be erected at the corner of Columbus avenue and Eightieth street, New York City, from plans prepared by Buchman & Deisler, architects. The estimated cost of the building is placed at $300,000, and it will cover an area 102 x 64 feet in size. The plans were filed by the Imperial Construction Company, the owner being Thomas R. White.



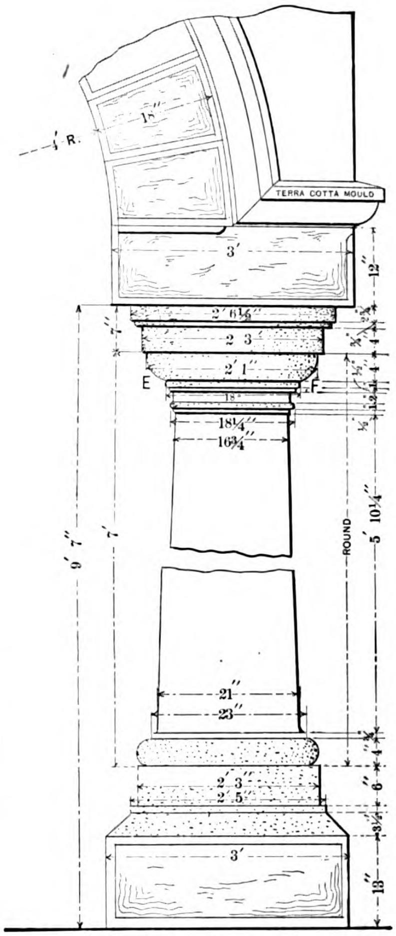
Vertical Section through First-Story Side Windows.—Scale, ½ Inch to the Foot.



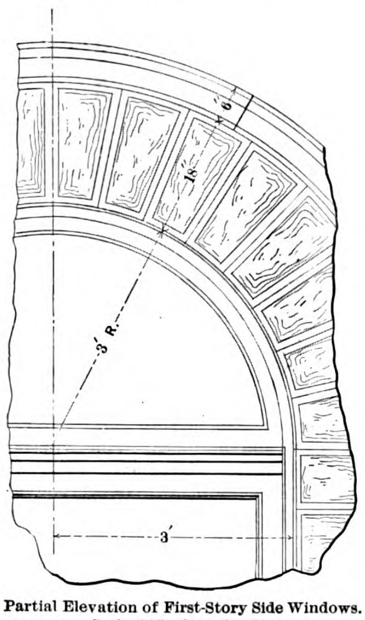
Inverted Plan of Column at E F.—Scale, ½ Inch to the Foot.



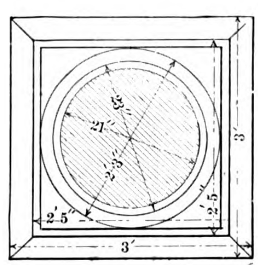
Horizontal Section through First-Story Side Windows. Scale, ½ Inch to the Foot.



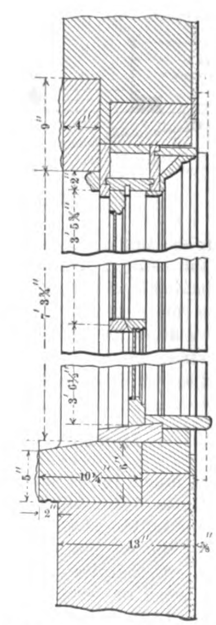
Detail of Stone Column at Corner of the Building. Scale, ½ Inch to the Foot.



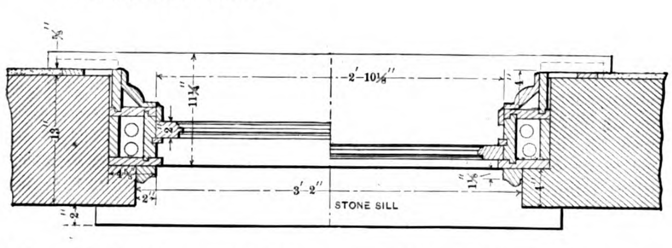
Partial Elevation of First-Story Side Windows. —Scale, ½ Inch to the Foot.



Plan at Base of Stone Column.—Scale, ½ Inch to the Foot.



Vertical Section through Windows in Second and Third Stories.—Scale, ¾ Inch to the Foot.



Horizontal Section of Windows in Second and Third Stories.—Scale, ¾ Inch to the Foot.

Miscellaneous Constructive Details of Piedmont Bank Building.

CORRESPONDENCE.

Building a Hunting Boat or Skiff.

From S. W. D., *Ashland, Pa.*—In one of the issues of the paper for last year "I. T. S.," Maloy, Iowa, made inquiry as to the best method of constructing a rowboat. In a very brief answer to this inquiry I mentioned in the September issue the fact that I had constructed a few hunting boats, about 12 feet long, and would furnish drawings and a description of one of these if it was thought the matter would be interesting. The editor intimated that such would be the case, and I have pleasure in presenting herewith the drawings and descriptive particulars of a hunting rowboat which may also be of service to the correspondent presenting the original inquiry. In constructing the boat the first thing is to fasten to the floor of the carpenter shop two trestles or horses about 10 feet apart, then plane and level the tops. the stem, mold board and stern are perpendicular. This must be kept so for the present.

Plane a 1-inch bevel on top of the shorter two side boards. Move the two outside planks in to nearly touch the mold board and rest the side boards upon them. Near each end pass around both boards a ¾-inch hemp rope, drawing the boards tight against the mold board, and by means of a stick twisted into the rope, making what is known as a Chinese windlass, draw the boards up to the stem and stern. By this means the boards will form a curve that raises at each end. They should touch the work planks a little back of the mold board. After being cut, bevel to fit the rabbet in stem, it being just at the bottom of stem and 4 inches from the working plank, the back end at the stern piece being about 2 inches from the plank. Great care is necessary to fit the stem rabbet.

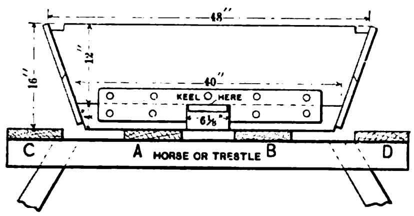


Fig. 1.—Mold Board.—Scale, ⅛ Inch to the Foot.

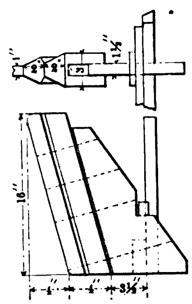


Fig. 3.—Stem Piece.

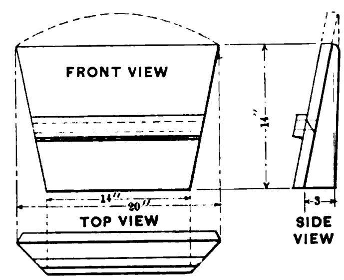


Fig. 4.—Stern Piece.

Scale, ¾ Inch to the Foot.

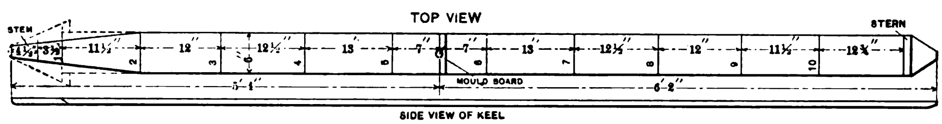


Fig. 2.—Top and Side Views of Keel, the Full Lines Representing the False Keel.—Scale, ⅛ Inch to the Foot.

Dress four 1⅛-inch pine planks about 9 inches wide and fasten the planks A and B to the trestles as shown in Fig. 1. Make as shown in this sketch a mold board of 1-inch pine, 12 inches wide, with 4-inch strip on the bottom, secured to the planks A and B, the board being secured by a lap piece, as shown. Carefully locate the center line of this board, and cut out 6⅛ inches to allow the keel to enter. Place two pieces of 3 x 3 inch pine as shown in Fig. 7. Then prepare from 1-inch pine a false keel or middle board, as indicated in Fig. 2, this being 6 inches wide and tapering at each end. Locate on this the midship line 0, also the lines for the forward edge of each frame, stem and stern. Make the main keel of oak board an exact duplicate of this with the addition of the dotted lines. The bottom is thus shaped so that no sharp point is produced to catch in weeds or be torn off by ice, while at the same time it is rendered much stronger. Lay off all lines upon this to correspond with the false keel. Make the stem piece as shown in Fig. 3, and the stern piece as shown in Fig. 4. The two pieces are joined together with a batten on the inside, which is also used as a seat rest. Place thick white lead on this joint and batten. After this has been done slide the false keel through the opening in the bottom of the mold board; carefully center it, bringing the midship mark ⊕ just to the front edge of the mold board. Now by means of screws secure the false keel to the 3 x 3 inch blocks and these blocks, in turn, to the planks A and B. Place the stem and stern pieces in position and lightly screw them to the false keel, taking care that they set solid and true to the lines. Having adjusted them secure their tops to the mold board by light battens or strips. It is well to run braces to the roof or ceiling of the shop and make sure that the center lines on

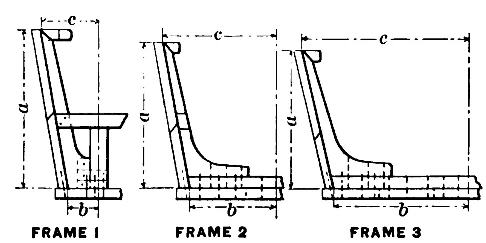


Fig 5.—Forward Side of Half of Frames.—Scale, ¾ Inch to the Foot.

Building a Hunting Boat or Skiff.

Cut and try until a good fit is secured, care being taken not to cut too much bevel at first. Bring both boards up together. It will take considerable time and patience to make a good joint here, but it must be done or the boat will not be strong and it will probably leak. Having adjusted these side boards to a good fit in the stem rabbet and having them project beyond the stern piece, put two nails into the stem through each side board so they can be easily withdrawn. Scribe along these side boards at a hight of 4 inches from the working plank inside and out. See to it that the boards fit to the stem bevel all right; if not, plane the stem to fit. Remove the side boards, rip off and plane to scribe line each side. Place extra 3 x 3 inch pieces on top of the working planks near the mold board and on top of the 3 x 3 inch pieces place 1-inch boards.

Replace the side boards; when they are drawn up they should fit into the rabbet and all along to the top of the 1-inch boards as adjusted to the bottom of the side boards. If they do, all right; if not, remedy the difficulty by fitting again; put thick white lead on the stem rabbet and stern piece where the side boards touch; then draw up again. See that the stem working boards, mold boards and stern are in the right position and plumb the perpendicular lines square to the center lines. Nail the side boards to the stem by four 8d. nails, putting two in the mold board, so they can be easily removed, and three 8d. nails in the stern. Allow the ropes to remain on in order to keep up the strain for the present. Before nailing securely to the stern and mold board it would be well to see that the boards are equidistant from the center line, and if at the forward edge of each frame they have the spread as indicated in column *b* of the accompanying table. They can easily be spread out or drawn in to make them right and secured by means of light battens across from one to the other. If they are about right securely fasten them to the stem. Then unscrew false keel from stem, blocks, mold board and stern and remove it. Slip the main keel in its place, making sure that the lines come right; then secure the stem, mold board and stern to this keel, placing white lead between the stern and up of felled oak trees for timber or fire wood. From the table accompanying this article he can obtain the shape

Table Showing Dimensions of Frames, Forward Side.

Number of frame.	Heights from bottom to top end of ribs (*a*).	Half widths. Outside dimensions.		Bevels on outside of the ribs.	
		Bottom(*b*).	Top (*c*).	Bottom.	Top.
	Inches.	Inches.	Inches.	Inch.	Inch.
No. 1	15 3/8	3 1/8	5 5/8	+ 1/2	+ 9/16
No. 2	14 1/4	8 3/8	11 3/8	+ 1/2	+ 7/16
No. 3	14	13 3/16	16 7/16	+ 7/16	+ 5/8
No. 4	12 7/8	16 7/8	20 7/16	+ 3/8	+ 1/4
No. 5	12 1/4	19 1/2	23	+ 1/4	+ 1/4
No. 6	12	20 1/2	24 1/4	− 1/8	0
No. 7	12	19 5/8	23 7/16	− 3/16	− 3/16
No. 8	12 1/8	17 5/8	21 1/4	− 1/4	− 1/4
No. 9	12 5/8	14 5/8	18 1/4	− 3/8	− 5/16
No. 10	13 1/2	11 1/4	15	− 1/2	− 3/8
Stern	14	7	10	− 3/8	− 1/2

All ribs or bottoms 1 1/4 inches wide, 1 1/4 inches thick bottom, 3/4 inch top + the bevel.

and number of them. They should be roughed out and allowed to dry at least one season, when the knee and rib

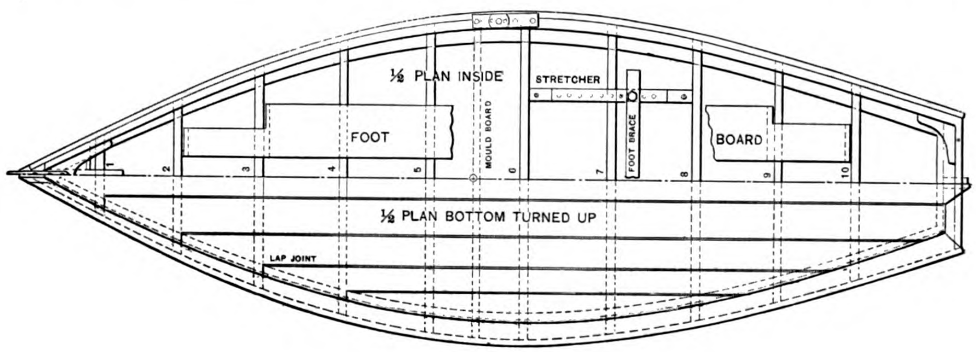


Fig. 6.—Half Plans of Inside and Outside of Boat.

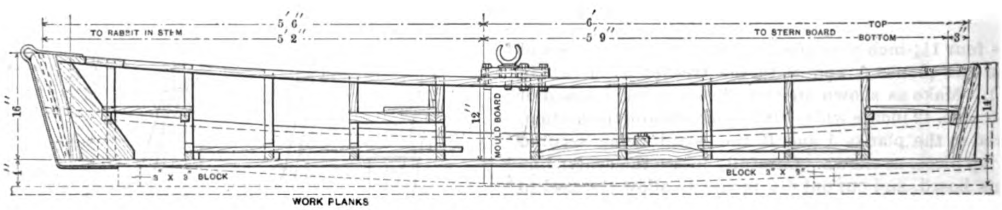


Fig. 7.—Vertical Longitudinal Section.

Building a Hunting Boat or Skiff.—Scale, 1/8 Inch to the Foot.

keel, also between the stem and keel. Drill holes for the screws and countersink the heads. Fill the holes with white lead and screw up tight.

The next step is to bend the other two side boards. Bring them up to the stem and stern as before, cutting boards to fit the rabbet in the stem, and see that the bevel on the sides is all right the full length. Having adjusted these side boards place plenty of white lead in the rabbet and bevel and also where they touch the stem. Nail securely to the stem and commence at that end to place between the location of each frame two 3-16 inch copper rivets. Drill holes for these so as to give a snug fit, countersink the heads and rivet over burrs on the inside, using white lead in each hole. Some care is necessary in making this joint, but if well made it will never leak.

We are now ready for the frame. For my part I prefer the natural bent breast hooks or knees. In " ye olden time " of wooden built ships and boats these were easily obtained and kept in stock roughed out. The carpenter contemplating building a boat or boats of this description can easily obtain all needed by assisting in the trimming combined, as in this case, can be finished. If he cannot conveniently get out these knees the frames can be sawed out of oak planks and the ribs attached to the bottoms by 1/8-inch sheet iron or steel pieces, riveted on each side, as shown in Fig. 8. I will suppose that he has made up the frames two to ten, inclusive, in either manner according to the accompanying table, making the lengths of the ribs fully as long as called for by the table. For convenience of construction Frame No. 1 is made up with the dead wood, as shown. Take a 1 1/2-inch plank, saw it out and fit behind the stern and to the keel. Place cleats upon each side just forward of the location of the ribs. Cut out for seat rest and attach the ribs so their outside distances agree with the table. Try it in place. It should be a tight fit when up to the lines, and it is essential that it set properly, especially if a mast is to be set in the bow, as much strain comes on this frame.

Having properly set Frame 1 to the dead wood, replace the dead wood, with white lead between stem and keel and dead wood. Lightly nail, then drill holes for four 1/4-inch stove bolts, as shown, and draw up tight, securely

RESIDENCE OF MR. E. T. SILLS, WILCOX AVENUE, MERIDEN, CONN.

D. BLOOMFIELD, ARCHITECT.

SUPPLEMENT CARPENTRY AND BUILDING, APRIL, 1898.

fastening the ribs by clinch nails to the side boards. Make up the remaining frames as shown in the drawings and by the table, cutting notches for seat cleats where necessary; secure them to the bottom board and each side board by clinch nails. A batten lightly nailed across about three-quarters of the way up will help sustain them in position and properly spread the side boards. Scribe from the working planks up the hight of the ribs in accordance with the table for each frame, stem and stern. Cut off the ribs at said hight and the top of the side boards. Saw off the stem end of them about ¼ inch beyond the outer side of the stern piece. Cut off the ribs at an angle of 45 degrees from the top outside edge.

Work out the 1½ x 1 inch oak gunwales about 12 feet long. They can be 1¼ inches wide near the stem. Make a trial gunwale of pine, as it is more easily worked up. If one has a steaming box, as would be necessary and most convenient if a large number of boats were to be built, it would not be much trouble to get this gunwale in place. Sponging with boiling hot water, or cuts with a saw at 45 degrees from lower outside edge about half across, two or three between notches for each rib, will help in springing it in place. Use care in cutting the notches for the ribs and getting the bevels and joints right, making a good fit to gunwale and side board. Having set the gunwales put in breast hook at stem, securing it to top of dead wood and the gunwales, and the latter in turn to the side boards. Put a 6d. nail at each rib and secure the knees to gunwale and stem piece. Dress off smooth, round the sharp edges, fill all cracks with white lead, withdraw nails from bottom section of mold board and unscrew keel from blocks. Do not forget to plug these holes with dry pine plugs. Remove the boat and planks from the horses or trestles, and turn the boat bottom up on them. The bottom boards are cut with lap cross joints to their forward end. They should also be planed up "out gauge" on edges. Clamp tight in place. Use 8d. nails and clinch to the ribs, and 6d. nails to the side boards. Be careful not to split off the corner at the cross cut. They ought to project 3-16 to ¼ inch beyond the side boards, stem and stern all around, and worked off round on the lower edge.

Boil 1 gallon of pitch, or to 1 gallon of common tar add 2 pounds of beeswax, and when well mixed and hot enough to run freely fill all cracks or seams and along the side. Tilt up the boat and fill the ledge formed by the extension of the bottom boards, also along the stem and stern, covering all nail holes as well. If the work has been well done no calking will be necessary, but if there are any wide openings they can be filled before the tar is poured in with a few strands of candle wick, using an old case knife.

Now turn the boat over and place the middle thwart or seat, as shown in Fig. 7, against Rib 5, and nail cleats from Rib 5 to 4 for it to rest on. A 1½ x ¾ inch strip under this seat and knees at each end to fit under the gunwale and securely fastened greatly strengthens the seat and stiffens the boat. Place the stem and stern seats by running the boards parallel to the bottom boards, ¾-inch stuff being heavy enough for all thwarts. The stretchers are then placed and secured to the bottom and Rib 7, just fitting in between Ribs 6 and 8, with a number of ½-inch holes bored through to adjust the foot rest, all as shown in Fig. 6. These should be placed exactly parallel, one on each side of the boat. The foot boards are made in sections, not fastened to the bottom of the boat, but to fit between the knees, and to have cleats under them so they will not tilt up or break, and at the same time can be readily removed for cleaning the boat or bailing.

Oak row lock blocks are bolted on to the gunwale, as shown in Figs. 6 and 7. The row locks and oars can be bought in almost any city, and are much superior to what the carpenter can make. They will not cost as much either. The proper oars for use with a boat of this kind are from 7½ to 8 feet in length. Bang iron of ¼ x ½ inch flat iron is drilled for screws with conical heads. Heat the iron and bend to shape, placing the painter ring or chain in top to fasten the boat. Smooth up, rounding all sharp edges, fill and paint two coats inside and three coats outside, using whatever color may be desired. When thoroughly dry place on the river or lake, and if the instructions here given have been carefully carried out and the work well done I will guarantee the boat not to leak a pint in the first 24 hours.

The following list of materials will be found interesting in this connection, the dimensions representing the finished sizes:

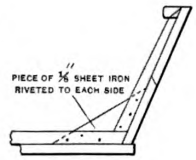


Fig. 8.—Section Showing a Different Construction for Frame.

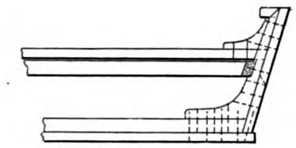


Fig. 9.—Half of Frame 5, Showing Location of Seat.

Building a Hunting Boat or Skiff.—Scale, ¾ Inch to the Foot.

Side planking, 2 pieces 9 inches wide by ¾ inch thick, 12 feet long, cedar or pine.
Side planking, 2 feet wide by ¾ inch thick, 12 feet 6 inches long, cedar or pine.
Keel, 1 piece 10 inches wide by 1 inch thick, 11 feet 6 inches long, oak or pine.
Bottom boards, 2 pieces 9 inches wide by 1 inch or ¾ inch thick, 10 feet 8 inches long, cedar or pine.
Bottom boards, 2 pieces 9 inches wide by 1 or ¾ inch thick, 9 feet 6 inches long, cedar or pine.
Bottom boards, 2 pieces 9 inches wide by 1 or ¾ inch thick, 7 feet 4 inches long, cedar or pine.
Bottom boards, 2 pieces 8 inches wide by 1 or ¾ inch thick, 5 feet 4 inches long, cedar or pine.
Stem, 1 piece 3 by 4 inches, 18 inches long, oak
Stem, deadwood, 1 piece 8 by 1½ inches, 18 inches long, pine.
Stem piece, 9 inches wide, 1 inch thick, 3 feet long, oak.
Stem piece, 3 inches wide, 1½ inches thick, 18 inches long, oak.
Gunwales, 2 pieces 1½ by 1 inch, 12 feet long, oak.
Stretchers, 2 pieces 2 by 2 inches, 2 feet 2 inches long, oak.
Foot rest, 1 piece 1½ by 2¼ inches, 2 feet 10 inches long, oak.
Bottoms for frames, 1¼ by 1¼ inches (see table), about 24 feet, oak.
Ribs depend upon method of construction (see Table).
Floor boards (1), 6 by ¾ inch by 10 feet long.
Floor boards (2), 8 by ¾ inch by 8 feet 6 inches long.
Seat boards, 9 by ¾ inch by 12 feet, cut to length.
Strips for seats and flooring from dressing of bottom boards.
Wire clinch nails, 2 pounds 6d. and 3 pounds 8d.
Few 1½ by 2 inch long screws.
3 pounds 1⅛ inches long by 3/16 (about) copper rivets and burs.
Row lock bolts (6), ⅜ by 2½ inches long, nuts and washers.
Foot rest bolts (2), 7/16 by 3½ inches long (file threads off).
Deadwood bolts, 1 each ¼ inch stove bolt, 7, 8½, 10 and 11 inches long, nuts and washers.
Bang iron, ¼ by ½ inch, 4 feet long, bent hot and screwed to place.
2 pounds white lead.
1 gallon tar.
2 pounds beeswax.
1½ gallons linseed oil.
Color to suit.

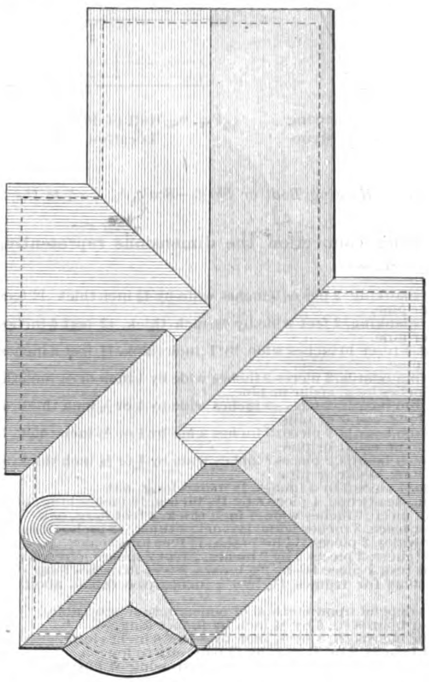
This boat is especially adapted to hunting or fishing purposes on account of its being so steady. Having a wide flat floor it is perfectly safe with children, as it is not cranky, and will not tilt easily. In fact, a man of 150 pounds weight can stand on the gunwale and it will not take water over the sides. It is not intended for a racing boat, and in a heavy seaway it would pound quite hard. Slight alteration, however, would adapt it for an inland sail boat with the necessary additional fittings. I have drawings of such a sail boat, and will contribute them to *Carpentry and Building* should any of the readers desire. I am aware that there has been more work put upon this construction than is absolutely necessary to make a skiff, but a fellow chip would want to build a boat that would be a pleasure and of which he would not be ashamed, also one that would give such satisfaction that duplicates would be ordered. The lessons learned under this construction would enable him to build lighter boats of cedar and fancy woods that would be beauties, and if he lived near a large river or lake his time in winter could be profitably employed in his shop in their construction

Barn Roof Sweats.

From E. C. WASHBURNE & CO., *New York City.*—In the issue of the paper for February is a letter from "M. B.," Baraboo, Wis., giving an account of the condensation on the under side of a barn roof. We would state that a rotary ventilator in the roof would prevent the moist air from accumulating under the roof to leave a deposit in the form of water. We use a great many ventilators for this class of work and have just completed a job on a brewery at Elizabeth, N. J., where the vapor and steam from the malt is successfully cleared from the building.

Roof Plan for a Stone House.

From E C., *Galveston, Texas.*—I have been a reader of *Carpentry and Building* for many a year, although of late years I have got it from the local dealers. I would like



Roof Plan for a Stone House.—Scale, 1-16 Inch to the Foot.

to ask the editor to publish a roof plan to suit the elevations of the stone residence published in the June number of the paper for 1897, David B. Provoost of Elizabeth, N. J., being the architect.

Answer.—Through the courtesy of Mr. Provoost we have secured a tracing of the roof plan of the stone residence referred to and present an illustration of it herewith.

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

From L. S. H., *Fredonia, N. Y.*—I notice in the January issue a sketch from Julian A. Hall, Morotock, Va., showing his method of obtaining the shape of an opening in a roof for a circular pipe. While his way is absolutely correct if carefully carried out, it seems to me it would take two men and a boy to make a success of it. I submit a method by which I think one man may attain the same result in less time. Referring to the sketches which I inclose, draw a line down the roof, as A B, Fig. 1, and square with it where the opening is to be; draw another line, as C D, crossing A B at right angles. Let the point of intersection represent the center of the opening. We will suppose the pipe to be 12 inches in diameter and the roof half pitch. Then from the center measure 8½ inches up the roof and the same distance down the roof. Also measure 6 inches to the right and 6 inches to the left. Next lay the square on a piece of pasteboard, or thin wood, and make an angle 8½ inches on one side and 6 inches on the other, dividing the two into an equal number of spaces—as, for example, 8; then connect them, all as shown in Fig. 2. Cut out the piece of board, thus producing one quarter of a perfect ellipse. Carefully place this on the marks already made on the roof and mark out, cutting to the line, which, if carefully done, will give the curve from A to D, from D to B, from B to C and from C to A. If the roof is one-third pitch 7¼ inches must be used instead of 8½ inches, while if the roof is one-quarter pitch 6¾ inches must be used, and if 10 in 12 pitch, 7⅞ inches. It will be seen that the lower half of the opening must be cut plumb

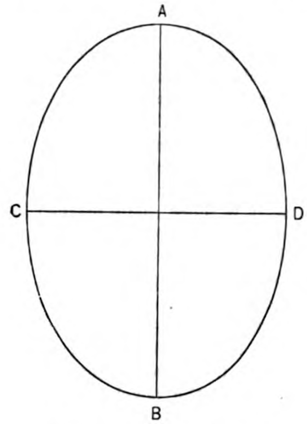


Fig. 1.—Outline of Opening.

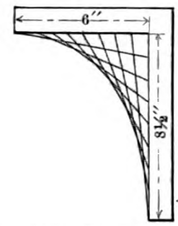


Fig. 2.—Method of Obtaining Curve for Quarter of an Ellipse.

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

or under. Instead of making a pattern as in accordance with the above method, the whole thing can be marked out on the roof, first drawing an oblong 12 x 17 and dividing the sides and ends into an equal number of spaces, then connecting them by intersecting lines, as indicated in Fig. 2.

Position of Door Knobs.

From M. L., *East Orange, N. J.*—In reply to "A. W.," Winnebago City, Minn., whose inquiry appeared in a recent issue, I send sketches of four different doors commonly used in this section, showing the position of the

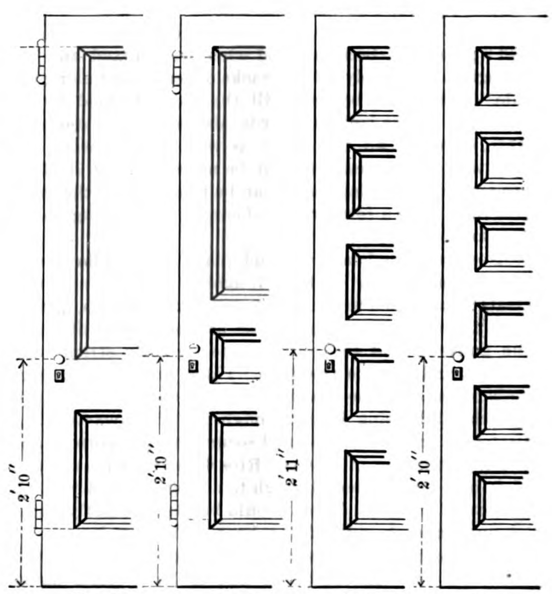


Fig. 1 *Fig. 2* *Fig. 3* *Fig. 4*

Proper Place for Door Knobs.—Sketches Submitted by "M. L."

door knobs. It will be seen that in Fig. 1 one tenon is cut away, as is also the case in Fig. 4. In Figs. 2 and 3 the position is such that no tenons are cut. In connection with Figs. 1 and 2 the position of the hinges is shown, Fig. 1 indicating that the hinge is on a line with the rail, while Fig. 2 shows it on a line with the molding.

Plan for a Piggery.

From H. E. D., *Utica, N. Y.*—I would very much like to have some of the readers of the paper furnish for publication the floor plans and elevations of a model piggery, particular attention being given to the dimensions of the building. I want something that is first class in every respect.

Criticism Desired of Roof Truss Construction.

From C. E. B., *Baltimore, Md.*—I inclose drawings of trusses designed for use in connection with two roofs. Fig. 1, the author believes, is the best roof construction for spans of from 40 to 70 feet. He says the tie need not be more than 5 x 8, the rafters and braces 5 x 5 and the battens of 1-inch boards well spiked to the timbers. In Fig. 2 is shown half of a truss for a building I am now erecting. This is 420 x 57 feet at one end and 60 feet 8 inches at the other. The trusses are 8 feet on centers with 2 x 5 inch purlins set 2 feet on centers. The owners claim that the sheeting boards will give very little dead weight, as they extend transversely. I should like to have these sketches presented to the readers of *Carpentry and Building* for the purpose of inviting their criticism as to the general design shown in Fig. 2, more especially the foot of the arch beam, which is constructed of 1⅛ x 4 inch stuff, four ply, and well secured with 1-inch boards on either side, as shown. There is also a 2 x 4 scantling extending between the battens, clearly shown in the drawing.

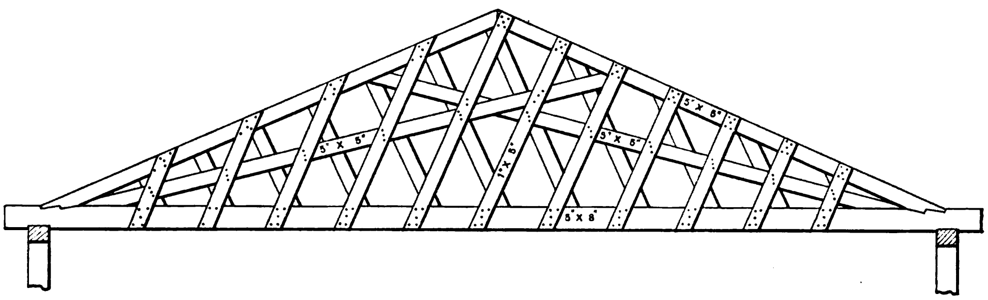


Fig. 1.—One Form of Roof Truss.

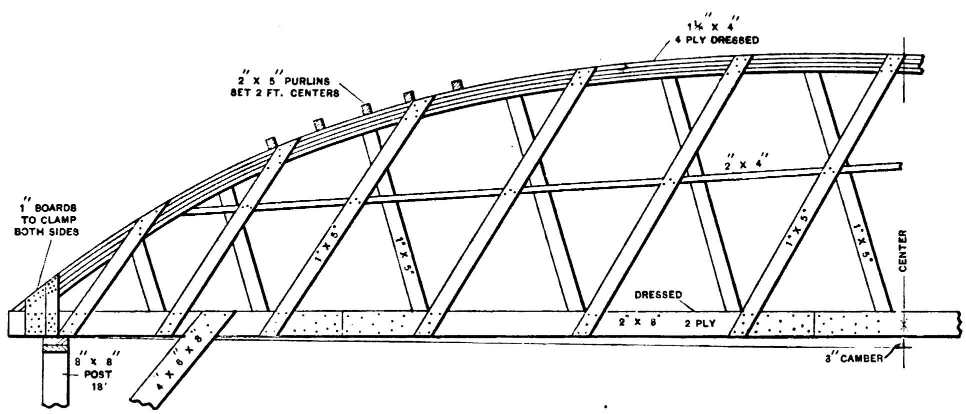


Fig 2.—Half of Roof Truss, Showing Construction at Foot of Arch Beam.

Criticism Desired of Roof Truss Construction.

Design for a Brick Veneered Hotel.

From HARMAN, *Volant, Pa.*—Will some of those who have had experience in such work furnish for publication designs for a brick veneered hotel of moderate cost with accommodations for 50 guests? I would like to have described in connection with the hotel a system of fire escapes.

Deflection of Floor Beams.

From C. H. T., *Brooklyn, N. Y.*—I would like very much to construct a table showing the limit of length which various sizes of shallow beams can be made without deflecting enough to warrant them undesirable for use. I would also like to have explained in the Correspondence columns the simplest way of finding the deflection and what deflection, if any, can be allowed on floor beams.

Answer.—In reply to the above it may be stated that there is but one general formula commonly employed for determining the deflection of beams, and in the case of white pine beams, loaded at the center, this formula may be represented by the following rule:

To find the deflection in inches multiply the load (in pounds) by the cube of the span (in feet) and divide by 2480 times the breadth, multiplied by the cube of the depth (both in inches).

For a uniformly distributed load the deflection will be five-eighths that determined by the above formula. For other woods than white pine use the following numbers in place of 2480: For spruce, 3000; hard pine, 4120; Oregon pine, 3300; hemlock, 2420; white oak, 2870.

Suppose, for example, it is desired to ascertain what will be the deflection of a 2 x 10 inch white pine beam, 16 foot span, loaded with 500 pounds at the center.

The solution would be as follows: Deflection in inches, $500 \times (16)^3 \div 2480 \times 2 \times (10)^3 = 0.41$ inch. If the load had been distributed, the deflection would be five-eighths of 0.41 inch, or 0.25 inch.

Every beam deflects, although if the beam is not loaded the deflection may not be perceptible. The limit for the deflection of floor beams with a plastered ceiling underneath is generally assumed at $\frac{1}{30}$ inch for each foot of span. Thus a beam of 15 feet span may have a deflection of $\frac{15}{30}$, or ½ inch.

It is possible to prepare tables showing the maximum span for different sizes of floor beams that may be used without exceeding the above limit of deflection, the formula being as follows;

$$\text{Cube of span in feet} = \frac{8 \times B \times D^3 \times e}{5 \times w},$$

in which B = breadth of beam in inches, D = depth of beam in inches, w = load per lineal foot of beam and e =

137 for hard pine, 110 for Oregon pine, 82 for white pine, 100 for spruce, 80 for hemlock.

The load per foot should include the weight of the floor and ceiling, and the allowance for live loads. For the floors of dwellings 60 pounds is the least that should be assumed for w when the beams are spaced 12 inches on centers and 80 pounds when 16 inches on centers.

Assuming these values we can make a table like the following by using the above formula:

Maximum Span for Floor Joists, Total Load 60 Pounds Per Square Foot.

Size of joists.	Distance on centers. Ins.	White pine. Ft.	White pine. Ins.	Spruce. Ft.	Spruce. Ins.	Oregon pine. Ft.	Oregon pine. Ins.	Georgia pine. Ft.	Georgia pine. Ins.
2 x 6	12	9	10	10	6	10	10	11	8
2 x 6	16	9	0	9	7	9	11	10	8
2 x 8	12	13	0	13	11	14	5	15	6
2 x 8	16	11	11	12	10	13	2	14	2
2 x 10	12	16	2	17	3	17	11	19	0
2 x 10	16	14	11	15	11	16	5	17	6
3 x 10	12	18	3	19	6	20	2	21	5
3 x 10	16	16	10	18	0	18	7	19	8

Finding the Lengths and Cuts for Hip Rafters.

From T. W. N., *Ingersoll, Ontario.*—In the February number of *Carpentry and Building* "W. L." of Kingston, Mass., asked how to obtain the lengths of hip rafters. I submit the following, by which any man with a square and pencil can find the length of any hip rafter where the corners of the building are right angles. In the first place, make a draft for the common rafter, which needs no explanation. After the length of the common rafter has been secured, which in this case will be 5 feet 10 inches, proceed as follows: Draw two lines at right angles to each other, as shown in Fig. 1. Measure up from A to B the length of the common rafter and from A to C the distance the foot of the common rafter stands from the corner, which in this case is 5 feet 6 inches. Intersect these two points by means of a line, which gives the length of the hip. In order to find the cuts for the hip draw a square as shown in Fig. 2. Lay up from A to B the rise of the common rafter. Now put the end of the square or rule at D and lay it diagonally across to the line C until the figures 8¼ on the square correspond with the line from A to C. Get the cuts the same as in any common rafter.

Now for the lengths and cuts of the jack rafters, turn to Fig. 1 and draw lines parallel with A B as far apart as the jacks are to be placed. Measure from the line A C to where the jacks intersect the hip, and the length of each jack is the result. A bevel placed on any of the jack rafter lines and set to cut with the hip gives the bevel of the jacks, and of course the cut of the common rafter gives the plumb cut and foot cut. With a little study and practice "W. L." can obtain all these cuts and measurements without a draft, using simply a square, a rule and a bevel.

From W. W. B., *Ansonia, Conn.*—In the February number of the paper "W. L.," Kingston, Mass., asked for a rule to cut the lengths of the hip rafters. In reply I would say take 4⅜ inches on the tongue and 17 on the blade of the steel square. If the veranda is 5 feet 6 inches wide, run off the hip five times, then get the square of 6 inches, which is 8½; place the square on as before, as if to make one more run, and mark where 8½ comes. This will be the length of the hip. Move the square along and mark the plumb cut. The tongue will give it and the blade will give the level cut. He can get the square of 6 inches by measuring across the steel square from 6 to 6. The sketch, Fig. 3, shows how to run off the rafter.

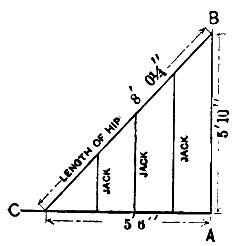


Fig. 1.—Method Suggested by "T. W. N." for Obtaining Lengths of Hip and Jacks.

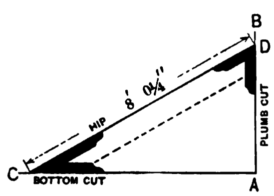


Fig. 2.—Diagram for Obtaining Cuts for the Hip Rafter.

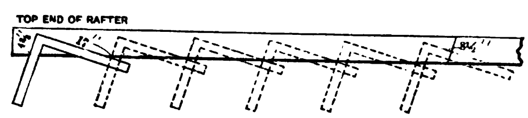


Fig. 3.—Method of Securing Lengths and Cuts Suggested by "W. W. B."

Finding the Lengths and Cuts for Hip Rafters.—Methods Recommended by Different Correspondents.

Laying Out Segment of Circle Without the Use of Radius.

From A. K. C., *Cuyahoga Falls, Ohio.*—If the editor can spare the space I will endeavor to answer the inquiry of W. T. Davies, Somerville, Mass., which appeared in the March issue of the paper. Subtract the square of the chord or span from the square of the diameter; then extract the square root of the remainder; subtract this root from the diameter, and half the remainder gives the rise. Take a circle of 500 feet diameter, as in the case mentioned by Mr. Davies, and take for example a 20-foot span or chord, this rule applying to any length. Then, according to the rule noted,

$$500 \times 500 = 250{,}000$$
$$20 \times 20 = 400$$

249,600, the square root of which equals 499.59.

$$500 - 499.59 = 0.41 \div 2 = 0.205 \text{ foot.}$$

$0.205 \times 12 = 2.46 = 2\,{}^{15}/_{32}$ inches, which is the rise in a 20-foot chord.

Such a segment of a circle can readily be described by the rule given in the issue of *Carpentry and Building* for June, 1897.

From J. D. McD., *South Sudbury, Mass.*—In answer to William T. Davies, Somerville, Mass., I would say that he can lay out a segment of a circle without using the radius by proceeding as follows: From the square of the radius subtract the square of half the span or chord; subtract the square root of the remainder from the radius and the remainder will be the spring of the segment from the chord line. The correspondent will then have three lines to which he can bend a flexible strip of suitable thickness. If the span is great he can obtain two more points by striking new chord lines from the point thus found to the extremities and proceeding in the same manner with the shorter segments. Should the span be very great the shorter segments can be divided and subdivided by the same process until the points found are near enough together to admit of a mold being made, which can be moved along from point to point to mark the whole segment.

The different expanded metal companies held a two days' meeting in Philadelphia, Pa., recently, for the purpose of discussing matters of interest to the expanded metal trade in general. On one evening many of the principal architects and engineers of Philadelphia, by invitation of James S. Merritt of Merritt & Co., Philadelphia, attended an evening session of the meeting at the Engineers' Club. Walter Hill of New York delivered a lengthy address on "Steel in Combination with Concrete," illustrating his points with blackboard drawings. The address was followed by a lengthy discussion in which a majority of those present participated.

The plans have recently been filed by the Lord & Burnham Company for a horticultural building of brick, stone and iron, which is to be erected in Bronx Park, Borough of Bronx, New York, at a cost of $200,000.

WHAT BUILDERS ARE DOING.

THE New York State Association of Contracting Builders recently held its annual session in Albany, N. Y., the objects of the organization being "to establish and maintain an association of contracting builders of the State of New York, for the purpose of uniting the power and influence of organizations and individuals in cities and towns where no organizations have been established; to promote the general welfare and to secure the proper consideration of all questions affecting the building interests of the State."

The following officers were chosen for the ensuing year: President, John L. Hamilton, New York; vice-president, F. Hughes, Utica; secretary and treasurer, J. C. Almendinger of Buffalo.

Baltimore, Md.

In the city and suburbs, especially in the latter, there seems to be signs of more than usual activity in building operations, particularly in the northwestern section. There is, too, some degree of improvement in the business districts of the city. Builders and architects report many inquiries with regard to prospective work and negotiations are pending for a number of large buildings. A Boston syndicate is reported to be planning to erect a large office and bank building at the corner of Fayette and Charles streets.

Hope is expressed that the system in vogue of erecting very cheap and unsafe residences, merely for the creating of ground rents, will be corrected by a bill which has been brought before the State Legislature.

E. J. Dowell, the new Inspector of Buildings, assumed charge of the Department on March 1. Mr. Dowell was at one time president of the Master Builders' Associaton.

Boston, Mass.

As a result of the action of the Mayor in proposing to use the repair division of the city for the erecting of structures with the employment of none but union labor, the following resolution was recently adopted by the directors of the Master Builders' Association:

Whereas. The Mayor of Boston has publicly declared that he intends, in defiance of law, to establish in the civil service of the Department of Public Buildings a class preference, irrespective of skill and merit, by employing therein only union laborers; and that he intends to erect by day labor a new public building or buildings in direct violation of the express provisions of law insuring to the taxpayers the protection of competitive bids therefor in open public competition: therefore

Resolved. That we hereby instruct our delegates to the Boston Associated Board of Trade to request the said board to investigate and act in the premises as the public interest may require.

As a result of the request of the master builders the Boston Associated Board of Trade referred the matter to a committee for investigation.

The Glee Club of the Master Builders' Association held its first public "sing" on the evening of March 16.

Cincinnati, Ohio.

The new officers of the Builders' Exchange are: President, Charles W. Ireland; first vice-president, H. Burbank; second vice-president, William Mitchell; secretary, Thomas D. Horner; treasurer, Ross Hamilton; directors, W. J. Pugh, E. A. Powell, W. W. Coney, H. B. Lucky; Arbitration Committee, Edward Schroder, Charles B. Stevenson, M. P. Scully, John Sperry, A. J. De Camp

Previous to the election of officers the reports of the treasurer and secretary were received, showing a small balance in the treasury and that eight new members had been received, the present membership being 133.

The exchange recently passed a resolution, to be conveyed by a special committee to the Mayor, praying that the new appointee to the position of Building Inspector be chosen from among the members of the exchange, in recognition of the services of the latter in giving the city its building laws, and in recognition of that body as representative of the building interests of Cincinnati.

It is stated that the next annual convention of the Master House Painters and Decorators' Association will be held in Cincinnati in February, 1899.

Chicago, Ill.

At a meeting of the Master Carpenters' Association of Chicago, held on Washington's Birthday, a number of resolutions were passed condemning the action of certain manufacturers of mill work and dealers in building materials, relative to their attempt to regulate the business of the contracting carpenters. The members expressed the belief that persons engaged in contracting should be personally liable for material furnished or should give security to material dealers outside of the liability of owners of the property improved with such material. They also condemn the system of selling material to contractors and owners at the same price, and efforts were made to have rules established by which a just discount be allowed to carpenter contractors. The resolutions also protested against piece work or subletting of carpenter work, and suggested that in the case of labor disputes the differences be adjusted on terms fair to both sides.

As a result of a recent conference of master painters and decorators from all parts of Chicago at which the wage problem for the present season was discussed, a committee of seven representatves was appointed to meet with a like committee from the painters' union and attempt to come to an understanding on the wage schedule to be employed.

Working rules and a wage scale have been determined upon and adopted by the Mason Builders' Association and the Bricklayers and Stonemasons' Union, to go into effect April 1. The new scale calls for 50 cents an hour and eight hours per day, the same hours and wages as for several years previous. Strikes may be called for certain grievances agreed upon. All other grievances must be referred to the presidents of the two organizations, and then if necessary the joint committee of arbitration may be called upon to decide the dispute. The union committee has also made a new agreement with the Illinois Fireproofing Manufacturers and Contractors' Association, by which 52½ cents is established as the wages, an increase of 2½ cents.

Denver, Col.

Building matters in Denver promise so well for the season that Inspector Cutshaw concludes it will closely resemble the era of prosperity that was enjoyed three or four years before the panic, says a recent issue of the *Post*. Inquiries at his office from architects indicate that more buildings are in prospect than are now in course of construction, and it is admitted that a very large amount of new work is in progress throughout the city, both in business and residence localities.

Grand Rapids, Mich.

The indications point to a very busy spring in the way of new buildings and alterations to old structures in Grand Rapids. The first large building for which ground will be broken will be a six-story and basement iron and brick business structure. Other business blocks are contemplated, and new fronts will be added to several buildings. It is thought that this year will be the largest in the history of Michigan in the way of the construction of public buildings. According to the statement of a local architect he has had notice of the construction of no less than ten county buildings in the State, to be put up the coming season, against an average of three or four a year in times past.

Lansing, Mich.

That there is general expectancy and hope among the working classes in the city for increased activity in industrial pursuits with the coming of spring there can be no doubt, and the present outlook indicates a healthful and prosperous beginning of the year 1898 in the capital city of Michigan, says the *Journal* of that place. From numerous inquiries among architects, contractors and builders the conclusion is reached that there will be a very large amount of building and remodeling done as soon as the frost is out of the ground. It is still too early to publish a complete list of the buildings which will be constructed this season, there being many cases in which the builder is still undecided as to his plans. It is an assured fact, however, that Lansing will have one new church edifice, several new business blocks and many handsome residences as well as a large number of cottages.

London, Ont.

The London Builders' Exchange of London, Ont., has recently been organized with the following officers for the ensuing year: Honorary president, Thos. Cannon, Jr., Toronto; president, William Jeffrey; first vice-president, Scott Murray; second vice-president, John G. Pritchett; secretary, Geo. S. Gould; treasurer, James Luney.

Directors.—Thos. Jones, Joshua Garrett, Henry Stratfold, Charles Colerick, William Smith, Arthur C. Nobbs.

The exchange has secured commodious rooms on the second floor of the Ontario Loan & Debenture Company's Building on Market lane, the rooms being very pleasant, easily accessible and centrally located. The officers hope to have 100 members on the roll of the exchange by April 1.

New York City.

The situation shows very little change from last month, architects and builders are still looking forward to a considerable degree of activity as soon as the weather becomes a little more settled. The number of permits, however, which are weekly being filed with the Bureau of Buildings is not quite up to the aggregate of a year ago. Up to the middle of March 638 buildings had been projected, estimated to cost $15,315,900, as compared with 802 buildings, valued at $18,081,900, for the corresponding period of last year. In Brooklyn the situation is to some degree the reverse of that just mentioned, as there were 552 buildings projected up to the middle of March this year, estimated to cost $2,616,626, as against 515 buildings, valued at $2,065,967, for the same period in 1897.

There have been a few minor labor troubles during the past month, the more important of them being the differences between the machine stonecutters and their employers, which commenced on March 17 with strikes in several yards. Several hundred men in the aggregate stopped work, and at the time of going to press it was thought that other yards would become involved before the matter was settled. The trouble seems to have really commenced about a month ago, when the machine stonecutters, who were working nine hours a day, notified their employers that they would demand an eight-hour day and a uniform and better rate of wages on and after June 1. The employers disapproved of these demands and the workmen were notified to withdraw them. It is said that the strikes above mentioned were precipitated by a dispute over a substitute agreement submitted by the employers which allowed the possible employment of non-union men.

The Amalgamated Painters and Decorators' Union of New York recently sent a circular to all employers notifying them that on April 1 they would demand that wages be not less than $4 a day for decorative work and $3.50 a day for plain work, eight hours to constitute a day's work, except on Saturday, when it is to be seven hours. Double wages are to be charged for work on Sundays or legal holidays. Traveling expenses and board to be paid on all work in the country.

The Building Trades Club held a "smoker" in their club rooms on the evening of Saturday, March 12, for the purpose of celebrating the ninth anniversary of the organization of the club. A very enjoyable programme of music and recitation was given, this in turn being followed by a substantial collation. The president, Henry M. Tostevin, made some well timed remarks on the excellent finanacal and numerical strength of the club, and the affair as a whole was thoroughly in keeping with those pleasant occasions which have characterized this orgainzation from its inception.

The Builders' League formally opened their new house, at 74 West 126th street, on the evening of Thursday, March 10, when a large number of representative builders and material men were in attendance. In the absence of the president of the league, the first vice-president officiated, and the affair was altogether a very pleasant one. There was an excellent programme of amusements, after which a substantial collation was served.

Oshkosh, Wis.

The Builders and Contractors' Exchange has recently been orgnized by 56 of those who are interested in contracting and building. Regulations and by-laws have been adopted and the following officers elected : President, C. R. Meyer ; vice-president, W. H. Davis ; secretary, A. E. Krippene ; treasurer, H. F. Kitz. Board of Directors, three years, Joseph Webber and C. L. Rundle ; two years, T. R. Morgan and C. W. Radford ; one year, R. Lutz and R. C. Brown.

The list of charter members includes all the large manufacturers of the city, nearly all of the contractors and builders, several plumbers, master carpenters and dealers in builders' material, &c.

One of the main objects of the organization is to maintain quarters where all persons interested in building may congregate daily and talk over matters of interest to them. Besides these informal gatherings, regular meetings will be held from time to time to consider matters of importance to builders and contractors, dealers in building material, &c.

Oakland, Cal.

The Builders' Exchange has, by reason of depression in the building trades and other causes, been forced to break up its organization in the Estey Block, but a few of the material and mill men will hold together and have a meeting place on Tenth street, where the secretary will have an office. The present president is James Smilie, and J. E. White is secretary.

Philadelphia, Pa.

The monthly report of the Building Inspection Bureau shows that during February 440 permits, covering 788 operations and involving an estimated cost of $1,573,885, were issued, an increase over February, 1897, of $520,800 in estimated cost. The operations for January were 585, covered by 379 permits, and the estimated cost was $705,290.

It is stated by the *Inquirer* that one of the largest dwelling house operations ever attempted in Philadelphia in a single year has been commenced at Overbrook Heights by Florey & Bevan. The operation consists in the erection of 182 three-story dwellings in 11 different designs, and will cost in the neighborhood of $700,000.

Camden builders are reported as being unusually active this spring. Three different parties are erecting an aggregate of 65 brick dwellings.

The fourteenth annual convention of the Master House Painters and Decorators' Association of the United States was recently held in Philadelphia, at the Bourse. Sixty delegates from without Philadelphia attended, representing 21 suburban associations. Three hundred and ninety dollars and ninety-five cents balance on hand was reported. Several papers were read, among them being one on the fire proofing of wood by silicate of soda, prepared by Alfred H. Lorton, read by F. A. Ballinger, and one by W. J. Edwards, entitled "How Unrestricted Immigration Is Affecting the Painting Business." Considerable discussion was caused by the failure of the Committee on the Revision of Constitution and By-Laws to agree on the subject of admission of manufacturers and journeymen to the association, and it was referred to a new committee.

Portsmouth, Va.

Not less than 100 buildings were recently reported in process of construction in Portsmouth and its suburbs, varying in value from $250 to $12,000 each. Building operations are not confined to any particular part of the city, a majority of the small residences and stores being located on the extension of streets into the country. There is said to be a demand for more residences, and investments in such, it is claimed, will yield 12 to 20 per cent. The Armour Packing Company are to erect a large cold storage plant at Port Norfolk, a suburb, to be used as a distributing point for the South.

St. Louis, Mo.

Subcontractors have effected a temporary organization in response to a call by a circular signed by six prominent contractors.

A strike, threatening to extend to every branch of the building trade, is expected to be inaugurated April 1 by 1000 to 1800 members of the Bricklayers' Union, on account of a cut of 15 cents per hour in their wages which has been announced to take effect on that date.

Toledo, Ohio.

At the recent annual meeting of the Builders' Exchange the matter of a State organization of builders' exchanges was fully discussed and a resolution that it was the sense of the meeting that the Toledo Exchange favor any move in the direction of organizing a State institution was unanimously approved. There is little doubt that such an organization will be formed in a short time.

The report of the secretary shows that the exchange is in a prosperous condition, not only as regards finances, but in a greatly increased membership.

The election of officers resulted in the following choice : A. R. Kuhlman, president ; John McCaffrey, first vice-president ; Henry Thorspeck, second vice-president. Directors : Albert Neukom, Peter H. Degnan, John W. Lee, Ed. Goulet, J. C. Romeis and J. Jacobs. In addition to those newly elected, the Board of Directors is composed of the following : Charles Hartman, Frank Gorman, R. G. Bacon, M. Donovan, W. J. Albright and John Stollberg.

Wilmington, Del.

The Builders' Exchange enjoyed the seventh annual dinner March 2, 50 persons being present. President Swayne acted as toastmaster. Remarks were made by William Lawton, Chief Engineer Wilson, Building Inspector Grubb, Engineer Hatton, A. S. Read and others. The committee in charge of the dinner comprised George Sigler, A. L. Johnson, C. I. Swayne, W. Gallagher, F. A. Mitchell and A. S. Read.

Notes.

The carpenters and wood workers of Evansville, Ind., are reported to be busy, with prospects good for activity during the summer and fall. The busy season commenced a month earlier than usual this year, and the relations of the carpenters and contractors are reported as eminently harmonious.

Contractors of Richmond, Ind., look for a fair degree of activity the coming season, but expect no great "boom."

The Builders' Exchange of the City of East Liverpool, Ohio, has been incorporated for the purpose of promoting social enjoyment and friendly interchange of views. Robert Hall, Josiah T. Smith, Daniel L. Nellis, George Phillips. Frank W. Milligan, Ed. Cook, Harry McHenry, Judson A. McCain and William Kent are the incorporators.

The leading carpenters and contractors of Parkersburg, W. Va., are reported as having formed a builders' exchange, and applying for a charter.

The *Press* judges that the coming season will be one of great building activity in the City of York, Pa. Improvements to the court house, with an addition, will be undertaken, and numerous private residences erected.

It is said that in Denver, Col., there has been more or less trouble among the building trades lately in relation to the employment of non-union workmen and working more than eight hours.

The contracting plasterers of Minneapolis, Minn., have recently formed an organization to be known as the Master Plasterers' Association. Officers have been elected, and a general discussion of matters pertinent has taken place. Bright hopes of the usefulness of the organization to the trade have been expressed.

The Utica, N. Y., Builders' Exchange held its annual meeting at Arcanum Hall Saturday evening. Officers for the ensuing year were elected as follows: President, William Fisher ; vice-president, Fred. G. Weaver ; secretary, H. Lancaster ; treasurer, Joseph Wicks ; trustee for three years, Thomas Bailey.

A prominent architect in Wheeling, W. Va., expresses the opinion that the bulk of building will be of a suburban character.

The Mechanics and Builders' Exchange of Yonkers, N. Y., recently appointed a committee to investigate the lien law of neighboring States and to formulate any amendments to the home law which may be thought advisable and to report thereon to the exchange.

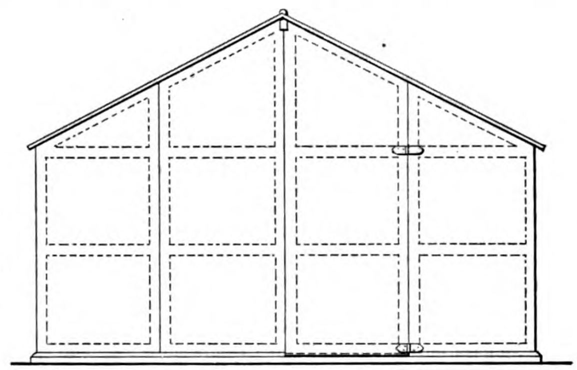
There has been a moderate activity in building among local residents at Bar Harbor, Maine, during the winter season.

Fire tests of cast iron columns, made by order of the city authorities of Hamburg, are described in recent issues of the *Deutsche Bauzeitung*. The columns were 10 feet 8 inches long, 10.5 inches in diameter and of 0.5 inch metal. They were loaded centrally and eccentrically, and some were cased with a fire proof covering A hydraulic press was placed below the column and its cross head above it, and then a hinged oven containing 12 large gas burners was clamped about the column. The oven was furnished with apparatus for measuring heat, with peep holes and with a water jet. On an average a load of 3.2 tons per square inch, with a heat of 1400 degrees F., produced deformation in 35 minutes in a centrally loaded column without casing. This showed itself by bulging all around in the middle of the heated part, especially where the metal happened to be thinner. Fracture occurred finally in the middle of the thickest point of the bulge. If the load was less this occurred at a higher temperature. Jets of water had no effect until deformation heat was reached. The casings had the effect of increasing the time before deformation began from half an hour to four or five hours.

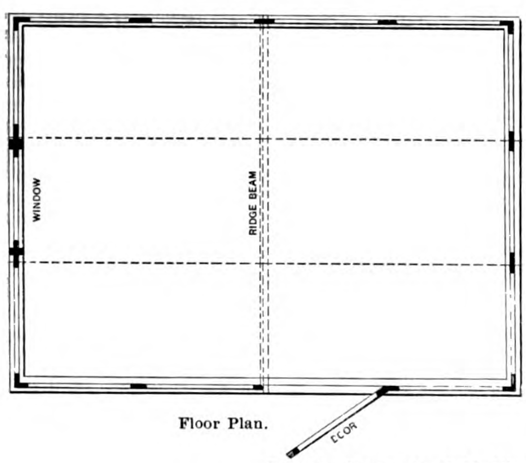
Portable Houses for Cold Climates.

Just at the present season, when so many people of this and other countries are pushing their way toward Alaska and adjoining territory in search of the golden wealth which is supposed to be hidden there, a short description of a portable house, designed especially for cold climates, may not be without interest to many of our readers. The illustrations which are presented include a general view of the completed structure, together with floor plan, elevations and a few constructive details. The size of the house is 9 x 12 feet, and will afford sleeping room for four men. The walls on the side are 5 feet high and the center is 8 feet from the ground. The material used in the construction is well seasoned spruce for the frame of the panels, a heavy four-ply water proof building paper for the outside and a heavy tar felt for the

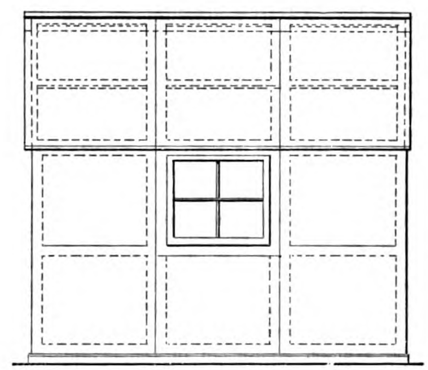
Perspective View.



Front Elevation.



Floor Plan.



Side Elevation.

Portable Houses for Cold Climates.—Scale, ¼ Inch to the Foot.

inside. The panels of which the house is made are tongued and grooved together and held by strong wire hooks. The roof is securely screwed to the sides and ridge pole. The paper and felt are firmly glued on the panels, besides being secured by strips with ¾-inch wire nails and washers. From an inspection of the details presented on the following page it will be noticed that the panels are so constructed as to create air chambers, and that the whole house is virtually a refrigerator designed to retain within it all the heat created by means of stoves, &c. The tar felt of which the inside lining is composed is said to be of such a character as to exclude vermin and insects. In order to avoid the danger of fire four panels, each 3 feet high, are lined with asbestos paper. Houses of this character are being made by the Kunz & Jennings Company of 40 North Front street, Portland, Ore., who refer to them as affording miners and prospectors in the Arctic regions a comfortable dwelling. The weight of the house ready for shipment is about 450 pounds, the different parts being packed in as small compass as possible, and the edges and outside of each package protected with strips of ¼-inch lumber.

The Architecture of Agra.

The architectural marvels which characterize the Mohammedan cities of Northern India culminate at Agra—the pearl of the Mogul crown and the heart of that splendid empire built up by the descendants of Timour, the barbaric Tartar chief of Central Asia. From the railway bridge which now spans the sacred Jumna the silvery domes and minarets of the Taj Mahal gleam against the black cypresses on the brink of the holy river. The pink dome of Princess Jahanara's mosque glows like the blushing bud of some huge tropical flower lifted into the deep blue sky, and the red battlements of the mighty fort soar in frowning majesty above the surging sea of color which ebbs and flows beneath the Titanic stronghold. The massive towers of a vaulted elephant gate surmount the machicolated walls, and three shimmering globes of misty whiteness float over the rugged, crimson parapet, like pearly bubbles which the faintest breeze would sweep away. These dreamlike spheres are the marble cupolas of the Moti Musjid or Pearl Mosque, once the sanctuary of the Mogul queens. A triple row of horseshoe arches divides the beauteous temple into three fairy aisles. The azure sky emphasizes the fragile frostwork of each fretted arcade, and the unearthly purity of the ideal shrine suggests some visionary temple of heaven—"a house not made with hands." Gilded spires accentuate the spotless whiteness of the milky marbles, the chaste simplicity of style exhibits the utmost refinement of ethereal aspiration, and the bridal fairness of the snowy mosque shines above the red masses of rough standstone, with the apparent contrast of tone and texture suggested by a cluster of lilies lying on the edge of a dark and storm swept precipice. Nine palaces of varying date, size and beauty stand within the huge quadrangular wall of the Imperial fort, which for ages proved impregnable, though storms of battle broke against it and hostile armies encamped around it, striving to gain by treachery what was denied to force. Mediæval travelers record the pageantry of the gorgeous court to which Queen Elizabeth and King James I sent ambassadors during the reigns of Akbar and Shah Jehan, and the ecstatic verse of a Persian poet—the laureate of that long past day—still encircles a marble dome with the appropriate motto, "Oh, if there be an Elysium on earth, it is this! It is this! It is this!" The palace of the Emperor Akbar forms the ancient portion of the majestic pile and retains the rude and massive character which distinguished the early days of Mogul supremacy.

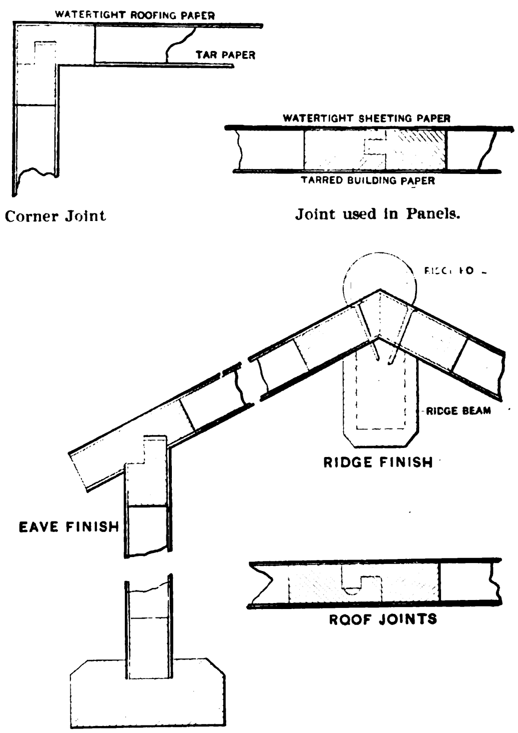
The dreamy loveliness of the imperial palaces represents but one phase of Mogul life. Dark and dreary dungeons flank the river and black tragedies were enacted in these cavernous depths while pomp and pleasure reigned overhead. The bowstring and the sack were in constant requisition, and at the great state banquets a poisoned rose, a sharp dagger and a crushed diamond in a goblet of water were easy weapons whereby the monarch could rid himself of an unwelcome guest or a secret foe. The age of unbridled luxury and power possessed "les défauts de ses qualités," and even the tolerant Akbar had little scruple in removing any human obstacle from his path with the tyranny of an Eastern despot, to whom might was right and will was law. Modern Agra derives her rich inheritance of artistic skill in marble and mosaic from the crowd of native and foreign artists who flocked to the Mogul Court. The brilliant bazaars show an "embarras de richesses" in sculptured jade and soapstone, enamel and mosaic, gold embroideries and silken hangings, whereon the parrots and peacocks of Mogul India shine in tinseled splendor. An after glow lingers from the long set sun of the vanished dynasty, and mediæval relics enrich crumbling walls and dusky street with fading memorials of the gorgeous past. In the flush of a radiant dawn, Agra looks like a city of cloudland, rising from billows of golden mist which veil the river and soften the sharp outlines of wall and watch tower.—*Belgravia.*

New Ellis Island Buildings.

Some time ago the buildings on Ellis Island which were used for the landing of emigrants at New York were destroyed by fire, and the Government has recently had the plans prepared for new buildings, which will probably cost when completed in the neighborhood of $1,000,000. The main structure will be in the French Renaissance style of architecture, having a frontage of 395 feet, a depth of 166 feet and a hight of 62 feet to the balustrade, or 100 feet to the tower roof. The material will be brick with light stone trimmings. The designs of the new buildings were chosen by competition, the successful architects being Borning & Tilson of New York City. The arrangement is such that the emigrants will pass from the barges to the building through a fenced off space, thence to the second story, where they will be subjected to a medical examination and the questions of the Registrar. Dormitories will be provided on the second and third floors to accommodate about 900 persons, with a possibility of extending the quarters in emergencies to accommodating 400 or 500 more. These have fire proof balconies and staircases outside, leading to the ground. There will be a large information bureau for the convenience of the public visiting Ellis Island, and the main detention room will have the floor inclined so that visitors looking in the windows can readily see all who are present. There will be a hospital large enough to accommodate 45 patients with such an arrangement that other wards can be added at any time. The tops of the second-story buildings will be arranged for roof gardens or airing grounds for the emigrants.

Old Time Way of Framing a Building.

In putting up a frame building, every effort should be made to get the roof on as soon as possible, and when this is done, if the time will permit, the building should stand awhile before being closed up in order to allow the frame and joists to season. In the old days, when our fathers built their houses, they generally arranged to have the frame put up, the roof on and rough boarded on the outside early in May, and then the whole building was allowed to stand until September, when it was inclosed and afterward finished inside. In those days all the doors and sashes were made by hand and the wainscot, base, moldings and flooring were also wrought by hand. Tonguing and grooving flooring was hard work, and to dress, joint and work 25 or 30 pieces of flooring 12 feet long in one day was considered a pretty good day's work, and many an old time apprentice will remember how he "earned



Details of Construction.—Scale, 3 Inches to the Foot.

Portable Houses for Cold Climates.

his bread by the big drops of sweat falling from his brow" "roughing off" flooring boards. Ripping stuff by hand for doors and sash was another choice job that used to fall to the lot of the latest apprentice, and this was the training he generally got the first year or two. All stuff for inside finish was supposed to be got out while the frame and joists were drying, the work being done in the building or in "the shop," and it must be admitted that the hundreds of houses that have come down to us from that time are substantial evidences of the good workmanship and good sense of the old time builder. No greater mistake can be made than that of putting up a balloon frame with green stuff and then closing it right in. It should be allowed to stand as long as possible unfinished.

IT is intimated that New York will soon have a Velodrome, similar to the one in Paris, and which was illustrated in these columns a year or two ago. The plans are being drawn by Architects Child & De Goll, and the estimated cost is placed in the neighborhood of $250,000. The building will be devoted exclusively to bicyclists.

The Builders' Exchange

Directory and Official Announcements of the National Association of Builders.

Officers for 1897-8.

President,
Thos. R. Bentley of Milwaukee, Wis.

First Vice-President,
Wm. H. Alsip of Chicago, Ill.

Second Vice-President,
Stacy Reeves of Philadelphia, Pa.

Secretary,
Wm. H. Sayward of Boston, Mass.

Treasurer,
George Tapper of Chicago, Ill.

Directors.

Baltimore, Md.	S. B. Sexton, Jr.
Boston, Mass.	C. Everett Clark.
Buffalo, N. Y.	Charles A. Rupp.
Chicago, Ill	Wm. M. Crilly.
Detroit, Mich.	John Finn.
Lowell, Mass.	Wm. H. Kimball.
Milwaukee, Wis.	W. S. Wallschlaeger.
New York City	Chas. A. Cowen.
Philadelphia, Pa.	Geo. Watson.
Portland	George Smith.
Rochester, N. Y.	John Luther.
St. Louis	P. J. Moynahan.
Worcester	John H. Pickford.

Organization in the Building Trades.—IV.

One of the surest means of proving the fact that a properly organized builders' exchange can be made valuable to every member is by demonstrating its power as an efficient and practical assistance to the transaction of business. The fact that the membership of an exchange includes members from all branches of building provides an opportunity for clearly showing that such an organization can furnish conditions for assisting the transaction of business which could be created by no other means. A membership which comprises a majority or even a fair proportion of the best men in the various branches of building in a given city possesses the requisite elements for benefiting all concerned. The common object which has drawn the members together is the hope of benefit—benefit to the fraternity first and to the individual incidentally, or *vice versa*, as the case may be.

In many, if not all, cases a general contractor will find among his fellow members in an exchange one or more subcontractors with whom he has business dealings, and it is equally likely that the subcontractors will find among their fellow members general contractors for whom they may be doing work, and in both cases each is sure to find a number of others with whom it is desirable to do business in the future. By fixing upon some hour in the day, from 11 to 12, 12 to 1 or 1 to 2, for example, during which all members will be at the exchange either in person or by representative, the direct business benefit to all concerned is manifest. As soon as it becomes known that all the contractors can be found at the exchange rooms at a certain hour in the day, those who have building material to sell, whether members or not, will recognize the great convenience of being able to see within an hour and at one place as many buyers as they were formerly able to visit in a day, and they, too, may thereafter be found at the exchange during the business hour.

The convenience of such a system is obvious, and in every case where it has been established there has no longer been the slightest question as to the benefit to the fraternity of a properly organized exchange. In Boston, for example, a large majority of the contracts between contractors are let and a large majority of the building material used in the city is sold to the contractors or ordered by them in the rooms of the exchange during the hour for business, thus leaving the rest of the day entirely free. The architects know where the contractors may be found between 12 and 1 o'clock, and no time is wasted in waiting at a job or running from one job to another in search of them. The builders are free to leave their offices as frequently as they like, for it is well known that they can be found at the exchange during the business hour.

No good reason has been advanced, so far as known to the secretary of the National Association of Builders, as to why such a system should not prove of incalculable benefit to the entire building fraternity in every city of importance in the country. In some cases members of exchanges that have tried in a half hearted way to establish such a system seem to feel that the business or "'Change Hour" is some kind of a meeting, and the thought of a meeting every day seems to be too much for them. The business hour at a builders' exchange is no more a "meeting" in the ordinary sense than is that of a Stock Exchange, a Clearing House or Chamber of Commerce. Its function is identical with that of other business bodies whose members transact a large share of their business at some regular time and place—simply a business convenience.

One of the greatest hindrances to the establishment of a business hour is the attitude of members who, when asked to help at the establishment of such a system, say in response, "Well, when I see so and so and so and so [naming the prominent members of the exchange] are there every day I'll be there too." It is almost too absurd to need pointing out, but this waiting by every one for some one else has done more to hinder the establishment of efficient exchanges than all other causes put together.

Employer and Workman.

The secretary of the National Association of Builders in a recent address on "The Relations of Employer and Workman" emphasized the following fundamental facts which underlie the labor problem as being some of the causes which have led to and created existing relations between the two :

1. That labor and capital are primarily and truly but equivalents of each other.
2. That the possession of a larger amount of capital (accumulated possessions) than is immediately needed for use does not carry with it the right to insist upon the payment of an ever lessening amount of capital in exchange for labor, for the extreme logical sequence of such an assumption is, no payment for labor, or, in other words, slavery.
3. That the employer and workman are simply and solely parties who exchange commodities that are equally needed, and that the sum and substance of the labor problem is the discovery of the just terms on which this exchange should be made.
4. That the employer, although fully as interested a party as the workman in the labor problem and as much a part of it as he, has insisted that it is none of his affair, has persistently avoided its study and ignored its lessons, and, relying upon his ability to defend himself, has declared the workmen his enemies, has invited improper attacks, weakened his own position, failed to do his duty to himself, to the workmen and to the community at large, thus greatly increasing the difficulties which he now cannot avoid meeting.
5. That the workmen have for many years been studying and experimenting with this great question, have discovered ways and means for accomplishing much good for themselves and indirectly much good for their employers and for the community, have through and by the same discovery developed a new and great power, and by an ignorant and unjust application of this power have demonstrated most forcibly the terrible danger it carries, not only for those it is used against but for those who use it.
6. That the labor question, particularly as regards the

relations of employer and workmen, cannot be pushed aside, cannot be ignored. It must be settled, and it must be settled right. No temporary expedient will avail, and mistakes, if made, will have to be corrected, for there is no final settlement of this or any other great question except upon the lines of truth, justice and equity.

New Publications.

Mechanical Heating and Ventilation. By M. C. Huyett. Size, 6 x 8¼; profusely illustrated; 155 pages; bound in leatherette. Published by Henry O. Shepard & Co. Price, $3.50.

The above is the title of a book which has just been received treating on the heating and ventilation of buildings by the use of fans. The book avoids the use of algebraic formulas, and presents the matter in a simple manner, providing tables to be used in connection with the rules for determining the proper proportions for various portions of a heating and ventilating system, so that they may be readily understood. It also treats of the various motive devices for operating fans and of the different types of coil heaters for use in connection with them. Illustrations show by means of half-tone sectional views the methods of arranging mixing dampers and devices for automatic regulation. Several types of fans or blowers are shown and tables are presented giving the proportions and sizes of the pipes used in blower systems to accomplish given results and also the weights of the pipes. The book also shows by means of half-tone views buildings in which heating systems have been tested, and the data are arranged for the information of those who are interested in the subject.

Law in the Building Trades.

WHEN CONTRACTOR CANNOT RECOVER LAST INSTALLMENT.

A building contractor, says the Supreme Court of Wisconsin, who receives an installment of the price on an express agreement that defective plastering will be made perfectly satisfactory before any further payment is made, cannot recover a subsequent installment, where he fails to repair such plastering and the owner has it done by other parties.—Pormann *vs.* Walsh, 72 N. W. Reporter, 881.

WHEN OWNER IS BOUND BY ARCHITECT.

The acquiescence of an architect who represents the owner of a building, in the building as constructed, during the progress of the work, is binding on the owner, under a provision in the contract that the work is to be done to the entire satisfaction of the owner and the architect, and that the whole work is to be inspected as it goes on, and accepted by the owner and architect before final payment.

The owner who fails, either personally or through his architect, to express dissatisfaction with such work as it progresses cannot refuse to pay the contract price, under a provision that the work is to be done to the entire satisfaction of the owner, who will have full power to reject all work and materials which are not of the best of the kind specified, and the work is to be inspected as it goes on.—Laycock *vs.* Moon, Sup. Ct. Wis., 72 N. W. Rep., 372.

COMPETITION ON PUBLIC BUILDINGS BY ARCHITECTS.

An architect, says the Supreme Court of Pennsylvania, who has violated the terms of a competitive programme under which plans for a public building are submitted, has no right of action for damages for violation of the obligations assumed by the commissions under such programme.—Cope *vs.* Hastings, 38 Atlantic Reporter, 717.

WHEN CONTRACTOR MAY ABANDON.

A party to an express contract for labor and material may, if he is prevented by the other from completing the contract after partial performance, elect to abandon the contract and sue for the fair and reasonable value of the labor and material actually furnished.—Thompson *vs.* Gaffey, Sup. Ct. Nebr., 72 N. W. Reporter, 313.

WHEN CAPRICE MAY GOVERN.

A contract for roofing a house with tile of a peculiar and rare color to the satisfaction of the owner and his architects requires the contractor to make the tiles accord with their tastes, however capricious and exacting they may be, but in the absence of an express contract provision as to the work of putting them on, defined by the plans, specifications and details, such work is not subject to the arbitrary caprice of the owner or the architects, as no question of personal tastes or preferences is involved.—McNeill *vs.* Armstrong, U. S. Cir. Ct. App., 81 Federal Rep., 943.

WHEN SUB-CONTRACTOR MAY ASSIGN.

A sub contractor, says the Supreme Court of Massachusetts, for the performance of a portion of the work on a building is not prohibited by a provision in the original contract that the contractor should "not let, assign or transfer the contract, or any interest in same" without the consent of the architect.—Perry *vs.* Potashinski, 47 N. E. Reporter, 137.

WHEN OWNER IS NOT LIABLE TO SUB-CONTRACTOR.

The mere fact that an owner stands by and sees a sub-contractor at work does not render his property chargeable with a mechanic's lien in favor of such sub-contractor, where at the time there was nothing due from the owner to the original contractor.—La Pasta *vs.* Weil, Sup. Ct., 46 N. Y. Supp. Rep., 275.

WORK OF INDEPENDENT CONTRACTOR.

Where a landlord employed a builder who was not subject to his orders, except as to the result to be obtained, to build a vault on premises occupied by a tenant, the landlord was not liable for the negligence of the builder in leaving an excavation, which filled with water, and in which a child of such tenant was drowned.—Wise *vs.* Remme, Sup. Ct. Mo., 41 Southwestern Rep., 797.

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CARPENTRY AND BUILDING

WITH WHICH IS INCORPORATED
THE BUILDERS' EXCHANGE.

DAVID WILLIAMS COMPANY, - PUBLISHERS AND PROPRIETORS.
232-238 WILLIAM STREET, NEW YORK.

MAY, 1898.

Elevators in Private Houses.

A feature which is rapidly becoming quite common at the present day in connection with many of the more expensive private houses is a passenger elevator operated by means of electricity. The wide application of this mysterious force and the ease with which it can be employed has given a great impetus to the installation of elevators in private residences, especially among the more palatial city dwellings, and now it is not infrequently the case that architects in their designs for costly houses make provision for a passenger elevator even though it is not to be immediately installed. Electricity is readily supplied from the electric mains in the subways of the city streets, so that the owner of the house is relieved of all trouble concerning the motive power, it being turned on and off like an ordinary gas or electric light. About the only thing required is that the working parts of the elevator be kept clean and lubricated, and this is usually attended to by the inspector of the company putting it in. One of the ingenious features of these electric elevators is that it is only necessary to press a button and the elevator immediately starts for that floor, stopping of its own accord when it reaches there. In some cases the door opens and closes automatically, while the possibiiity of its being left open is guarded against by a device which prevents the elevator from moving until the door has been closed. After it has been closed it automatically locks and so remains until the arrival of the elevator. Most of the elevators installed are small, accommodating perhaps three persons, while some are large enough to hold six or seven. They are handsomely and expensively decorated so as to be thoroughly in keeping with the finish of the house in which they are used. The device has become so popular among the wealthy that elevators have been installed within the past few years in many old houses, put up long before elevators were considered at all feasible in connection with private dwellings. At the present day passenger elevators are regarded as almost a necessary part of new houses erected by those who desire to be fully abreast of the times in everything pertaining to household conveniences. As a general thing, one elevator is considered sufficient for a residence, although in some houses there are several, one of which may be employed for freight purposes, although the dumb waiter is ordinarily used for this purpose.

Chicago's New Building Law.

It is worthy of note that the city of Chicago, which was the first to put up what is now so generally known as the "sky scraper," has recently passed a new building law restricting the hight of buildings erected in the future to 130 feet, or what is supposed to mean ten stories above grade. As noted in another column, the possibility of the passage of this ordinance led to the taking out of an unusual number of permits for buildings, although it is probable that many of the structures contemplated may not be put up within the present year. The ordinance as passed provides for a building department with a commissioner, a deputy commissioner and a force of different kinds of inspectors, the commissioner being made the judge of all questions arising as to whether existing or contemplated buildings comply with the terms of the ordinance. In cases where work is not commenced within six months of the time the permits are taken out, they become void under the new law. In the case of what is known as "skeleton construction," the iron or steel skeleton must be covered with brick, terra cotta or fire clay, and the inside pillars must be protected in a like manner. Similar protection is called for in connection with the weight carrying parts of buildings erected on the "slow burning" principle, except that oak beams of more than 100 square inches sectional size need not be covered. Foundations are to be proportioned to the actual loads they are likely to carry and are to be constructed of cement, concrete, dimension or rubble stone and sewer or paving brick. If iron or steel is used the foundation is to be Portland cement, while timber piles are to be covered with a grillage of either oak timber or cement. Piles shall not be loaded more than 25 tons each and the extreme fiber strain on the grillage, it is stated, shall not be more than 1200 pounds to the square inch. Brick work laid in Portland cement shall not be loaded more than 25,000 pounds to the square foot, and if laid in ordinary cement not more than 18,000 pounds. In the case of warehouses, stores and similar buildings the thickness of the walls will depend on their hight both the external and internal walls used to sustain weight being graduated from 12 inches in a one-story structure to 32 inches in a 12-story building. Practically the same scale applies to residences, hotels, office and apartment buildings. Where the walls are over 100 feet in length without cross walls of equal hight, an increase of 4 inches is required in their thickness. The provision with regard to fire escapes is made to apply to existing buildings as well as to those to be erected under the new ordinance.

A Model Tenement House.

A new model tenement house which embodies a number of novelties in construction and arrangement was opened the middle of April in the Borough of Brooklyn, New York, the structure having been put up as a business venture by a local builder as the result of an investigation recently made by him during a visit to England and Scotland, in the course of which he carefully studied the recent advances in homes for the poor. The house, which is six stories high, contains apartments for ninety-six small families. It is built on a lot containing 20,400 square feet. More than half of this area is unoccupied by the structure, being devoted to light and air shafts and a large courtyard. All the hallways are lighted by windows, a feature usually absent from tenement houses in this city. Protection against fire has been provided in the most thorough manner by the use of non-combustble materials throughout the structure. The stairs are of iron and slate. In the basement is a series of spray baths, which take the place of individual bathtubs, which experience has taught tenement house owners are used for many purposes besides that intended. Hot water is supplied to all apartments from a single boiler in the cellar, springs on the faucets preventing waste. Incandescent lights illuminate the halls and staircases at night. The plumbing is exposed, and floors and walls are made impervious to water. The apartments are divided into suites of three and four. For the former $2.40 a week is to be charged and for the latter $2.60, the rentals being collected weekly. The builder is confident that his enterprise will prove a profitable investment at these charges, as the advantages offered by the house will insure the apartments being constantly occupied by acceptable tenants.

New Industrial Corporations.

This year has witnessed a great increase in the number of industrial corporations in the manufacturing sections of the country. Every day gives birth to a number of new enterprises, for which the times now seem to be fairly propitious. Men of praiseworthy ambition but small means had no encouragement during the dark days of '96 and most of '97 to launch even the most captivating project, and the work of grinding out new corporations required very little of the time of State authorities. The activity now prevailing in this line presents a sharp contrast. The country is vastly benefited by the increase thus effected in small factories, although in not a few instances the foundation has been laid for rather large concerns. Expansion is again the order of the day, and it will be continued until checked by some blight greater than the little shadow of a war with Spain.

New Masonry Arch Centers.

In the construction of masonry arches and vaults it is not always possible to erect ordinary centers, as when the arch is near the center of the water. A writer in the *Annales des Ponts et Chaussies* illustrates two kinds of false work which have special features and have been used at Bordeaux. The contractors supported the masonry upon a cylindrial platform or lagging of iron plates about 3¼ inches thick, suspended from three pairs of lattice arched girders above and clear of the arch of masonry. At equal distances on panel points 2-inch suspending rods ran down through the vault lagging and cross beams, supported from screw nuts on plates across the tops of girders. These rods passed through holes cut in the arch stones, normal to the intrados. The centers were easily removed by unscrewing the nuts from the lower ends of the suspending rods. Another method is described in which the intrados of the arch of masonry is carried by iron lattice girders below the soffit in the usual position of centers. Six girders were framed together, though each acted as a simple truss instead of an arch. The two trusses at each end were connected and incased by iron plates, and formed two four-sided or rectangular water tight caissons of cylindrical curve to suit the arch. These floated the whole false work into position at high water. They, in fact, formed two caissons of the depth of the arch, and of its whole width, segmental in form, corresponding to the arch, connected together, and having between them the other trusses. The straight iron girders were inserted in the masonry piers, and the trusses were landed upon them and made stable by admitting water through the valves. The vault was then built, and the centers were afterward struck by slacking the screw in the usual way. The first described method is really an overhead center, by means of which the real masonry arch is suspended, while the second plan is really a floating center below the arch to be constructed, the ends being floated into position, and the centering and lagging constructed between them. Both plans are ingenious methods of forming centers for bridge vaults which are too close to the water surface to admit of the usual plan being used.

Curing a Sweating Barn Roof.

The inquiry of the correspondent in Baraboo, Wis., relative to the sweating of a barn roof, which was presented in this journal for February, has attracted no little attention in the trade, and especially among concerns engaged in the manufacture of steel roofing, with which the building in question was covered. The matter coming to the notice of George M. Verity, secretary of the National Iron Roofing Association, he communicated with each member, requesting an expression of opinion as to the cause of the trouble mentioned by the correspondent and the remedy therefor. The information thus obtained was incorporated in a circular letter recently sent out to roofing manufacturers, and is of such importance that we present it herewith for the benefit of our readers:

The consensus of opinion of the different manufacturers who have been sufficiently interested in this matter to answer our communication is that in all ordinary cases close sheeting and water proof paper lining will prevent condensation. Where this does not answer, a liberal use of ventilators placed at highest point in roof should remedy the trouble When the temperature in buildings where rafters are exposed is over 60 degrees ventilators should always be used. A tight ceiling 4 to 8 inches from the roof is also recommended.

In regard to barn roof of "M. B.," Baraboo, Wis., one manufacturer writes as follows: "We believe the trouble is not so much on account of the steel roofing as it is due to the method of heating and ventilating the building. As we understand the matter, 'M. B 's' arrangements for heating are such as to necessarily force the excess of heat directly to the top of the building, instead of heating up the lower part where it should, and under these conditions he practically depends on heating the lower part by forcing or compressing the hot air in the upper part to such an extent that it must force a certain amount of heat below. In our judgment, this is not the proper way to heat the building. We think if 'M. B.' would put several foul air pipes in his building, starting them very near the ground floor and letting them pass up and out of the roof far enough above it to create a suction, that this would cause a circulation of the hot air in the lower part of the building, and would also take out the cold and foul air from the bottom; and as a circulation of hot air would be caused in the lower part of the building, it would necessarily mean that 'M. B.' would not have to overheat the upper part of the building to such a great extent in order to get sufficient heat below."

Another manufacturer says: "We do not believe the roof mentioned by 'M. B.' sweats at all, but that the trouble comes from the excessive heat he is compelled to keep up, and that the sweating comes from the animals. It ascends and vaporizes underneath the sheeting to a sufficient extent to cause a drip."

In dwelling houses a dead air space is created by closed ceilings, which do not permit the warm air to reach the metal roof, and, therefore, no condensation or sweating takes place. Trouble of this kind is only experienced in tight buildings that are not ceiled where the temperature inside is very much greater than it is on the outside. In ordinary barns, where the cold air can circulate freely, there should be no sweating. The closer the building and the higher the temperature the more liability there is of trouble from condensation, particularly where the under side of the metal roof is unprotected. This trouble can be remedied as outlined above. Paper lining, close sheeting and ventilators are good investments, whether the owner of building fears trouble of this kind or not.

HOUSE AT LARCHMONT MANOR, N. Y.

A DESIGN which will appeal to many of our readers, especially those who prefer such an arrangement as will give rooms on both sides of the main hall, is the basis of the supplemental plate which accompanies this issue of the paper. The location of the house is on a commanding site facing nearly north, giving to the dining room the morning sun and to the library, which may also be used as a sitting room, if desired, the afternoon sun. The nearly square outlines of the ground plan afford opportunity for economical construction, as well as a compact arragement of rooms with a minimum of waste space. On the first floor there are four apartments, with the main stairs so located as to land in the center of the house on the second floor, the space at the rear being utilized for a commodious pantry, giving ready communication between kitchen and dining room. It will be seen that there are in this pantry all the necessary fixtures in the way of dresser, shelving, sink, &c., and in the dining room are two corner china closets. The second floor has four nearly square sleeping rooms, the bathroom and water closet being at the rear of the house. It will also be noted that the water closet is separated from the bathroom, although in close proximity to it.

The foundations are constructed of local stone laid up in cement mortar, properly pointed with black cement outside above grade. The entire frame is of hemlock, the sills being 4 x 8 inches; first and second floor joist, 2 x 10 inches; attic joist, 2 x 8 inches, placed 16 inches on centers; rafters, 2 x 6 inches, placed 20 inches on centers; collar beams, 2 x 8 inches; all plates, 2 x 4 inches, doubled and properly spiked together; studding, 2 x 4 inches, placed 16 inches on centers and doubled at all angles, door and window openings. The frame is covered with ⅞ x 10 inch surfaced hemlock boards on which is placed Empire sheeting paper, this in turn being covered at the first story with white pine beveled siding and the second story, tower and gables with cedar shingles laid 4½ and 5 inches to the weather. The roof is covered with dimension cypress shingles.

The entire trim of the house is cypress, all the first floor except the kitchen having fancy cabinet caps, as shown in the details. The floors are of 3-inch North Carolina pine. The main staircase is of oak paneled from strings to base. The bathroom is wainscoted 3½ feet high with narrow North Carolina pine, tongued and grooved, ceiling boards with cap molding intersecting back moldings around doors and windows. The bathroom has solid copper tub made by R. M. Wilson Mfg. Company of Rome, N. Y. All the plumbing is of the exposed type with nickel plated trimmings, the fixtures being of Fred. Adee's manufacture. The cellar, which has a cement floor, contains laundry and a Richardson & Morgan Cyclone steam boiler, which heats the entire house by direct radiation.

The house here illustrated was erected last summer at Larchmont Manor, N. Y., for Thomas C. Taylor, in accordance with plans prepared by Stanley A. Dennis, archi-

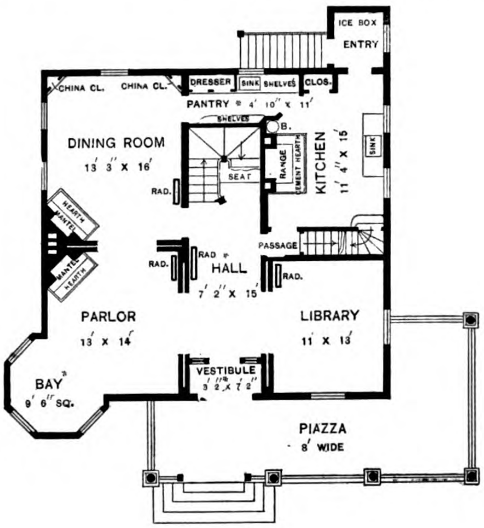
Front Elevation.—Scale, ⅛ Inch to the Foot.

House at Larchmont Manor, N. Y.—Stanley A. Dennis, Architect.

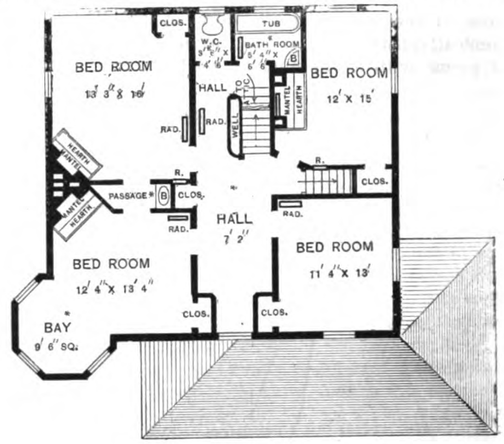
tect, American Tract Society Building, 150 Nassau street, New York City. The builder was J. A. Pharo of Bayonne, N. J.

Kitchen of the Modern House.

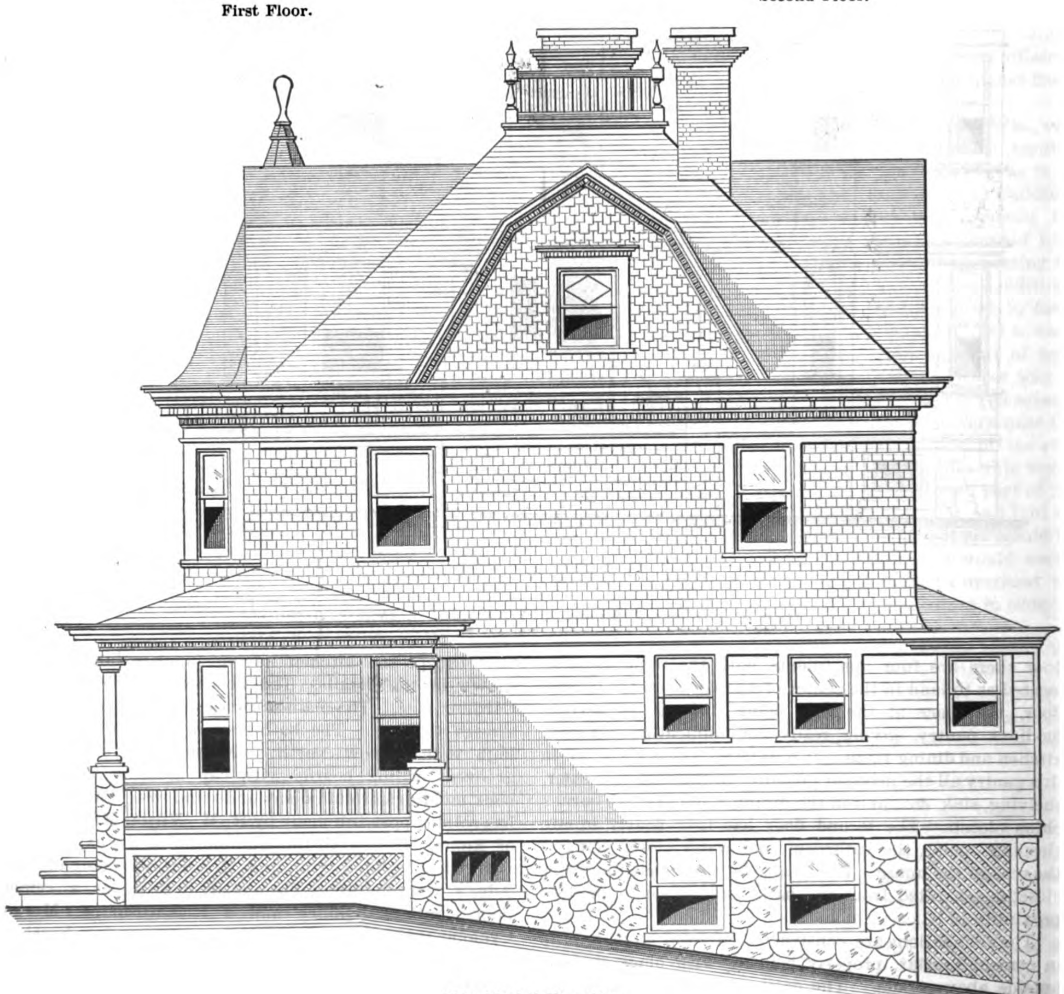
To plan and arrange a kitchen of the modern house is a question of great importance, and one that is very often overlooked in the studying of plans, says F. R. Comstock in a recent number of the *Connecticut Industrial Journal.* From some of the plans we have seen it would seem that the main idea was to get as many corners and angles into the kitchen as possible, so that the remaining rooms of the house were square, and whereas, oftentimes, the blame is laid to the architect, the majority of times it is the fault of the client, for within one week three sketch plans were sent into an architect's office recently, showing an irregular outline of the plan of a kitchen, perhaps taking off one corner to make the proper size pantry or to



First Floor.



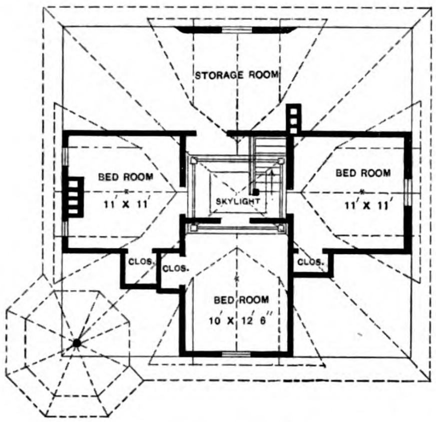
Second Floor.



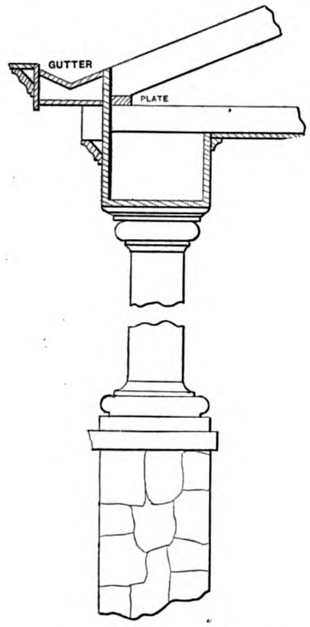
Side (Right) Elevation.

House at Larchmont Manor, N. Y.—Floor Plans.—Scale, 1/16 Inch to the Foot.—Side Elevation.—Scale, 1/8 Inch to the Foot.

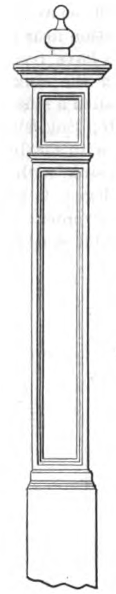
form a jog to receive the laundry tubs. Oftentimes it is hard to impress a client with the objections to these points, for they will remind you that "it's only the so as to avoid a large amount of space to clean, saying a kitchen 8 x 10 feet is plenty large enough, with the laundry tubs in the cellar. And the next house, of about the



Attic with Outline of Roof Plan.—Scale, 1/16 Inch to the Foot.

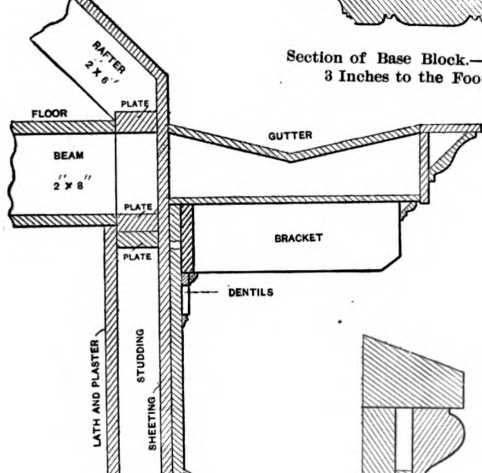


Detail of Piazza Finish.—Scale, ½ Inch to the Foot.

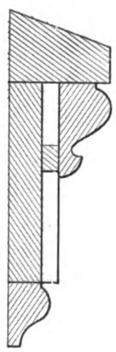


Newel Post.—Scale, ¾ Inch to the Foot.

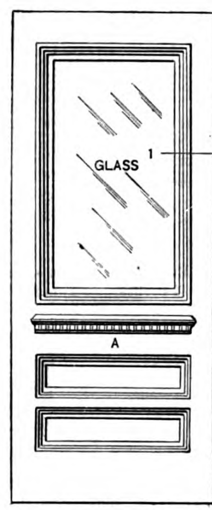
Section of Base Block.—Scale, 3 Inches to the Foot.



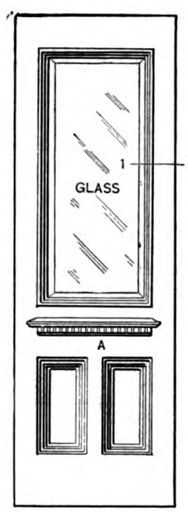
Detail of the Main Cornice.—Scale, ¾ Inch to the Foot.



Detail of Doors at A.—Scale, 6 Inches to the Foot.

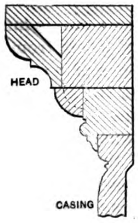


Vestibule Door.

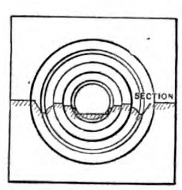


Half of Outside Doors.

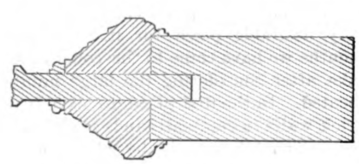
Scale, ⅜ Inch to the Foot.



Detail of Door and Window Finish. —Scale, 3 Inches to the Foot.



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



Detail of Doors on Line 1 2.—Scale, 3 Inches to the Foot.

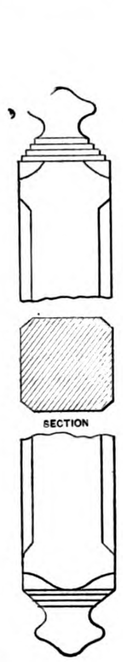
Miscellaneous Constructive Details of House at Larchmont Manor, N. Y.

kitchen." Yet at the same time it is a monument of poor planning and arrangement.

The proper size for a kitchen seems to be a question. One housekeeper will want a kitchen as small as possible, same size and cost, will want a kitchen 14 x 16 feet, with a large amount of space. One housekeeper wants a sink and the laundry tubs in the kitchen, and the next one will want the sink in a sink room, the tubs in the laundry, with nothing in the kitchen but the range. At the same time you will find the window sills close to the floor, so the hired help can look out of the windows. And perhaps the next house will want the window sills 4 feet from the floor and the next neighbor will want them 8 feet up from the floor, so as to get plenty of wall space, with light and ventilation near the ceiling.

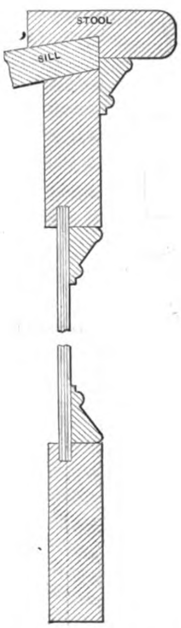
We have recently noticed a house where, instead of placing the sink in the kitchen, it was located in what was called a sink room, which is a very common practice with the English. This room has tile wainscoting 5 feet high, with marble slab under the sink, and a solid porcelain sink, with porcelain back, supported on nickel plated brass legs. It was so located as to be near to the pantries and convenient to the kitchen, and yet avoided having all the usual washing of kettles, &c., in the kitchen. The room was also ventilated with a galvanized iron pipe for registers, extended above the roof.

It has been customary in designing houses to arrange for the laundry in the cellar, which has seemed to be a very desirable place for it. But within the last few months we have come to the conclusion that this is a mistake, after considering the large number of laundries so located. In the first place, to leave it with bare stone and brick walls to catch all kinds of dirt and dust is an objection. True, they could be whitewashed or covered with water paint, but there is still the opportunity for dust and dirt and the walls would have a rough appearance. Yet on the other hand if you furred the walls and lined them with wood, if there is any dampness it congeals on the back of the wood work, brings out odors and brick mold and in time the wood is so decayed that it has to be renewed. We have gone so far as to stop the lining 6 inches from floor to get a circulation of air under same, but it amounts to about the same thing. Would it not be much better to reduce the size of the kitchen and put the laundry on the main floor? If the laundry is properly arranged in reference to the kitchen the stove could be located near the side of the room, so the kitchen stove could be used for laundry purposes if desired. This is of special advantage on ironing day and would avoid having the heat in the laundry.

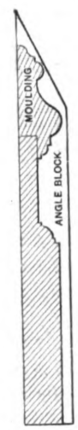


Detail of Landing Newel. —Scale, ¾ Inch to the Foot.

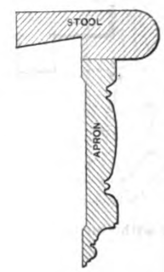
Stair Baluster.— Scale, 1½ Inches to the Foot.



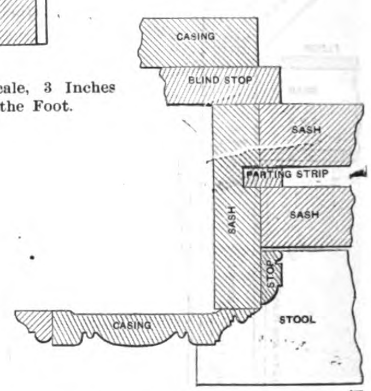
Vertical Section through Panel Backs. — Scale, 3 Inches to the Foot.



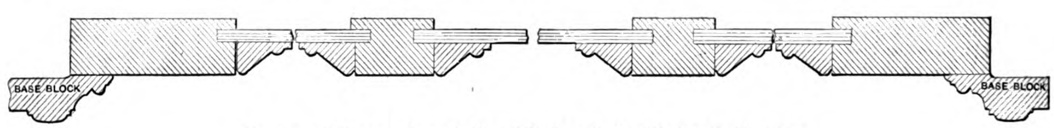
Base.—Scale, 3 Inches to the Foot.



Detail of Window Stool and Apron.—Scale, 3 Inches to the Foot.



Detail of Window Finish on First Floor.— Scale, 3 Inches to the Foot.



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

Miscellaneous Constructive Details of House at Larchmont Manor, N. Y.

Builders' Ladders.

A legal case has just been decided in England which is likely to serve as a warning to builders in that country not to leave ladders in places where people may tumble over them, or if they do so under orders from their employer, to be careful to have evidence of a definite order. The defendants in this case, doing work for some weeks at a house, left their ladders in the first instance on the grass plot of the garden, but the owner objected, and told them to place them alongside of the walk (apparently against the fence). The plaintiff, a baker supplying the family, tripped against the ladders, received severe injuries from a fall, and brought an action against the builders for damages. The builders' defense was that the owner had ordered them to put the ladders there, and he was responsible. The jury took the view that they only had "permission" to put them there, and found for the plaintiff, a judgment which was confirmed by the Court of Appeal. The moral seems to be that if builders are "ordered" to put their ladders anywhere where they may cause an accident, they should make sure first on whom the law is likely to fix the responsibility.

HOUSE OF MR. THOMAS C. TAYLOR, AT LARCHMONT MANOR, NEW YORK.

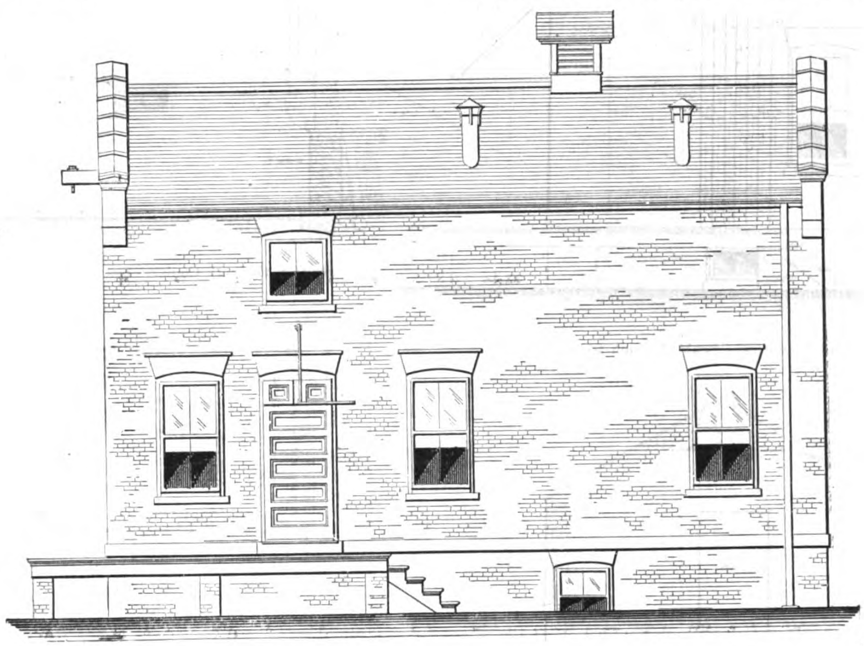
STANLEY A. DENNIS, ARCHITECT.

SUPPLEMENT CARPENTRY AND BUILDING, MAY, 1898.

Construction of a Cold Storage Building.

THE cold storage of meats is a necessity in most cities of the country, and designs of buildings or compartments especially intended for this purpose, with proper ventilation and insulation, are frequently required at the hands of architects or builders. In the smaller cities and towns, as well as in villages where meat coolers are employed, comparatively few architects or builders fully understand the needs of a cold storage structure. The article presented herewith is therefore likely to prove of great value in the way of suggestions offered to such as are called upon to erect buildings of this kind, as with slight modifications the structure may be readily adapted to meet larger or smaller requirements, according to circumstances. It will be seen that the details are full and the particulars so complete as to render the construction readily understood by the practical man. The air spaces, as regards number, can be constructed to suit varying conditions and regulated to some extent by the amount of money to be expended.

on centers, mill dressed on all sides. The ceiling joists and rafters are 2 x 8 inches placed 16 inches on centers, the porch floor joists 2 x 8 inches, porch beams 6 x 6 inches, plates 2 x 12 inches, doubled; the ridge 2 x 12 inches, furring for ice floor 3 x 8 inches tapered to 3 x 1 inch, partition studs 2 x 4 inches placed 16 inches on centers, sills and plates 2 x 4 inches, studs 2 x 4 inches placed 6 inches on centers, wall strips ½ x 4 inches, laid dry, 2 feet on centers; wall furring 1¼ x 2 inches placed 16 inches on centers, furring between flooring and boarding ⅞ x 2 inches, also 16 inches on centers; stair strings 2 x 12 inches placed 2 feet on centers, door and window lintels 6 x 8 inches and second-story bond timbers 2 x 8 inches All openings in the brick work have wooden lintels not less than 6 inches deep and cut 8 inches longer than the box opening. Anchors ¼ x 2 inches and 3 feet long are used for every eighth joist of the first and second floors, and anchors of the same size of iron to reach the third joist and rafter every 6 feet on the ends of the build-



Front Elevation.—Scale, ⅛ Inch to the Foot.

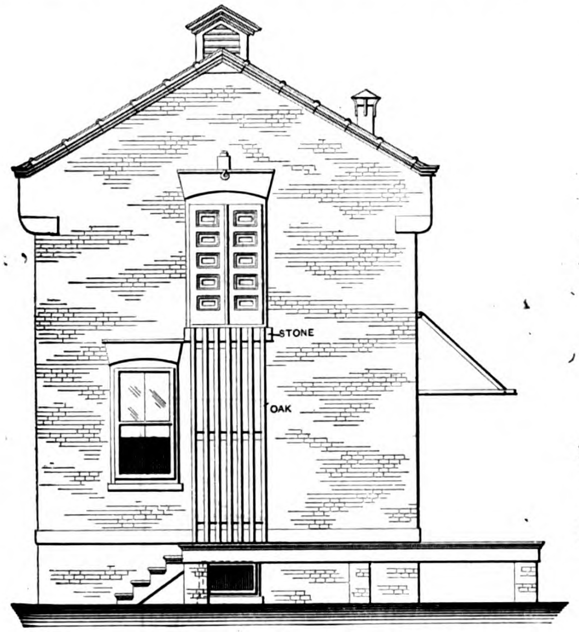
Construction of a Cold Storage Building.

The building here illustrated is of brick, 19 x 36 feet in size, with meat cutting room, and was erected about a year ago at Fort Sheridan, Ill., in accordance with drawings prepared by H. D. Grodavent, under direction of Capt. D. E. McCarthy, Assistant Quartermaster, United States Army, the arrangement and methods being the same as those followed by the Armour and other large packing companies. From the specifications we learn that all walls below grade are of rubble limestone, while the footings are of concrete composed of 4 parts broken stone or gravel, 2 parts clean sharp sand and 1 part cement. A damp proof course of slate and Portland cement extends across all walls. The mortar used for the stone walls is of 1 part cement and 2 parts sharp coarse sand. The walls above grade are of hard burned brick, laid up in mortar composed of 2 parts clean sharp sand and 1 part fresh burned lime. The walls are well bonded throughout, every fifth course being of full headers, while all joints are flushed up solid with mortar.

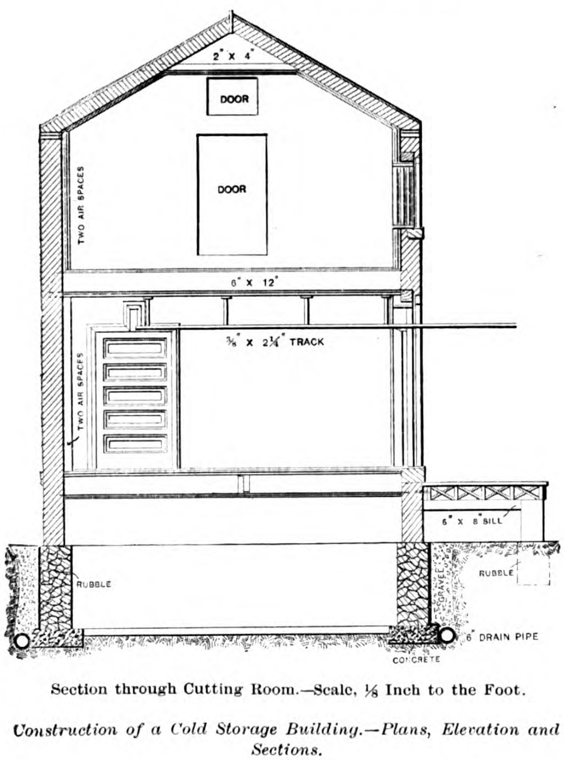
The timber of the framing is of thoroughly seasoned white pine, the first-floor joists being 2 x 12 inches placed 16 inches on centers and bridged with 1 x 4 inch cross bridging. A 6 x 12 inch timber extends under the partitions. The second-floor joists are 2 x 12 inches placed 18 inches

ing. The roof is covered with 1⅛-inch matched fencing, over which is laid black Neponset water proof sheeting and 10 x 14 x ¼ inch thick Vermont green slate laid 5½ inches to the weather. The courses at the eaves are doubled, and the ridge ventilator is also covered with slate. The under floors are of matched fencing, this being covered with sheeting on which in the first story is laid long leaf yellow pine strips ⅞ x 3¼ inches in size, these being blind nailed and planed smooth. The second-story top floor is of selected fencing matched, while the porch floors are of white pine. The door frames are of white pine, the outside frames being secured in place at the bottom with ½ x 3 inch iron dowels, there being two to each jamb. Around all door and window frames oakum is calked in order to make them air tight.

An important feature of a structure of this kind is the insulation. In the present instance air spaces are employed in combination with black Neponset water proof sheeting paper, manufactured by F. W. Bird & Son of East Walpole, Mass. This is used between different courses, the joints of the paper being lapped 1½ inches. In the details presented herewith the position of the sheeting paper is indicated by a + mark. Over the ice chamber is placed sawdust to a depth of 18 inches. The inside lining under the floors and partitions is matched fencing, the second layer of the under floor of the first story being laid diagonally. The inside finish of the first story is ⅞ x 4 inches beaded spruce ceiling, put on vertically and extending to the top of the joists in the ice cooler. All angles of the first-story rooms are finished with ⅞-inch



End Elevation.—Scale, ⅛ Inch to the Foot.

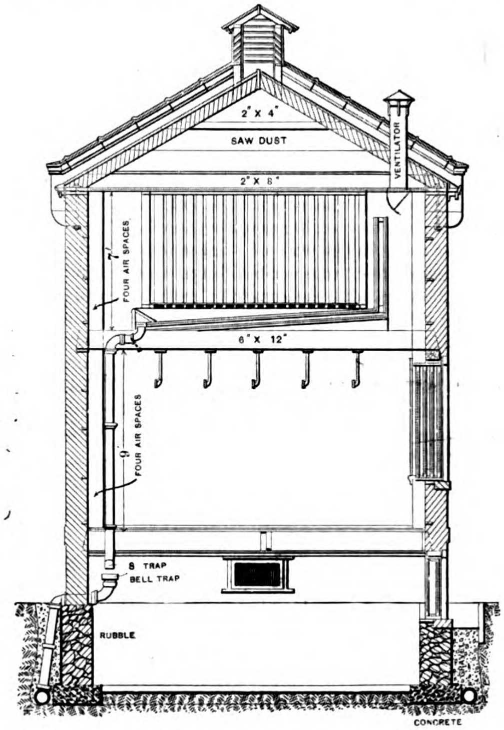


Section through Cutting Room.—Scale, ⅛ Inch to the Foot.

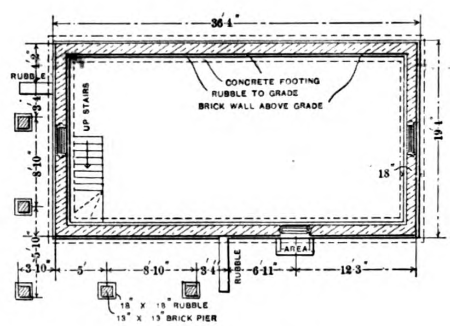
Construction of a Cold Storage Building.—Plans, Elevation and Sections.

spruce, quarter round. The doors are made air tight at the edges by means of canvas and hair felt.

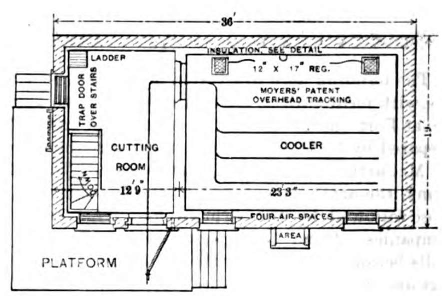
The plumbing of the building includes a 4-inch standard cast iron coal tar coated waste pipe, extending from the ice chamber to discharge through an S-trap into a 12 x 12 inch hydrant cesspool, and thence into a drain pipe outside of the building, as shown on the plan. The joints



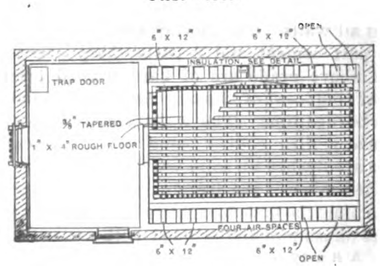
Section through Cooler.—Scale, ⅛ Inch to the Foot.



Cellar and Foundation.



First Floor.

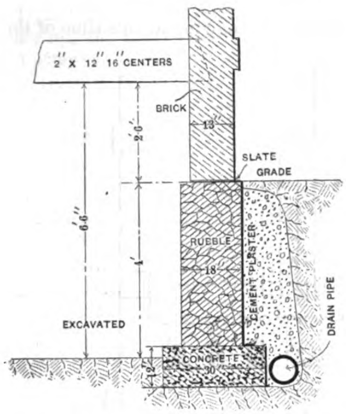


Second Floor.
Scale, 1/16 Inch to the Foot.

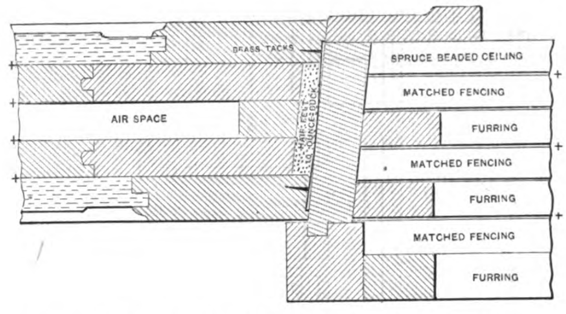
of the cast iron pipe are calked only with oakum. The ice chamber floor is covered with galvanized iron with lock seams turned up 6 inches on all sides and soldered water tight. Two ventilators of No. 24 galvanized iron are provided, the pipe extending 6 inches above the roof on the upper side and over flashed with 3 pound sheet lead with roof plate 18 inches square. The ice skid is made of 2 inch oak, 30 inches wide and 14 feet long, for the purpose of conveying the ice from the door to the ice chamber. The under side of this skid is covered with No. 26 galvanized iron 36 inches wide, turned up on the sides and made water tight.

All outside wood and metal work is painted with pure white lead and raw linseed oil, while all inside work on the first floor, including ceiling and joists in the cooling room, have one coat of white shellac and one coat of Rosenberg's Elastica No. 1.

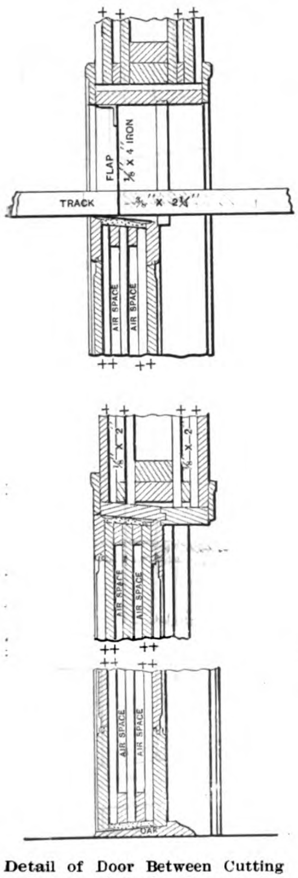
The building is provided with an overhead track of 3/8 x 2 1/2 inch rolled iron suspended from the ceiling by patent cast iron hangers made by J. W. Moyers of Philadelphia,



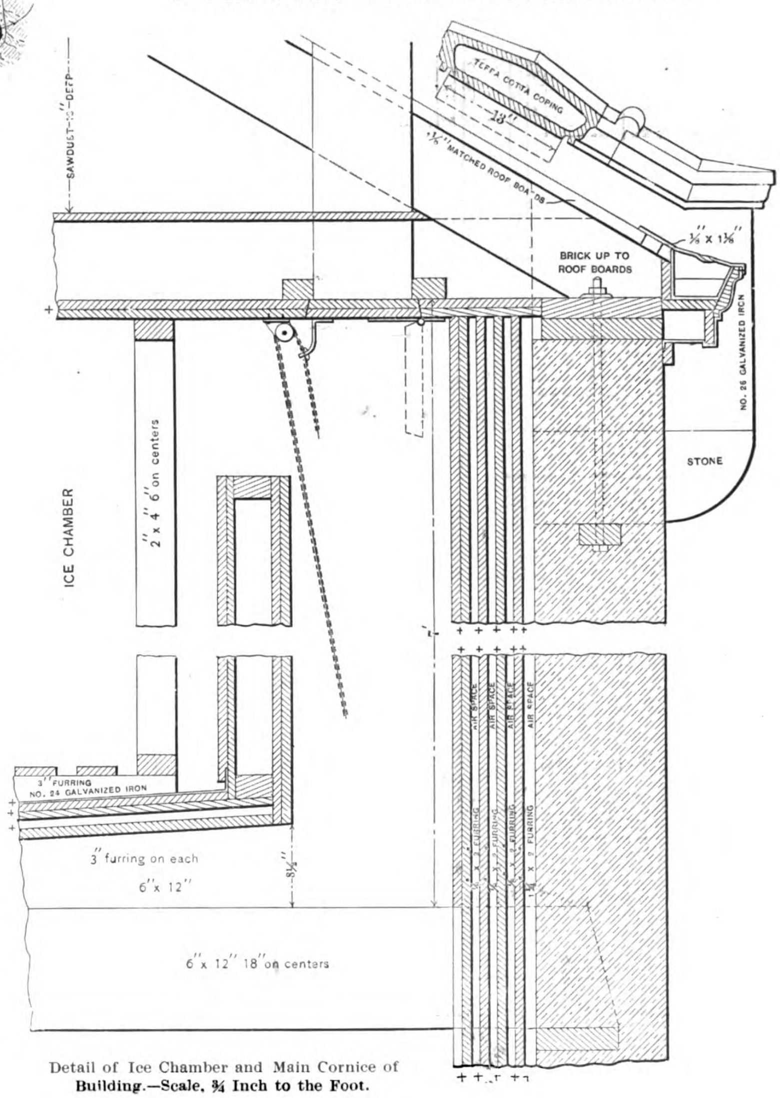
Section of Cellar Wall.—Scale, 1/4 Inch to the Foot.



Horizontal Section of Outside Door.—Scale, 3 Inches to the Foot.



Detail of Door Between Cutting Room and Cooler, Door to Ice Chamber Having Two Air Spaces.—Scale, 3/4 Inch to the Foot.

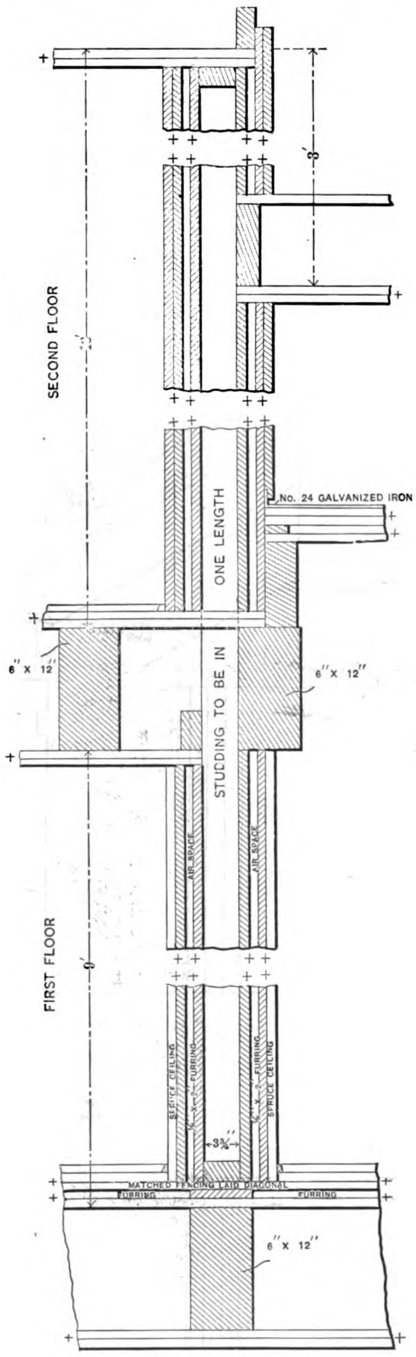


Detail of Ice Chamber and Main Cornice of Building.—Scale, 3/4 Inch to the Foot.

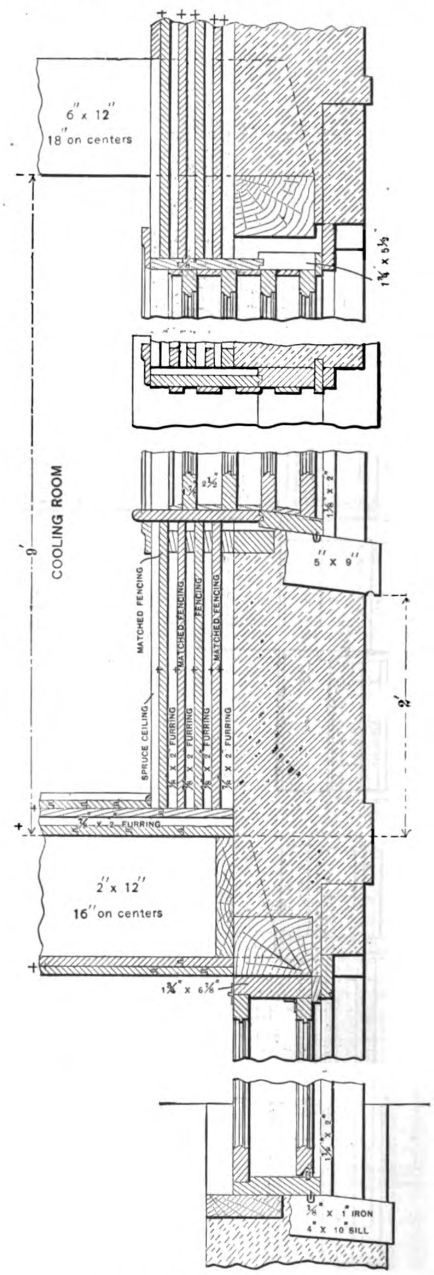
The + Marks Indicate Paper Between.

Miscellaneous Constructive Details of a Cold Storage Building.

Pa. There are also 20 of Moyers' patent beef trolleys, there being ten each for hind and fore quarters. The overhead track and hangers are painted one coat of black japan varnish. The building was constructed under con-



Vertical Section through Partition Wall.



Detail of Windows in Cooler Room.

The + Marks Indicate Paper Between.

Miscellaneous Constructive Details of a Cold Storage Building.—Scale, ¾ Inch to the Foot.

tract, the proposals ranging from $2087 to $3748, the work being let to the lowest bidders.

THE Mechanics' Lien law which has recently been passed by the General Assembly of the State of Maryland amends the old law so far as it relates to the city of Baltimore, in that it covers work which may be done, but does not cover materials which may be furnished.

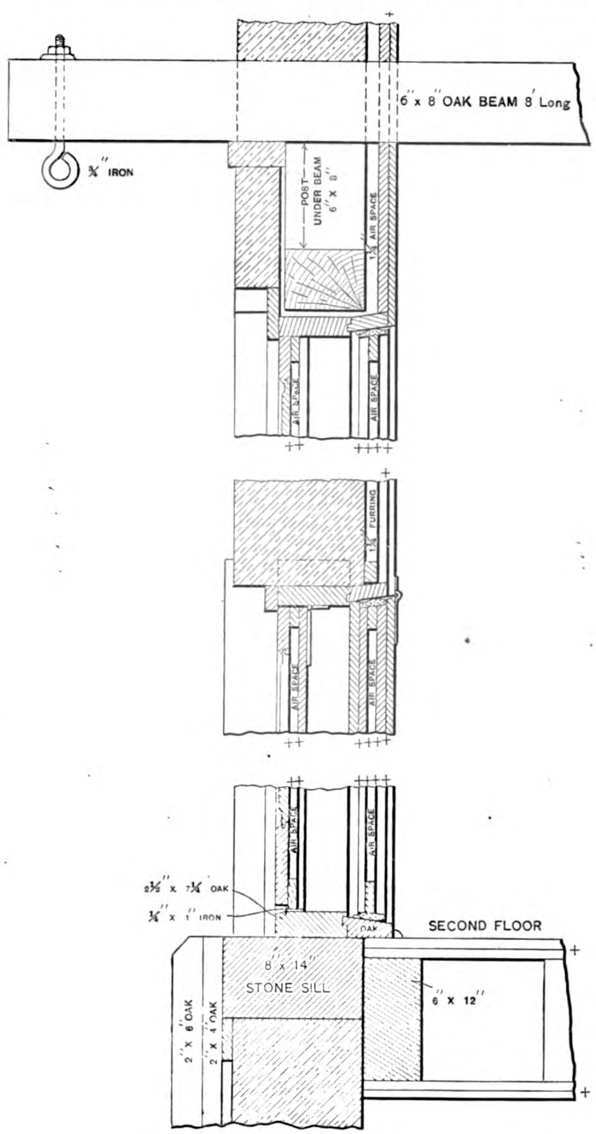
Painting and Repairing Roofs.

A roofer, particularly in the smaller cities, is compelled to do a great variety of work if he has any desire to amass, I was going to say wealth, but I guess I'll change it to a mess of pork and potatoes, says a writer in a recent issue of *The Metal Worker*. This variety of trades is apt to keep him moving at this time of the year, but the way times have been he has had plenty, yes, a surfeit, of leisure to think and to scheme how he can make a few dollars. I guess I should have said a dollar and saved the few. This writing business is rather perplexing, for how can a man save the few when it is hard to make the solitary dollar ?

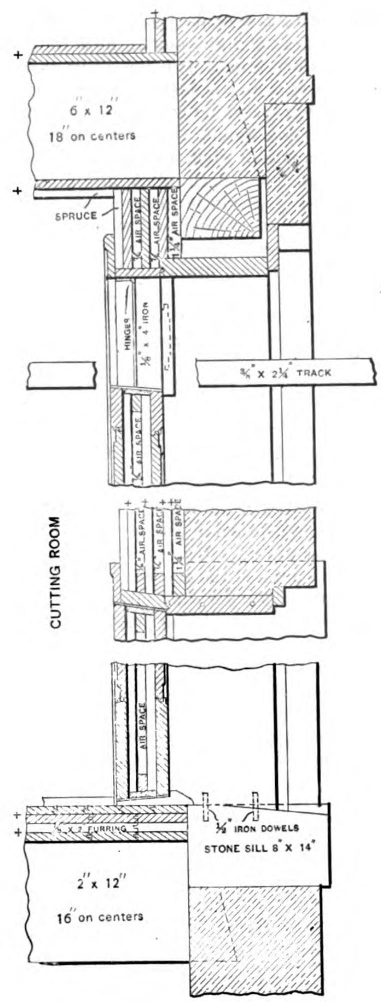
To resume: He must let no chance pass, and to that end he should inform all who have roofs and gutters that there is no better time of the year than the fall to have them repaired and painted. A long winter, with its snows, sleets and freezes and thaws, is apt to try a roof and is sure to find the weak spots in one that needs attention. To repair a roof it takes a man with experience to look in the right place and it requires some skill to do the tinning on old rusty tin before the soldering is begun.

It is quite the fashion now to use acid for repair soldering, and many men make no attempt to remove the acid after the soldering is done. The surplus acid should be wiped off with a wet sponge and a bucket of water should be handy for the purpose. I can get pay for this trouble with my old customers, to whom I have explained all about it. After the roof is attended to the gutter should be more carefully gone over, particularly if it is a box or valley gutter that might leak within the house wall. If it is a hanging gutter it should be lined up and have new straps where needed, and the spout head and leader should be looked over.

Then comes the painting, and the material used is of considerable importance. The best is none too good. Don't buy cottonseed or fish oil, but get good boiled linseed oil. Then don't take zinc white, but get good white lead; there are several qualities and the best is what you want. For coloring yellow ocher is less objectionable than some of the other materials and colors. Mix these properly, and if the weather is good very little drier will be needed, and what is used should be a good japan drier in preference to turpentine. I was first given this information by an old and highly esteemed painter, but did not profit by it; but a short time after another man of varied experience in outdoor painting gave me the same receipt, which I have tested to the satisfaction of my customers. Now is the time to paint roofs, for there is no hot sun to blister the paint before it dries, and if it is done now it will stand longer than if done when it is freezing weather or when the weather and sun are hot.



Detail of Outside Door in Second Story.



Detail of Outside Door of Cutting Room.

The + Marks Indicate Paper Between.

Miscellaneous Constructive Details of Cold Storage Building.—Scale, ¾ Inch to the Foot.

THE retirement of storm doors in favor of screen doors, now in progress, is as sure a testimony of the advent of spring as the shooting leaf and the springing grass. It is now pretty safe to say that the winter has gone the way of all snow.

ECONOMY OF BRICK STRUCTURES AS COMPARED WITH THOSE OF WOOD.

IN a paper read before the National Brick Manufacturers' Association at their convention in Pittsburgh, Pa., A. N. Buell, in speaking of brick construction, said:

In treating this subject I will divide it into two distinct parts: First, the comparative cost of wood and brick structures, and second, how to best demonstrate the fact to American home builders.

Brick building, as well as brick making, has within the last decade undergone radical changes, and when I speak of brick houses in comparison with those of wood I do not mean those square brick boxes, relics of a bygone age, with a few loopholes, mistermed doors and windows, no angles but right angles, no arches, panels, belts or other ornamentation. It is not to be wondered at that such structures were considered monotonous. Built with solid walls of brick which would absorb their own weight of water, is it any wonder they were damp?

On the contrary, when the brick house is mentioned herein, I mean the modern brick house, with liberal but not necessarily expensive ornamentation, whose walls contain an air space (either by the use of hollow brick or otherwise) and provided with a damp course of asphalt or other moisture proof material at the ground level.

And again, when I mention a wooden house I do not mean the cheapest kind, but a first-class one with good studding, sheeting outside and in and good finish throughout.

Some inspired individual has proclaimed that "comparisons are odious," but be that as it may, I feel constrained to stick to my text and furnish two or three examples which will suffice to illustrate the point at issue.

Brick and Frame Double Houses.

In the suburbs of the city of Hartford, Conn., during the last year, a gentleman proposed to erect a number of double houses to rent. Being unhampered by fire limits, his architects advised the erection of wooden buildings in preference to brick, but this client, not so easily influenced, insisted on plans being prepared for both brick and wood structures, the finish to be as far as possible identical. When the plans were submitted to the contractors, the following estimates were furnished by the lowest responsible bidder: Price for wooden house, $4300. Price for brick house, $4720. Then the owner, being somewhat of a mathematician, added these figures:

First cost of wooden house	$4,300
Estimated cost of repairs for eight years (two paintings)	450
Extra insurance, eight years	42
Extra rent for brick house, eight years	96
Total cost of wooden house, eight years	$4,888
First cost of brick house	$4,720
Estimated repairs, painting, &c., eight years	125
Total cost of brick house, eight years	$4,845
Difference in cost in favor of brick	$43

It is perhaps unnecessary to add that the brick houses were erected. Not to deal too much with any particular locality, my next example will be from Buffalo, N. Y. A brick residence was recently erected in that city, at a cost of $16,000, for which tenders were submitted for both brick and wood structures. The lowest bid for the wooden house was a trifle over $15,000—hardly $1000 difference, which was more than made up in five years by saving in heat, insurance and repairs.

Again, in Wilkes-Barre, Pa., two dwelling houses, two tories high, 21 x 41 feet, were erected from the same plan, one of brick, the other of wood, and pretty little structures they were, too, with plenty of appropriate ornamentation. The first cost of the brick house was $2300, the wooden house $2150.

In studying the question many builders and others have attempted to discover some item of expense in a brick house which might be curtailed. Such efforts, however, where ordinary competition is allowed in bidding for the work, generally prove a detriment to the building, either in appearance or actual stability.

Let us pause a moment and investigate a trifle. As labor is generally the largest item in all building operations, we will consider that first.

In discussing this same question a year ago at Buffalo, some of the distinguished members of this association gave their opinions on the labor problem. One gentleman, if I quote him correctly, stated: "A worker in wood must necessarily be something of a mechanic, but a man to be a bricklayer only needs $2 or $3 worth of tools and practice in laying brick perfectly square." Now, I am inclined to believe that this view of the matter is hardly fair to the artisan.

While we often find bricklayers who lack in both mental and mechanical ability, and while some may be a trifle too fond of the flowing bowl, I think you will agree with me that the mass of bricklayers are industrious, intelligent and skillful workmen. Although the average wages of bricklayers the country over is 45 cents per hour, their pay is none too large when we consider the time which they must lose by wet and cold weather, not to mention time lost in waiting for other artisans.

Cost of Materials.

As regards economy in the cost of material for the brick house, you brickmakers are best able to judge for yourselves. In some sections I believe you might reduce the price of brick with beneficial results to yourselves, while in many places the price is already too low to produce a good quality of brick. From the standpoint of material, therefore, we can save little, if anything. But let us not be discouraged in our search for economy. I think we can do some missionary work with our architects, who are, as a rule, inclined too much toward expensive ornamentation, such as cut stone, &c., the cost of which is liable to equal that of all other mason work. Not that I would have them leave out the ornamentation entirely, but I would have it limited to such embellishment as can be executed in brick at small extra expense.

There is a custom among the builders which, for economy's sake at least, should be corrected—namely, the letting of contracts for brick buildings to carpenters. Whether it is a lack of push or energy on the part of the mason, or a lack of capital, I am not prepared to say, but the fact remains that this practice among builders is not what it should be, and we cannot expect to produce a brick structure at a minimum cost until such a time as the contracts for brick houses are let directly to brick builders.

Another source of economy in a brick structure is the saving of heat. By personal experience I have discovered that a brick house once heated can be kept at the proper degree of temperature by the use of 10 per cent. less fuel than is required for the same purpose in a wooden house, it matters not what the method may be—stoves, hot air, water or steam. *Vice versa*, the brick house is cooler in summer for the same reason, the brick walls, properly built, being a non-conductor of heat, cold or moisture.

WHEN Sir Christopher Wren was building the town hall of Windsor, a fidgety member of the corporation—so the story goes—insisted that the roof required further support and desired the architect to add more pillars. In vain did Sir Christopher assure him that the danger was imaginary; he knew better. The alarm spread and the great architect was worried into adding the desired columns. Years passed and in later times, when architect and patrons were dead, cleaning operations in the roof revealed the fact that the supposed additional supports did not touch the roof by 2 inches, though this was not perceptible to the gazers below. By this ingenious expedient did Wren pacify his critics, while vindicating his own architectural skill to future generations.

IT is said that the great end pressure on some of the timbers in the Rocky Mountain mines compresses or upsets the wood until pine and hemlock become as hard as ebony or lignum vitæ.

FIRST PRINCIPLES OF WOOD TURNING.

BY JAMES F. HOBART.

ALTHOUGH a carpenter or a builder is not expected to have a special knowledge of wood turning, or to be an expert in that line, still there are times when the ability to do a small job of wood turning is not to be despised. Many a time it has been of great benefit to the writer in his business, and more than once the "know how" in that direction has been a source of considerable profit as well as convenience. When the average carpenter must tackle a job of wood turning he gets the stock into the lathe after a fashion and commences operations as illustrated in Fig. 1. Invariably the chisel is held in this manner, and the also invariable result is to scrape off a little of the wood and a good deal of the cutting edge of the chisel. Only a pattern maker is privileged to hold a chisel in this manner, and he is allowed to do thus because time and experience have demonstrated that the pattern maker seldom learns to do any different.

When a piece of wood is to be made as true as possible it is then allowable to hold the chisel so as to scrape the surface, thus removing the high spots and gradually reducing the whole surface to a plane or cylindrical surface. But for commercial work, where hundreds of pieces are to be duplicates of each other and turned out with regard to the least expenditure of time, then the scraping wood turner is simply "not in it."

The correct way of holding a gouge or chisel is plainly shown by Fig. 2. While in this position the tool will cut —not merely scrape. If one will take up a gouge and apply it to the surface of a piece of wood in the lathe—after the wood has been rounded up—it will be seen that the cutting edge, marked *a* in Fig. 2, does not touch the work, and even if the rest were removed the tool would not even mark the wood in the least. In the engraving the contact between wood and tool will be found to be at *b*, and the heel of the bevel, *c*, is raised above the surface of the work. The result of this location of the tool is that if the rest were entirely removed the tool would not dig into the work. But the principal object of thus placing the tool is to prevent its digging into the work when cutting. By drawing the tool back just far enough the point *a* touches the wood and begins to cut its way into it. As soon as a certain depth is reached the tool bears far enough toward *b* to prevent its entering further into the wood, and as long as the tool is held firmly, so that it cannot move back endwise, it will, if moved along sidewise, cut off a chip of even thickness from one end of the work to the other, even if lifted entirely free of the rest —something hard to do and not allow the tool to move the least bit endwise.

As seen in Fig. 2, the part from which the chip is taken serves as a guide for the tool to run upon, and in roughing down a square stick, as in the engraving, the rest is necessary to hold the tool up when it is passing from corner to corner. But, as stated above, the rest is not by any means necessary when cutting straight along a round piece of work.

Before the would-be turner commences operations he must see that his tools are in proper condition for work. A man can do a job of wood turning with an old file the tang of which has been ground sharp, but that man could never make a living trying to turn stair balusters at 1½ cents each if he used such a tool. Likewise, a man can make an ox sled with no other tools than a narrow axe, but the sled would look so like thunder that he would have to back the oxen up to the sled. They never would face it and step over the homely tongue!

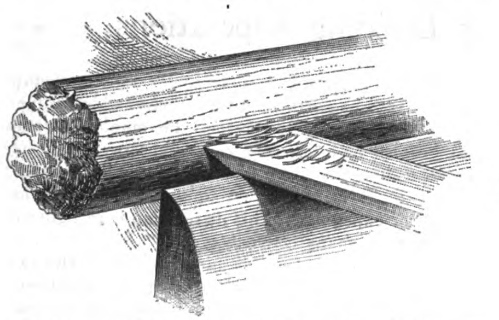


Fig. 1.—Manner of Holding Chisel by Inexperienced Workman.

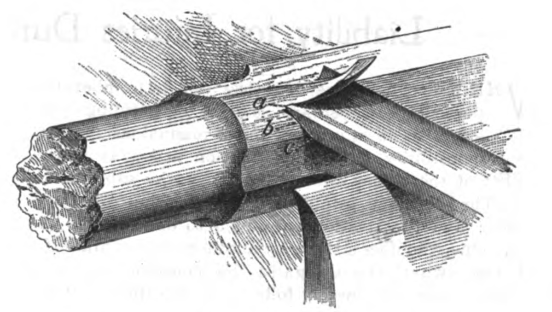
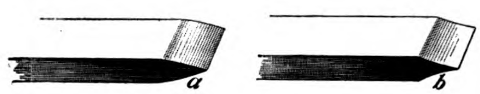


Fig. 2.—Correct Manner of Holding Gouge or Chisel.



Figs. 3 and 4.—Showing Two Ways of Grinding a Turning Chisel.

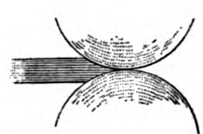


Fig. 5.—Grinding for a Short Bevel.

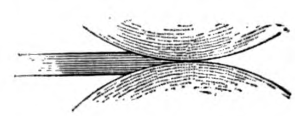


Fig. 6.—Showing Method of Grinding a Long Bevel.

First Principles of Wood Turning.

Figs. 3 and 4 show two ways of grinding a turning chisel. The manner depicted in Fig. 3 is all too common among workmen who should know better. It is possible to do a good job of turning with a tool ground like this, but it is impossible to do a quick job, and to do the work both quickly and well with the tool in such condition is an impossibility even for the best turner, and a good workman at the lathe would not tolerate such a tool for a single instant, much less try to work with it.

The correct form is shown by Fig. 4 Perhaps the bevel may be a little longer than shown in the engraving, but the main point is to have the face of each bevel concave instead of convex. This means that a rather small wheel or stone should be used for grinding and the tool held thereto in one position, so that the face of the bevel will show the curve of the stone. That is the test for good grinding in all cases, for if the curve of the bevel is the same as that of the circumference of the grindstone or emery wheel, and there is only one face, the entire bevel extending in an unbroken sweep from heel to toe, then the tool is well ground.

The length of the bevel should be fixed by the diameter of the wheel on which the tool is ground, as shown in Figs. 5 and 6. The small diameter of the wheel in Fig. 5 gives a short bevel by the time the cutting edge of the tool and the metal immediately back of the edge has been reduced to the proper thinness. In Fig. 6, where the grinder has a greater diameter, the bevel has to be run back further on the tool in order to obtain the desired thinness at the place mentioned.

On a very large stone, 4 or 5 feet in diameter, the face of the bevel would be so near a straight line that it would be hard to tell it therefrom. The reason why better and quicker work can be done with a concave bevel than with a convex one is because with the latter more end motion can be allowed to the tool without changing appreciably the depth of cut.

The hollow ground tool works better for the same reason that the long screw driver enables a man to exert more power with it than he can with a short one—viz., the same movement of the hand will not throw a long screw driver out of the slot which would make it impossible to use a short one. A concave bevel admits of more irregular holding than does a rounding one. The best size of wheel for grinding tools is probably from 9 to 11 inches in diameter. If smaller the bevel is too stunt. If larger the tool is too thin just back of the cutting edge, and the slightest catch of the tool might break a piece out. Not only should chisels be ground concave, but gouges, parting and cutting off tools should be sharpened in the same manner.

The proper placing of the work in the lathe is a matter which affects the work to a limited extent, but as long as the wood is held firmly and does not bind so as to reduce the speed the work may go on all right. The position of the rest does affect the work and should not be placed too low. It may be located as high as suits the stature of the workman.

A good way in which to adjust the hight and position of the rest is to put the chisel on the work in the position most comfortable for the hight of the operator, then bring the rest up against the tool while held firmly in that position. The rest should be placed as close to the work as possible and the hight, as stated, to suit the operator. The rest should in all cases stand parallel with the surface to be turned, as it makes the work easier when so placed.

One more general point may be presented to the beginner and then he is ready to learn from practical experience. This point is never to let the corner of a tool touch the work until the tool has been placed firmly against the rest. Otherwise you will "catch crabs."

Liability for Injuries During Building Operations.

WHILE accidents are doubtless less in number, the percentage is perhaps as great in building operations as in any other line of manual occupation. The responsibility fixed, the question arises as to the liability of the owner, the contractor or the subcontractor. The contract establishes the relation of these parties; and the relation has much to do with the liability. One who does a thing by another, does it himself; and the owner who delegates the construction of a building to one who merely follows his directions cannot escape responsibility for accidents resulting through the negligence of such employee. The same is true of the contractor for the entire work who parcels out the labor of construction of the various branches of the work to subordinates.

Although, in a general sense, every person who enters into a contract may be called a "contractor," yet that word, for want of a better one, has come to be used with special reference to a person who, in the pursuit of an independent business, undertakes to do specific jobs of work for other persons without submitting himself to their control in respect to all the petty details of the work. It is not altogether easy to give an accurate definition of the word "contractor" as it is used in the law books; but the above approximates to accuracy. The true test by which to determine whether one who renders service to another does so as a contractor or not is to ascertain whether he renders the service in the course of an independent occupation, representing the will of his employer only as to the result of his work, and not as to the means by which it is accomplished.

To draw the distinction between independent contractors and servants is often difficult, and the rules which courts have undertaken to lay down on this subject are not always simple of application. A rule as often quoted as any was stated by the Supreme Court of Virginia thus: An independent contractor is one who renders service in the course of an occupation, and represents the will of his employer only as to the result of his work and not as to the means whereby it is accomplished, and is usually paid by the job. If the person employed to do the work carries on an independent employment, and acts in pursuance with a contract with his employer by which he is engaged to do the work on certain specified terms, in a particular manner and for a stipulated price, then the employer is not liable. The relation between master and servant does not subsist between the parties, but only that of contractor and contractee. The power of directing and controlling the work is parted with by the employer, and given to the contractor. But on the other hand, if the work is done under a general employment, and is to be performed for a reasonable compensation, or for a stipulated price, the employer remains liable, because he retains the right and power of directing and controlling the time and manner of executing the work, or of refraining from doing it if he deems it necessary or expedient. This distinction is recognized by the decisions of many courts.

In every case the decisive question is, had the owner, or the contractor, or the subcontractor, the right to control in a given particular, from the doing, or the leaving undone, of that from which the injury resulted? On this question the contract under which the work has been done must speak conclusively in every case, reference being had, of course, to the surrounding circumstances. This being so, the mere fact that the agent who did the injury carried a separate and independent employment will not absolve the principal from liability. If such were the rule, a party would be exempt from responsibility even for the negligent acts of his domestic servants—such as his cook, coachman or gardener. A person who works for wages, whose labor is directed and controlled by the employer, either in person or by an intermediate agent, is a servant, and the master must answer for the wrongs done by him in the course of his employment. But a person who for a stated sum engages to perform a stated piece of work in which he is skilled, the proprietor of the work leaving him to his own methods, is an independent contractor. The proprietor does not stand in the relation of superior to him, and is not answerable for the wrongs done by him or his servants in the prosecution of the work, unless special circumstances exist making him so.

One who has an independent business or contract, and generally serves only in the capacity of a contractor, may abandon that character for a time and become a mere servant or agent, and this too without doing work of a different nature from that for which he contracted. If he submits himself to the direction of his employer as to the details of the work, fulfilling his wishes not merely as to the result but also as to all the means by which that result is to be attained, the contractor becomes a servant in respect to that work and the employer liable. He may also be contractor as to part and servant as to part. Which he is, however, is a question of mingled law and fact, scarcely possible to decide by any fixed rule which will accurately govern those cases where the one occupation borders closely upon the other. The actual builder may be a contractor by agreement in writing, but a mere servant by a course of interference on the part of the owner of the building.

WHAT BUILDERS ARE DOING.

THE building trades throughout the larger cities of the country are feeling in varying degree the effect of the uncertainty resulting from the prospect of war with Spain. No specific area seems to be seriously affected, but certain cities appear to feel a tendency on the part of investors to wait before proceeding with building operations till general business conditions have thrown off the feverishness, which is much more manifest in some cities than in others.

It is an interesting fact that the Government has made no change in work being done on public buildings throughout the country. The limit of cost in the buildings still incomplete, but authorized before December 1, 1889, is $18,157,531, and the limit of cost with the 59 authorized since that date is $18,439,154. For the last eight years, it appears, Congress has authorized public building construction at the rate of about $2,250,000 a year. The largest building under way is the Chicago Post Office and Court House, the total cost of which was limited to $4,000,000, and of this sum $3,000,000 was appropriated last year, and the committee has asked for $1,000,000 this year.

Baltimore, Md.

In spite of the encouragement in the conditions existing in the building interests of Baltimore during the past few months the amount of work actually ready to be begun is comparatively small. Secretary E. D. Miller of the Builders' Exchange states that at present there is no large work in the market, and that the prospects for building in 1898 seem to be diminishing. The Baltimore builders attribute the reduced prospect of activity in the building trades to the general business depression caused by the prospect of war with Spain. Work in the suburbs seems to be less affected than that in the business portion of the city proper.

On April 12 the Master Painters' Association, at a meeting held in the rooms of the Builders' Exchange, took final action looking to the establishment of a trade school in which the painting trade will be taught. This is intended to be the first step in the direction of founding a trade school similar to that maintained by the Master Builders' Exchange at Philadelphia, in which instruction in all branches of the building trade is given. Instruction will be given at the outset by members of the Master Painters' Association and a small tuition fee will be charged to help cover the expense of brushes, colors, &c.

Boston, Mass.

There seems to be a general feeling of uncertainty among builders in Boston as to the amount of work likely to come into the market this season. While the records of the building department are not flattering, showing a materially lesser number of permits granted for February and March of this year as compared with the same period of last year or two years ago, the result is not more than could be expected when one contemplates the national excitement of the last six weeks or more. As it is, March showed a very heavy increase in permits for both brick and wooden structures over the preceding two months. The number of permits issued at the present time is not necessarily indicative of all work to be undertaken in the immediate future, as permits for large structures are often not taken out until the owners are ready to break ground. In addition to the activity promised in the vicinity of the new Southern Union Station, and nearly the average number of new residences, apartment houses, &c., on India street, adjoining the Chamber of Commerce, some fine mercantile blocks are now being completed and the foundation for another large one is being laid. The Boston Wharf Company will soon start on two large mercantile buildings to be constructed on Summer and Congress streets, each to be eight stories in hight. Jordan, Marsh & Co. will put up a large building of the same hight for their own use at the corner of Chauncy and Bedford streets.

Following annual custom, the Mason Builders' Association and Bricklayers' Unions 3 and 27 have arranged a schedule of wages and hours of labor for 1898.

For several years the bricklayers have striven for 45 cents an hour. This rate has been objected to by the mason builders, and 42 cents an hour has been paid for ten years. This year, when employers and journeymen met, the demand for 3 cents additional an hour was discussed. No agreement was reached. The question was left to an arbitrator, the Rev. Edward Connolly. The decision is that after May 1 the journeymen bricklayers of Boston shall receive 45 cents an hour. The rate will be paid by the mason builders.

The Mason Builders' Association and the Bricklayers' Unions, acting through their joint committee of arbitration, have petitioned the Mayor of Boston for the appointment of practical men as inspectors of mason work under the Building Department of the city.

Chicago, Ill.

The progress of building in Chicago was interrupted during April by a strike of carpenters. About the middle of March the workmen demanded :

1. Wages to be $3.25 per day. 2. A half holiday every Saturday. 3. Pay day every Saturday not later than 12 m. 4. Men who may be discharged for cause to be paid forthwith.

The employers returned the following schedule as the only one to which they would agree :

1. Wages $3 per day. 2. Double pay for all work overtime. 3. Pay day every other Tuesday. 4. Men who may be discharged for cause to be paid forthwith. 5. The bosses to employ none but union carpenters and the carpenters to work for none but union bosses. 6. When any evasion of the schedule is reported to the president of either union he shall report it to the president of the other union, and if they both agree that there is an evasion the work shall stop.

This schedule was rejected by the workmen, and as a result about 3000 men struck. Frank Conrick, secretary of the Builders and Traders' Exchange, states that the strike was settled by a majority of the employers agreeing to accept the workmen's demands.

Judge Ball, in agreement with a like opinion given some time ago by Judge Tuley, has recently decided that the School Board cannot be restrained by the courts from inserting in contracts for building construction a clause providing for the employment of none but union workmen. He holds that such a contract is not illegal, but is a matter within the discretion of the board.

Permits were issued by the Building Department for structures whose total cost will be $3,258,209. This is an increase over the preceding month of nearly a million dollars, and is looked upon by architects as indicating a more favorable state of the market than has existed for some time. The increase in building permits is due to the passage of the new ordinance limiting the hight of buildings, which caused a number of intending builders to hurry their plans through and procure the permit under the old ordinance before the new went into effect. No doubt exists, however, that all the permits issued will be made use of before the end of six months, when they expire.

Since the last issue of the paper went to press the rooms occupied by the Building Trades Club have been destroyed by fire, the building, 118 Monroe street, in which they were located, being burned to the ground. Secretary Edward E. Scribner writes that the club lost about $10,000 in furnishings, &c., partly covered by insurance. Immediately after the fire a number of the clubs in the city extended the use of their rooms pending the selection of new quarters. The offer of the Hamilton Club was accepted. A new home will be established as soon as possible.

Cincinnati, Ohio.

Building interests generally in Cincinnati are reported as being quiet, the present outlook being less favorable than it was earlier in the year.

At a regular meeting of the Builders' Exchange held April 7 the initiation fee was reduced from $25 to $5. It was voted to withdraw from the Ohio State Board of Commerce as a needless expense, and the question of a State Association of Builders was considered.

Cleveland, Ohio.

Inspector of Buildings Thomas of Cleveland is reported as having said that all records as to the erection of new buildings would probably be broken this year if applications for permits continued at the rate they were now coming in at. He believed that at least $7,000,000 would be put into new buildings during 1898. Among the buildings planned are an unusual number of apartment houses and stores. Work upon the great ten-story sky scraper to be put up by ex Mayor Rose at the corner of Prospect and Erie streets has already been begun. The old buildings on the site are being torn down and work of erecting the building will go forward rapidly. It will be one of the largest and most handsome blocks in the city.

Following the example of Chicago, the Building Trades Council will again make an effort to get a clause inserted in school building contracts requiring that union labor only be employed.

Detroit, Mich.

Building interests in Detroit are dull, with few indications of improvement in the near future. There is little chance of labor disturbance during the coming season, all the trades except the carpenters being apparently satisfied with the present wage scale. Bricklayers are paid $3 for eight hours, plasterers $3.20 for eight hours, painters 25 cents per hour, stone cutters $3 for eight hours, stone masons $2.50 for eight hours, wood workers 25 cents per hour, plumbers and steam fitters about $2.50 for nine hours, structural iron workers $2.25 for nine hours, electricians $2.50 per day, tin and sheet iron workers $2.25 for nine hours, and laborers from 15 to 18 cents per hour.

Kansas City, Mo.

The Building Trades Council has determined to enter openly into politics, and has prepared the following list of questions to be sent to every nominee for office at future elections :

1. Are you in favor of having all contracts for public work contain a clause that union labor only shall be employed where same may be had ?

2. Are you in favor of appointing as inspectors of mechanical work requiring said positions on public buildings only practical journeymen mechanics who are members of unions of their respective crafts ?

3. Are you in favor of confining all bids on contracts for work or material to Kansas City citizens, providing they can comply with conditons thereof ?

4. Are you in favor of excluding from appointment to public positions all who are not *bona fide* citizens of Kansas City ?

5. Are you in favor of an amendment to the city charter providing that all public work let out by contract by the city of Kansas City shall be done by union labor, and no person shall be allowed to work more than eight hours per day, and that contractors shall so conduct their work as to prevent strikes among their own employees or among the employees of other contractors ?

6. Are you willing to use all efforts to establish rules for the enforcement of all questions you have answered in the affirmative ?

The Builders and Traders' Exchange has been reorganized, and the following officers for 1898 elected : J. Hollinger, president ; A. W. Love, vice-president ; John Lonsdale, secretary and treasurer ; J. G. Durner, assistant secretary and treasurer.

Milwaukee, Wis.

On April 7 the Mayor of Milwaukee approved a bill passed by the City Council making the eight-hour day compulsory on all work done under the control of the Board of Public Works.

The amount of new building in sight at the present time is relatively small, though contractors are hoping that the upward tendency of general business will extend to building by the time the season is fairly under way.

The present rate of union wages in Milwaukee is indicated by the agreement between the Brewers' Association and the Building Trades Council that only union workmen shall be employed on work undertaken by the former, which provides for the following scale :

	Per hour.
Housesmiths and bridge men	$0.25
Sheet metal workers and coppersmiths	.25
Sheet metal workers' and coppersmiths' helpers	.20
Marble setters and helpers	...
Electrical workers	.31¼
Stone cutters	.43¾
Plasterers	.37½
Carpenters	.25
Painters, kalsominers, shellackers and hardwood finishers	.25
Millwrights	.27½
	Per day.
Steam, hot water, sprinkler, ice machine and thermostatic fitters	$2.75
Tile layers	3.50
Plumbers	3.00

Nashville, Tenn.

On April 7 the Builders' Exchange of Nashville held their annual meeting and election of officers. The report of the Auditing Committee was very satisfactory, showing that the exchange is in good condition financially. It is the intention to admit into the exchange, on certain conditions, material men, those who furnish material to contractors but do not do contracting themselves. The total membership of the exchange now numbers 58. The election of officers resulted as follows : President, H. W. Buttorff, re-elected ; first vice-president, Nick Breen ; second vice-president, G. N. Ingram ; secretary, P. Morrison, re-elected ; treasurer, T. L. Herbert, re-elected. Board of Directors : E. T. Murray, Joe P. Fulcher, Russ B. McCollum, S. J. Lesueur and M. Bardon. The meeting was one of the most enthusiastic the exchange has ever held, and the new year starts off with everything in a very satisfactory condition.

New York City.

Secretary Edmund A. Vaughan of the Mechanics and Traders' Exchange of New York City says that at the close of the building season last fall the prospects for a busy year in 1898 were very bright. As the season has advanced, however, these prospects have failed to materialize, there being considerably less work in sight than is usual at this time of year, and that offered being on a smaller scale than has prevailed for several years past. Mr. Vaughan reports that builders generally do not look upon the coming season as being very promising, and that they attribute the present condition of affairs to the war scare and to the fact that capital seems to be finding more profitable investment just now in channels outside of building.

The extent to which building operations are being conducted may be gathered, in some degree at least, from the permits which are being filed with the Bureau of Buildings. Up to the middle of April 981 buildings had been projected, estimated to cost $22,402,190, as against 1261 buildings, valued at $33,068,515, for the corresponding period of 1897. There have been a few minor labor disturbances in the building and allied industries, but none of them have assumed really serious proportions.

The Society of Architectural Iron Work Manufacturers held their annual meeting on the evening of April 12, this being followed by a banquet at Delmonico's. The new officers elected at the meeting were : President, John Cooper ; vice-president, James J. Healey ; treasurer, B. E. J. Eils ; secretary, William J. Fryer. The trustees elected include William H. McCord, William H. Van Tassel, Charles H. A. Cuny, J. M. Cornell, E. F. Milliken, Charles E. Cheney and Thomas Dimond. The delegate to the Board of Examiners in the Department of Buildings is William J. Fryer.

The seventeenth annual election of officers and trustees of the Building Material Exchange was held April 11 at 65 Liberty street, and resulted in the election of the regular ticket as appended : President, Clifford L. Miller; vice president, Walter H. Redman ; treasurer, Hiram Snyder. Trustees : Clifford L. Miller, Walter H. Redman, Hiram Snyder, B. P. Brown, Robert B. Waldo, Charles D. King, Uriah F. Washburn, William F. Fisher, Frank Sears, Robert Main, Frederick C. Boynton, C. Clayton Bourne and James E. Clonin.

Omaha, Neb.

Secretary Wedge of the Builders and Traders' Exchange of Omaha reports that work is being pushed rapidly forward on the Trans-Mississippi Exposition buildings, and that the whole building interests of the city are more active than they have been lately, as a result. Complications which appeared to be threatening arose between the Building Trades Council and the Building Department of the exposition over the employment of electricians on certain work claimed by the carpenters. The matter was finally adjusted by permitting the carpenters to do the work.

Pittsburgh, Pa.

Capt. J. A. A. Brown, superintendent of the Bureau of Building Inspection of Pittsburgh, issued his report on March 29, covering the fiscal period from February 1, 1897, to January 31, 1898. The report shows the number of new buildings erected during the time named to be 1616, at an estimated cost of $6,466,-432. The additions were 557, of an estimated cost of $308,477 ; repairs, alterations, &c., 687, costing $315,960. As compared with 1896 there was an increase of 204 new buildings, at an increase in cost of $1,178,750 ; increase in additions, 60, and increase in cost, $1850. The total increase in cost over 1896 was $1,183,300. Total operations of the bureau during the year, 2840, representing a cost of $7,090,869. Superintendent Brown says in the report : "Building operations during the past year have been exceedingly active—more so than in any year since 1892, that year being what may be termed a building boom. I take it that the great activity in building circles in 1897 was not in the nature of a boom, but was the forerunner of the great wave of prosperity which then started and is now sweeping over the entire country. It may not be out of place at this time to predict much greater activity and more prosperous times in building lines during the year 1898."

In Allegheny, Inspector John C. Heckert reports that the total number of buildings erected and altered during the year was 568. Of that number 371 were new buildings and 197 were old buildings remodeled. In the material used 362 buildings were frame, 190 brick, 5 each of iron clad and iron cement, and 1 of stone. In cost the total improvements run to $989,803.

The suit of Contractor G. P. Kretz against the Pittsburgh Builders' Exchange and many others, which was filed five years ago, has been revived and a statement filed asking damages to the amount of $50,000 for alleged conspiracy, boycott or black listing because he hired union labor on contracts.

The suit was brought against the Master Builders' Association and officers, Master Stone Contractors' Association, Master Tinners' Association, Master Painters' Association, Master Roofers' Association, Master Bricklayers' Association, Master Plumbers' Association, Brick Manufacturers' Exchange, Builders' Supply Association, Architects T. D. Evans, James T. Stein, Allegheny County Retail Lumber Dealers' Association, Master Plasterers' Association, McCandless & Kinser, Retzler & Weir, Murry Bros., Stolzenbach & Pfiel, McDonald & Bros., Christ. Wehman, Frank N. Leigh and Amandus Krah.

Portland, Maine.

J. C. Ward, inspector of buildings, says in regard to the building outlook for the present season : "During the month of March this year we had more applications for permits to erect new buildings than in any previous year. This looks like a very prosperous and busy season ; in fact, the indications are that considerably more building will be done this year than last year. The war talk apparently is not having much effect on the disposition to build. All those who I know made plans to build before the trouble with Spain came up have, with one exception, signified their intention to adhere to their original plans, regardless of the possibility of war.

Providence, R. I.

The builders of Providence are anticipating a busy season in 1898. A number of important contracts have already been let, and it is said that the number still in the hands of the architects warrants the conclusion that the total of the year will compare favorably with the excellent record of the past few years.

The Builders and Traders' Exchange recently issued its handbook for 1898, containing a list of members, a list of architects in the State of Rhode Island and other matters of general interest to contractors and property owners. The book is neatly bound in boards and is profusely illustrated.

Rochester, N. Y.

It is reported that the prospect for building in Rochester is better than it has been, at this season, for several years past. The work already projected indicates that the amount to be done this season will exceed that of either 1897 or 1896. The majority of the improvements already begun are in the residence parts of the city and in the suburbs. The new almshouse hospital, bids for which are already being considered, is one of the largest jobs in sight at present. Its erection this season, however, depends on the decision of the supervisors.

There is little prospect of any agitation this spring for higher wages or shorter hours in the building trades. Wages remain about the same as last year.

Louisville, Ky.

Building Inspector R. J. Tilford has completed a report of the work in his office during the month of March. The report shows that 198 building permits were issued, 58 buildings were condemned, 125 buildings were inspected and 16 cellar doors were condemned. The total value of the building permits issued during March was $171,326, against $154,450 during the same month last year, an increase of $16,876.

St. Louis, Mo.

The subcontractors of St. Louis are organizing an association for the purpose of creating more intimate social relations among the members of the building trades. At a recent meeting held in the rooms of the Builders' Exchange a committee consisting of Messrs. Rutter, Mockler, Lederer and Sheehan was appointed to prepare a plan of organization. Permanent quarters will be established as soon as the organization is fully perfected. There are in St. Louis about 200 subcontractors, from which the membership will be drawn.

About April 1 the union bricklayers to the number of 300 struck against a reduction of wages from 55 to 40 cents per hour. The strike is still "on" at the time of this writing, and the workmen claim that nearly all the important work in the business part of the city is suspended.

San Francisco, Cal.

The annual election of a Board of Directors of the Builders' Exchange of San Francisco was held recently at the Exchange Building, 109 New Montgomery street, between the hours of noon and 3 o'clock. The following directors were elected : S. H. Kent, Thomas Elam, E. B. Hindes, James A. Wilson, Thomas McLachtan, J. R. Tobin, D. McPhee, John Tuttle, G. V. Daniels and E. L. Snell. R. Herring and C. C. Morehouse tied for the eleventh place, and unless one or the other withdraws a special election must be held.

Building is reported as being quiet, with the prospect for the season still undefined. It is generally thought that the amount of work done this year will be about the same as that done in 1897.

Springfield, Mass.

The prospect for an active season in building circles is not very brilliant this year. The Smith College Dormitory, the proposed Science Hall and the completion of the Vernon Street School Building are the only large work in sight. There

(*Continued on page* 130.)

CORRESPONDENCE.

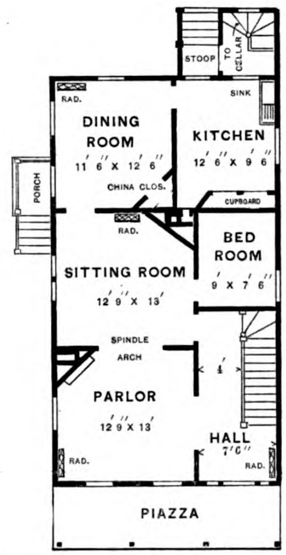
Design for a Brick Veneered Hotel.

From EXPERIENCE, *Collingwood, Canada.*—If "Harman" of Volant, Pa., will be a little more precise he may receive some good suggestions with regard to his brick hotel. How many stories high does he want the building? How about a basement, cellar, heating, billiard room and bar? There are many other things that may or may not be included in a hotel suitable for the accommodation of 50 guests.

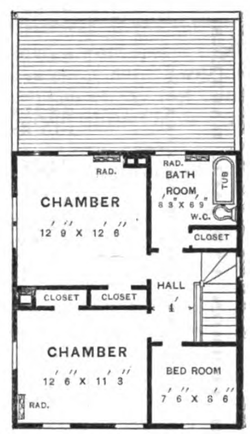
Design for a Frame Cottage.

From JOHN F. LAPE, *Rensselaer, N. Y.*—As being of possible interest to many readers of the paper, I inclose herewith sketches of a house recently built in Bath-on-Hudson, by John Millick, at a cost of $1985. The foundations are of stone and brick, while the exterior of the building is covered with hemlock boards, on which is placed building paper, and this in turn covered with bevel siding and ornamental shingles. The roof is of tin with standing seams. The cellar contains coal bins, vegetable room and hot water heating apparatus. It will be noticed from an inspection of the floor plans that on the first floor are parlor, sitting and dining rooms, these occupying the depth of the house together with kitchen and one bedroom, which opens out of the sitting room. The interior finish of the house is plain 4½-inch white pine casings, with corner blocks and 9-inch base. The site is all that can be desired, commanding a magnificent view of the Hudson River and valley.

Front Elevation.—Scale, ⅛ Inch to the Foot.



First Floor.



Second Floor.

Scale, 1/16 Inch to the Foot.

Design for a Frame Cottage.—John F. Lape, Architect, Rensselaer, N. Y.

Roof Truss Construction.

From CRITIC, *Ontario, Canada.*—The roof truss shown in Fig. 1 of the sketches accompanying the letter of "C. E. B.," in the April issue of the paper, is a fair sort of a truss, and will no doubt answer very well in the neighborhood of Baltimore, where a heavy snow fall is a luxury, but I am afraid it would stand a poor show, if it spanned 60 feet and had to sustain 2 or more feet of snow, as well as a wind pressure of 40 pounds to the foot. The truss illustrated in Fig. 2 would stand a worse show, as its construction is faulty in several respects. The method of tying the laminated arch to the chord would not be permitted for a moment by any trained architect or engineer, for the amount of spring between the first braces of 1-inch stuff and the end of the arc would be sufficient in itself to tear away from the clamps nailed to the laminations. An iron bolt running through the arc and chord near the foot of the former at right angles with the tangent of the arc and well secured would be much safer than the board clamp. The danger to be apprehended from trusses built up on the principle applied to these two examples is the sag which inevitably follows their adoption, no matter what care may be taken in the selection of material or in the workmanship. A built up web truss, dependent altogether on nails and devoid of means to adjust its defects when in position, is at best but a sorry apology for a truss for a span of 60 or more feet. The unequal pressures to which it is subject from wind and rain storms eventually loosens the nails, each storm increasing the sag and hastening its final destruction. In case of fire the inch braces become such an easy prey to the flames that only a few minutes are required to bring the whole mass down with perhaps the walls as well. The solid framed timber truss, with all its disadvantages and shortcomings, is the truss to be depended upon, and I am not sure but what it is cheaper in the end than the skeleton truss so called.

How One Subscriber Regards Carpentry and Building.

From W. L., *Dubois, Pa.*—I am a young contractor and am doing some of the best work in our city. Six years ago I commenced carpentry work, being a woodsman at that time. Five years ago I commenced taking your valuable paper, and I attribute my success and advancement to *Carpentry and Building.* Last summer I remodeled a residence in our city which is now regarded as the finest home in the place.

Styles of Hardwood Finish.

From F. M. W., *West Andover, Ohio*—I would like to have some of the correspondents of the paper show designs of the styles of casings in hardwood used at the present time. I am going to finish oak and quartered red beech, and I want to finish the oak as plain as I can.

Note.—Our correspondent may derive some valuable suggestions from the designs of finish presented in con

LENGTHS OF COMMON AND JACK RAFTERS.

HALF WIDTH OF BUILDING IN FEET AND DECIMALS OF A FOOT.

Rise per foot.	1/12	2/12	3/12	4/12	5/12	6/12	7/12	8/12	9/12	10/12	11/12	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
4.......	0.087	0.175	0.262	0.351	0.437	0.525	0.612	0.702	0.787	0.875	0.963	1.05	2.10	3.15	4.20	5.25	6.30	7.35	8.40	9.45	10.50	11.55	12.60	13.65	14.70	15.75	16.80	17.85	18.90	19.95	21.00
5.......	0.090	0.180	0.270	0.360	0.450	0.540	0.630	0.720	0.810	0.900	0.990	1.08	2.16	3.24	4.32	5.40	6.48	7.56	8.64	9.72	10.80	11.88	12.96	14.04	15.12	16.20	17.28	18.36	19.44	20.52	21.60
6.......	0.093	0.186	0.280	0.373	0.466	0.560	0.653	0.746	0.840	0.934	1.02	1.12	2.24	3.36	4.48	5.60	6.72	7.84	8.96	10.08	11.20	12.32	13.44	14.56	15.68	16.80	17.92	19.04	20.16	21.28	22.40
7.......	0.096	0.193	0.290	0.386	0.482	0.580	0.676	0.773	0.870	0.966	1.06	1.16	2.32	3.48	4.64	5.80	6.96	8.12	9.28	10.44	11.60	12.76	13.92	15.08	16.24	17.40	18.56	19.72	20.88	22.04	23.20
8.......	0.100	0.200	0.300	0.400	0.500	0.600	0.700	0.800	0.900	1.00	1.10	1.20	2.40	3.60	4.80	6.00	7.20	8.40	9.60	10.80	12.00	13.20	14.40	15.60	16.80	18.00	19.20	20.40	21.60	22.80	24.00
9.......	0.104	0.208	0.312	0.416	0.520	0.625	0.729	0.832	0.937	1.04	1.14	1.25	2.50	3.75	5.00	6.25	7.50	8.75	10.00	11.25	12.50	13.75	15.00	16.25	17.50	18.75	20.00	21.25	22.50	23.75	25.00
10.......	0.108	0.216	0.325	0.433	0.541	0.650	0.758	0.866	0.975	1.08	1.19	1.30	2.60	3.90	5.20	6.50	7.80	9.10	10.40	11.70	13.00	14.30	15.60	16.90	18.20	19.50	20.80	22.10	23.40	24.70	26.00
11.......	0.113	0.226	0.340	0.453	0.566	0.680	0.793	0.906	1.02	1.13	1.24	1.36	2.72	4.08	5.44	6.80	8.16	9.52	10.88	12.24	13.60	14.96	16.32	17.68	19.04	20.40	21.76	23.12	24.48	25.84	27.20
12.......	0.118	0.236	0.355	0.473	0.591	0.710	0.828	0.945	1.06	1.17	1.30	1.42	2.84	4.26	5.67	7.09	8.51	9.93	11.35	12.76	14.20	15.60	17.02	18.44	19.86	21.28	22.70	24.11	25.53	26.95	28.37
13.......	0.122	0.245	0.367	0.490	0.612	0.735	0.857	0.983	1.10	1.22	1.34	1.47	2.95	4.42	5.89	7.37	8.84	10.32	11.79	13.27	14.74	16.22	17.69	19.16	20.64	22.11	23.59	25.06	26.54	28.00	29.48
14.......	0.128	0.257	0.385	0.513	0.641	0.770	0.898	1.02	1.15	1.28	1.41	1.54	3.08	4.62	6.16	7.70	9.24	10.78	12.32	13.86	15.40	16.94	18.48	20.02	21.56	23.10	24.64	26.18	27.72	29.26	30.80
15.......	0.133	0.267	0.400	0.534	0.667	0.801	0.934	1.06	1.20	1.33	1.46	1.60	3.20	4.80	6.40	8.00	9.60	11.20	12.80	14.40	16.00	17.60	19.20	20.80	22.40	24.00	25.60	27.20	28.80	30.40	32.00
16.......	0.139	0.278	0.417	0.556	0.695	0.835	0.974	1.11	1.25	1.39	1.53	1.67	3.34	5.01	6.68	8.35	10.02	11.69	13.36	15.03	16.70	18.37	20.04	21.71	23.38	25.05	26.72	28.39	30.06	31.73	33.40
17.......	0.144	0.288	0.432	0.576	0.720	0.865	1.00	1.15	1.30	1.44	1.58	1.73	3.46	5.19	6.92	8.65	10.38	12.11	13.84	15.51	17.30	19.03	20.76	22.49	24.22	25.95	27.68	29.41	31.14	32.87	34.60
18.......	0.150	0.300	0.450	0.600	0.750	0.900	1.05	1.20	1.35	1.50	1.65	1.80	3.60	5.40	7.20	9.00	10.80	12.60	14.40	16.20	18.00	19.80	21.60	23.40	25.20	27.00	28.80	30.60	32.40	34.20	36.00

CORRESPONDING RECTANGULAR HIP AND VALLEY RAFTERS.

4.......	0.121	0.242	0.363	0.485	0.606	0.727	0.848	0.970	1.08	1.21	1.34	1.45	2.91	4.36	5.82	7.27	8.72	10.17	11.64	13.09	14.55	16.00	17.44	18.89	20.34	21.82	23.28	24.73	26.18	27.63	29.10
5.......	0.123	0.246	0.369	0.492	0.615	0.738	0.857	0.984	1.10	1.23	1.35	1.47	2.95	4.42	5.89	7.37	8.84	10.32	11.79	13.27	14.74	16.22	17.69	19.16	20.64	22.11	23.59	25.06	26.54	28.00	29.48
6.......	0.125	0.250	0.375	0.500	0.625	0.750	0.875	1.00	1.12	1.25	1.37	1.50	3.00	4.50	6.00	7.50	9.00	10.50	12.00	13.50	15.01	16.50	18.00	19.50	21.00	22.50	24.00	25.50	27.00	28.50	30.00
7.......	0.127	0.255	0.382	0.510	0.637	0.765	0.892	1.02	1.14	1.27	1.40	1.53	3.06	4.59	6.12	7.65	9.18	10.72	12.25	13.78	15.31	16.84	18.36	19.90	21.44	22.97	24.54	26.04	27.57	29.09	30.63
8.......	0.130	0.260	0.390	0.521	0.651	0.782	0.912	1.04	1.17	1.30	1.43	1.56	3.13	4.69	6.26	7.82	9.38	10.94	12.52	14.08	15.65	17.21	18.76	20.32	21.88	23.47	25.01	26.57	27.13	28.69	31.30
9.......	0.133	0.267	0.400	0.534	0.667	0.801	0.934	1.06	1.20	1.33	1.46	1.60	3.20	4.80	6.40	8.00	9.60	11.20	12.80	14.40	16.00	17.60	19.20	20.80	22.40	24.00	25.60	27.20	28.80	30.40	32.00
10.......	0.137	0.274	0.411	0.547	0.684	0.821	0.958	1.09	1.23	1.37	1.50	1.64	3.28	4.92	6.56	8.21	9.84	11.48	13.12	14.76	16.43	18.07	19.68	21.32	22.96	24.64	26.29	27.93	29.57	31.27	32.86
11.......	0.140	0.281	0.421	0.562	0.702	0.843	0.983	1.12	1.26	1.40	1.54	1.68	3.37	5.05	6.74	8.43	10.10	11.78	13.48	15.16	16.86	18.54	20.20	21.92	23.60	25.29	26.98	28.66	30.34	32.02	33.72
12.......	0.144	0.288	0.433	0.577	0.721	0.866	1.01	1.15	1.29	1.44	1.58	1.73	3.46	5.19	6.92	8.66	10.38	12.11	13.84	15.57	17.33	19.06	20.76	22.53	24.26	26.00	27.73	29.46	31.19	32.92	34.66
13.......	0.148	0.297	0.446	0.595	0.743	0.892	1.04	1.18	1.33	1.48	1.63	1.78	3.56	5.31	7.12	8.91	10.68	12.46	14.24	16.02	17.83	19.61	21.36	23.18	24.46	26.74	28.53	30.31	32.09	33.87	35.66
14.......	0.152	0.305	0.458	0.611	0.763	0.917	1.07	1.22	1.37	1.52	1.68	1.83	3.67	5.50	7.34	9.17	11.00	12.83	14.68	16.51	18.35	20.18	22.02	23.85	25.68	27.52	29.36	31.19	33.02	34.85	36.70
15.......	0.157	0.315	0.472	0.629	0.786	0.944	1.10	1.25	1.41	1.57	1.73	1.88	3.77	5.65	7.54	9.44	11.30	13.18	15.08	16.96	18.89	20.77	22.60	24.55	26.43	28.33	30.22	32.10	33.98	35.86	37.78
16.......	0.162	0.322	0.486	0.648	0.810	0.972	1.13	1.29	1.45	1.62	1.78	1.94	3.89	5.83	7.78	9.72	11.66	13.60	15.56	17.50	19.45	21.39	23.32	25.28	27.22	29.17	31.12	33.06	35.00	36.94	38.40
17.......	0.167	0.334	0.501	0.668	0.835	1.00	1.16	1.33	1.50	1.66	1.83	2.04	4.08	6.12	8.16	10.20	12.24	14.28	16.32	18.36	20.40	22.44	24.48	26.52	28.56	30.60	32.64	34.68	36.72	38.76	40.80
18.......	0.172	0.343	0.515	0.687	0.859	1.03	1.20	1.37	1.54	1.72	1.89	2.06	4.12	6.19	8.25	10.31	12.37	14.43	16.50	18.56	20.62	22.69	24.76	26.82	28.88	30.94	33.00	35.06	37.12	39.18	41.25

CORRESPONDING OCTAGON HIP RAFTERS.

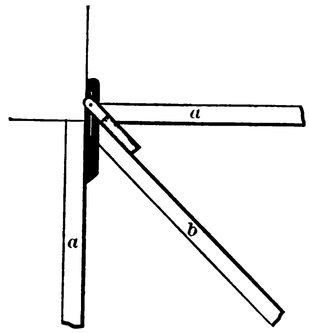
4.......	0.094	0.188	0.283	0.377	0.471	0.566	0.660	0.754	0.849	0.946	1.03	1.13	2.26	3.39	4.52	5.65	6.78	7.91	9.04	10.17	11.30	12.43	13.56	14.69	15.82	16.96	18.08	19.21	20.34	21.42	22.56
5.......	0.097	0.193	0.290	0.383	0.480	0.580	0.677	0.773	0.870	0.963	1.06	1.16	2.32	3.48	4.64	5.80	6.96	8.12	9.28	10.44	11.60	12.76	13.92	15.08	16.24	17.40	18.56	19.72	20.88	22.04	23.20
6.......	0.099	0.198	0.298	0.397	0.496	0.596	0.695	0.794	0.894	0.993	1.09	1.19	2.38	3.57	4.77	5.96	7.15	8.26	9.53	10.73	11.92	13.11	14.31	15.50	16.68	17.87	19.08	20.17	21.46	22.65	23.84
7.......	0.102	0.205	0.307	0.410	0.512	0.615	0.717	0.820	0.922	1.02	1.12	1.23	2.46	3.69	5.92	6.15	7.38	8.61	9.84	11.07	12.30	13.53	14.76	15.99	17.22	18.45	19.68	20.91	22.14	23.37	24.60
8.......	0.106	0.212	0.318	0.424	0.530	0.635	0.740	0.846	0.952	1.06	1.16	1.27	2.54	3.81	5.08	6.35	7.62	8.89	10.16	11.43	12.71	13.98	15.26	16.53	17.80	19.07	20.35	21.63	22.89	24.16	25.43
9.......	0.109	0.219	0.329	0.439	0.548	0.658	0.767	0.877	0.987	1.09	1.20	1.32	2.64	3.96	5.28	6.59	7.91	9.22	10.54	11.85	13.17	14.49	15.81	17.13	18.45	19.76	21.08	22.40	23.72	25.03	26.35
10.......	0.113	0.227	0.341	0.455	0.568	0.683	0.796	0.910	1.02	1.13	1.25	1.37	2.74	4.11	5.48	6.85	8.22	9.59	10.96	12.33	13.70	15.07	16.44	17.87	19.18	20.55	21.92	23.29	24.66	26.03	27.40
11.......	0.118	0.236	0.354	0.472	0.590	0.709	0.827	0.945	1.06	1.18	1.29	1.42	2.84	4.28	5.68	7.10	8.52	9.94	11.36	12.78	11.20	15.62	17.04	18.46	19.88	21.30	22.72	24.14	25.56	26.98	28.40
12.......	0.122	0.245	0.367	0.490	0.612	0.735	0.857	0.983	1.10	1.22	1.34	1.47	2.95	4.42	5.89	7.37	8.84	10.32	11.79	13.27	14.74	16.22	17.69	19.16	20.64	22.11	23.59	25.06	26.54	28.00	29.47
13.......	0.127	0.255	0.382	0.510	0.637	0.765	0.892	1.02	1.14	1.27	1.40	1.53	3.06	4.59	6.12	7.65	9.19	10.72	12.25	13.78	15.31	16.84	18.38	19.90	21.44	22.97	24.50	26.04	27.57	29.09	30.62
14.......	0.132	0.265	0.397	0.530	0.662	0.795	0.927	1.07	1.19	1.32	1.45	1.59	3.18	4.78	6.37	7.96	9.55	11.14	12.73	14.31	15.91	17.50	19.10	20.69	22.28	23.88	25.48	27.06	28.65	30.22	31.81
15.......	0.138	0.275	0.413	0.351	0.689	0.826	0.964	1.10	1.23	1.38	1.51	1.65	3.30	4.96	6.61	8.27	9.92	11.57	13.23	14.88	16.53	18.19	19.84	21.50	23.15	24.80	26.45	28.10	29.76	31.40	33.06
16.......	0.143	0.289	0.429	0.572	0.715	0.858	1.00	1.14	1.28	1.43	1.57	1.72	3.44	5.15	6.87	8.59	10.30	12.02	13.74	15.46	17.17	18.99	20.61	22.23	24.05	25.76	27.48	29.12	30.92	32.63	34.35
17.......	0.148	0.297	0.446	0.595	0.743	0.892	1.04	1.18	1.33	1.48	1.63	1.78	3.57	5.35	7.13	8.91	10.70	12.48	14.27	16.05	17.83	19.61	21.40	23.18	24.97	26.75	28.53	30.31	32.10	33.88	35.67
18.......	0.152	0.305	0.458	0.611	0.763	0.917	1.07	1.22	1.37	1.52	1.68	1.83	3.67	5.50	7.34	9.17	11.00	12.83	14.68	16.51	18.35	20.18	22.02	23.85	25.68	27.52	29.36	31.19	33.02	34.85	36.70

To reduce decimal to inches, multiply by 12. Example: The length of common rafter for a building 24 feet wide is found in the table to be 12.60 feet. $.60 \times 12 = 7.10$. The length of the rafter on "work line" is therefore 12 feet $7\frac{3}{16}$ inches.

nection with the house designs which have appeared in previous issues of the paper. The subject, however, is one of general interest, and we trust a number of our readers will give the request attention.

Lengths of Common and Jack Rafters.

From THOMAS W. BUNTING, *Brooklyn, N. Y.*—I submit a rough table of lengths of rafters for the use of the readers of *Carpentry and Building*. The table, it will be noticed, is arranged from 1 inch, or $\frac{1}{12}$ foot, up to 20 feet run, in order to provide for buildings of odd widths.



Obtaining Side Bevels of Rafters.—Fig. 1.—Plan View of Two Common and One Hip or Valley Rafters.

For example, suppose it is desired to get the length of the common rafter for a building 30 feet 6 inches. The length of a rafter 10 inches rise to 1 foot run for 15 feet is given in the table as 19.50 feet and $\frac{3}{12}$ or 0.325 foot.

19.50 feet + 0.325 foot = 19.825, or 19 feet 9⅞ inches, which is the length of the rafter on the work line, the lookout for the cornice projection not being included.

Another advantage of the table will be found in locating a ridge for a dormer or gable intersecting a hip rafter or locating jacks and cripples on a hip or valley rafter. For instance, say the rafters are spaced 20 inches on centers. Referring to the hip rafter table, 10 inch rise, $1\frac{8}{12}$ feet, or 1.64 feet, + 1.09 feet = 2.73 = 2 feet 8¾ inches. Or in the case of an octagon hip, 1 37 + 1.910 = 2.280 = 2 feet $3\frac{11}{16}$, or 2 feet 3⅜ approximately, will be the centers on hip rafter. The length of rafters and cripples can be obtained by referring to the common rafter table.

Obtaining Side Bevels of Rafters.

From DOWN SOUTH, *Poplarville, Miss*—With the editor's permission I will offer a mite on the inexhaustible subject—roof framing. The question lately seems to be in regard to getting the side bevel of rafters, or more particularly valley rafters. The length of a rafter is, in my estimation, a more important thing than the bevel, but all the same every one who follows the business should not be content until he has found out how, and then get them both correctly. I inclose some sketches which, poor as they are—and they are almost my first

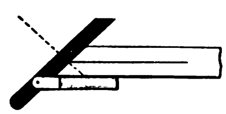


Fig. 2.—Showing Bevel Set in Position After Length of Rafter has been Obtained.

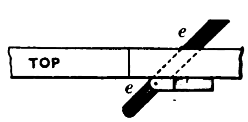


Fig. 3. Showing Method of Applying the Bevel.

effort with a pen—may make my meaning somewhat plainer. Referring to them, let *a a* of the plan, Fig. 1, represent two common rafters meeting at an angle and *b* a valley rafter or hip, as it will apply to either. Cut the lower end of the rafter, and if correct results are expected it should be cut true and square. Now take the bevel shown on the plan referred to and apply to the under side of the rafter just cut, as indicated in Fig. 3 of the sketches, marking from *e* to *e*. Now square up from this, marking on both sides of the rafter, as shown in Fig. 4, when by setting the bevel to these marks on top of the rafter we have the correct bevel. Now find the correct length of the rafter and apply the bevel as at Fig. 2 and mark one side from the center, after which reverse and mark as shown by the dotted line, and there you are. I am not claiming for this plan that it is better than others or more scientific, I merely give it and let every one judge of its merits. Some doubtless may catch on to it more readily than they would others. As most men will observe, it will apply to roofs of nearly all shapes and pitches. I would say to all interested in roof framing get a copy of Hicks' "Builders' Guide" and study it, not running it over once and throwing it aside, for it is by far

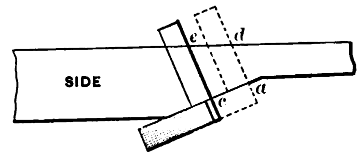
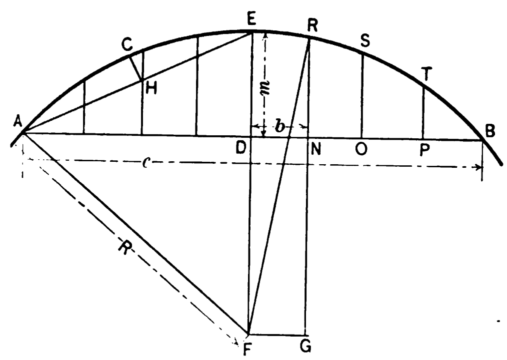


Fig. 4.—Rafter Marked on Both Sides and Bevel Set in Position.

the best and most practical treatment of the subject I have ever seen. There is, however, a weak spot or two in it which at some other time I may point out. I will also at some future time give a description of my tool chest, containing some ideas of my own and which I have never seen elsewhere presented.

Laying Out the Segment of Circle Without the Use of Radius.

From GEORGE W. B., *Long Island City, N. Y.*—In answer to the inquiry of William T. Davies, Somerville, Mass, in the March number of *Carpentry and Building*, I inclose the following solution: In order to lay out a section of a curve without using the radius it is necessary to know the length of the chord joining the two end points of the arc. Divide this chord into any number of equal parts, for example eight, as shown in the accompanying sketch, and draw perpendicular lines through these points to the circumference. These lines are termed ordinates. Then to find the middle ordinate, as



Laying Out Segment of Circle Without the Use of Radius.

E D, calling E D (*m*), the chord A B (*c*) and the radius (R), we have in the triangle A D F:

$$DF = \sqrt{\overline{AF}^2 - \overline{AD}^2} = \sqrt{R^2 - \tfrac{1}{4}c^2}$$

Then $m = EF - DF = R - DF$ or $m = R - \sqrt{R^2 - \tfrac{1}{4}c^2}$.

To find any other ordinate, as RN, at a distance $DN = b$ from the center of the chord: Produce $R.N$ until it meets the diameter parallel to AB in G. Then join $R.F$.

Then $RG = \sqrt{\overline{RF}^2 - \overline{FG}^2} = \sqrt{R^2 - b^2}$ and

$$RN = RG - NG = RG - DF.$$

Substituting the value of RG and then of DF, previ

-ously found, we have $R N = \sqrt{R^2 - b^2} - \sqrt{R^2 - \frac{1}{4} c^2}$.
By these formulæ the ordinates may be calculated.

An approximate value of m may also be found from the formula $m = R - \sqrt{R^2 - \frac{1}{4} c^2}$. The same is done by adding to the quantity under the radical the very small fraction $\frac{c^4}{64 R^2}$, thus making it a perfect square, the root of which is $R - \frac{c^2}{8 R}$. We then have $m = R - \left(R - \frac{c^2}{8 R}\right)$ which, when reduced, is $m = \frac{c^2}{8 R}$.

From this value we see that the middle ordinates of any two chords in the same curve are to each other (nearly) as the squares of the chords. Thus, if A E is considered equal to ½ A B its middle ordinate C H = ¼ E D Thus intermediate points of a curve may be readily found.

Drying Room for a Dwelling.

From G. H., *New York*.—In regard to a cheap method of building a drying room for a dwelling, I would suggest that between the carpenter, the tinsmith and the stove man a very cheap drying apparatus may be constructed in a laundry room or kitchen. From my own experience in building drying rooms I submit the accompanying sketches, which may prove of interest to some of the readers of the paper. Fig. 1 is a plan, Figs. 2 and 3 vertical sections and Fig. 4 the detail of fastenings with the clip and slide for holding the clothes horses. The plan represents a drying room 4 x 6 feet for 11 clothes horses. With continuous drying from six to eight horses is sufficient for small families. The sides and top may be matched ¾ stuff and the framing 1¼ x 2½ pine. The slides for holding the horses may be ¾ x 2 inches, with a rabbeted strip for holding the clips nailed or screwed to it to form the groove, as shown in Fig. 4. The clips may be made of No. 12 sheet iron and screwed to the stiles of the horses. The rails may be halved and clinch nailed to the stiles. The flat top ironing stove of the stove trade is best suited if placed on the same floor with the drier, and may be so arranged that the sheet iron cover can be removed and the stove used for heating irons.

For safety the stove should be boxed in with sheet iron and a sheet iron apron extended into the room, supported on small stanchions, for equalizing the flow of air. An opening in the sheet iron box opposite the opening into the dryroom serves to impinge the cold incoming air directly against the stove. There should be a stove pipe ventilator at each corner brought together and carried to a chimney flue not used for fire or up through the house to the roof with a hood. If there is room over the drier the partitions may be run up to the ceiling of the room with the holes in the cover of the drier at the corners, and a single ventilator to a flue or to the roof. To charge the dryroom the horses may be unhooked and set at the further end of the room, and one at a time hung and the clothes put on—or if the heat is on, one at a time may be drawn out through the door and hung on a pair of hooks outside of the room, charged and slid into place. This makes a convenient and snug drier with no rails extending out into the room, and if the stove can be placed in the cellar with an air casing leading through the floor the drying room may be made a neat and ornamental adjunct of a kitchen or laundry room.

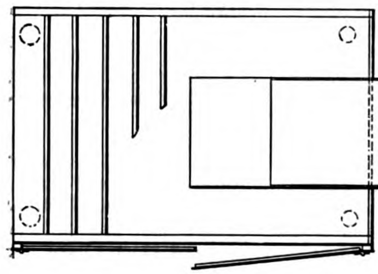


Fig. 1.—Plan View.

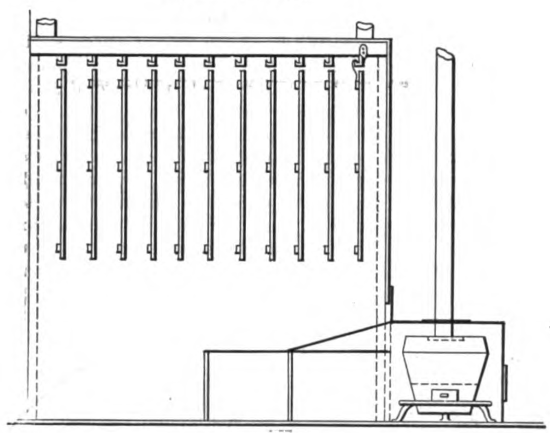


Fig. 2.—Longitudinal Vertical Section.

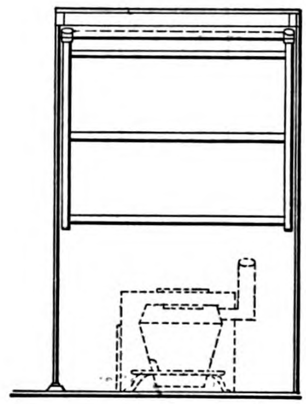


Fig. 3.—Vertical Cross Section.

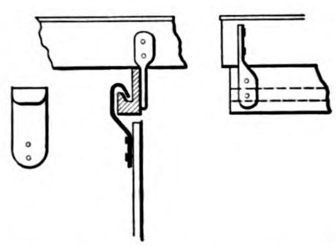


Fig. 4.—Detail of Fastenings With Clip and Slide for Holding Clothes Horses.

Drying Room for a Dwelling.—Engravings Showing Construction.

Location of Gas Fixtures on Floor Plans.

From M. A. M., *Bramwell, W. Va.*—I have just secured a copy of the new work which you have published, entitled "Modern American Dwellings," being the second volume in the *Carpentry and Building* series, and I notice that a good many floor plans have little stars on them while on others they are missing. Will you kindly inform me what the stars mean? Possibly an answer through the Correspondence columns might interest others as well as myself. I notice that the same kind of stars appear on the plans published in the paper.

Answer.—The stars to which our correspondent refers indicate the location of the gas fixtures in the various rooms. A single star indicates what may be a wall bracket or a drop with a single jet, while the clusters which appear in some cases are used to designate the position of the chandeliers. It must not be inferred from this, however, that plans which fail to show the stars do not provide for gas lighting, for in the process of making the drawings or engravings the stars may have been inadvertently omitted. This is not an essential feature of published plans, but the location of the gas fixtures is occasionally an aid to the prospective builder, as it shows where, in the estimation of the architect, is the best place to put the lights in order to secure the best results.

Bracing a Basement Barn Built on the Plank Frame System.

From E. S. H., *Connecticut.*—I have been reading the articles of Mr. Shawver on barn framing with a great deal of interest, and I am desirous of obtaining full instructions in regard to bracing the interior of a basement barn: also a complete bill of materials for the frame of such a barn, 40 x 60 feet in area, basement 8 feet high and superstructure 20 feet high. The roof is of the gable pattern, one-third pitch. There is also a bay in each end and a double driveway.

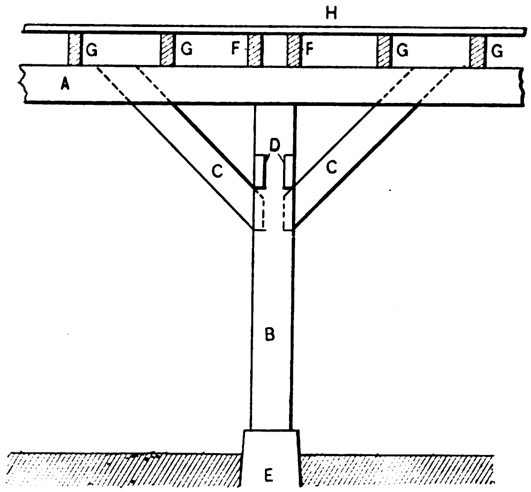


Fig. 1.—Showing Method of Bracing.

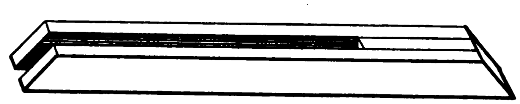


Fig. 2.—One Form of Brace Employed.

Bracing a Basement Barn Built on the Plank Frame System.

Answer.—In referring to the above inquiry Mr. Shawver submits the following information, accompanied by the illustrations presented herewith: The sketches here given will explain in detail the manner of inserting the braces and the way in which they are made. Of course when long braces will not interfere with the desired use of the space they are preferred to short ones, but short ones properly inserted will give the same rigidity to the plank frame that braces of similar length will give to a mortise and tenon frame. The braces C C of Fig. 1 are inserted in the bents as the latter are constructed, but the brace shown in Fig. 2 is not inserted until the barn is raised.

In basement barns the joist bearer A of Fig. 1 is made to extend lengthwise of the building, and the bents of the superstructure being placed crosswise we find the sill of a bent of a superstructure as represented at F F. But in ground barns the joist bearers extend crosswise of the barn and the post B is permitted to extend up through the joist bearer about 7 inches. Two posts are then spiked to this projecting portion, one on either side, and thus again the brace shown in Fig. 2 may be inserted if thought necessary. If, however, the braces are properly inserted in the side walls of the frame the short braces may safely be omitted in ground barns.

The following is a bill of materials for a plank frame basement barn 36 x 60 feet, basement 8 feet, with wall on one side, 16-foot superstructure with a 23-foot bay at each end and a 14-foot driveway in the middle. Roof one-third pitch, plain gable, decks over driveway if permissible. Interior posts of basement to stand on stone pillars.

BILL OF MATERIALS.

		Ins.	Ins.	Ft.	
Basement:					
First bent.—	2 sills	2 x	8 x	60	(or six 2 x 8 x 20)
	12 posts	2 x	8 x	8	
	4 door posts	2 x	6 x	8	
	6 post fillers	2 x	8 x	8	
	4 nailers	2 x	6 x	12	
	1 nailer	2 x	6 x	14	
	3 joist bearers	2 x	10 x	60	May use 14s and 24s.
	10 braces	2 x	6 x	10	
Bents 2, 3 and 4, similar.—	12 posts	2 x	8 x	8	
	18 post fillers	2 x	8 x	8	
	20 braces	2 x	4 x	6	
	3 joist bearers	2 x	10 x	60	
Ends of basement.—	8 sills	2 x	8 x	9	(or four 2 x 8 x 18)
	4 nailers	2 x	6 x	18	(or eight 2 x 8 x 9)
	4 nailers	2 x	8 x	18	
	16 braces	2 x	6 x	10	
	56 braces	2 x	4 x	6	
	28 brace blocks	2 x	4 x	16	
Superstructure:					
Two end bents.—	4 sills	2 x	8 x	36	(or eight 2 x 8 x 18)
	12 nailers	2 x	6 x	18	
	4 beams	2 x	8 x	36	(or eight 2 x 8 x 18)
	20 posts	2 x	8 x	16	
	10 post fillers	2 x	4 x	16	
	8 braces	2 x	6 x	18	
	8 purlin posts	2 x	8 x	8	
	8 braces	2 x	4 x	9	
	2 gable ties	2 x	6 x	18	
	6 stiffeners	3 x	6 x	16	
Two interior bents —	4 sills	2 x	8 x	36	(or eight 2 x 8 x 18)
	4 sills	2 x	8 x	2	
	8 posts	2 x	8 x	16	
	8 purlin posts	2 x	8 x	24	(or twelve 2 x 8 x 16)
	4 roof supports	2 x	8 x	22	
	4 sub-supports	2 x	6 x	17	
	4 collar braces	2 x	12 x	5	
	8 stays	2 x	4 x	3	
	4 ties	2 x	8 x	8	
	4 ties	2 x	6 x	5	
	4 ties	2 x	6 x	4	
	4 braces	2 x	6 x	8	
Two floor bents.—	4 sills	2 x	8 x	36	(or eight 2 x 8 x 18)
	4 sills	2 x	8 x	2	
	8 posts	2 x	8 x	16	
	8 purlin posts	2 x	8 x	24	
	4 roof supports	2 x	8 x	22	
	4 sub-supports	2 x	6 x	17	
	4 collar braces	2 x	12 x	5	
	8 stays	2 x	4 x	3	
	4 ties	2 x	8 x	8	
	4 ties	2 x	6 x	5	
	4 ties	2 x	6 x	4	
	4 braces	2 x	6 x	9	
	8 joist bearers	2 x	8 x	8	
Side timbers.—	4 sills	2 x	8 x	23	
	2 sills	2 x	8 x	14	
	24 nailers	2 x	6 x	12	
	4 nailers	2 x	8 x	14	
	8 plates	2 x	8 x	23	
	4 plates	2 x	8 x	14	
	8 purlins	2 x	8 x	23	
	4 purlins	2 x	8 x	14	
	8 couplings	2 x	8 x	8	
	4 couplings	2 x	8 x	4	
	16 braces	2 x	6 x	18	
	4 braces	2 x	4 x	12	
	16 braces	2 x	4 x	7	
	8 deck joist	2 x	8 x	14	

Floors, siding, roofing, doors, &c., will be the same as in other barns of same dimensions.

ESTIMATED COST OF FRAMING.

Foreman, $2.50 per day, 3 days	$7.50
Two journeymen, $2 per day, 3 days	6.00
Two apprentices, $1.25 per day, 3 days	3.75
Total	$17.25
Raising and inserting braces, 1 day	5.75
Total	$23.00

Cost of completing same as other barns of same dimensions and style of finish.

DANGERS OF TALL STEEL STRUCTURES.

IN the putting up of steel structures of the tall office building type, which in recent years have become so common in the large cities of the United States, there are no dangers that an experienced architectural engineer cannot so guard against as to remove all and every cause for uneasiness; yet there are dangers that, from carelessness or want of skill, might easily become frightful. A tall, steel skeleton building is a scientific structure, in which every piece of steel and even every rivet can be accurately calculated from known data. All the strains of load and wind pressure can be determined and provided for with as much accuracy and certainty as in a railroad bridge.

In considering the dangers in detail, says W. L B. Jenney in the March issue of *Cassier's Magazine*, the foundations are, naturally, first to be considered. If the building is erected on rock or on an incompressible soil, it is essential that the building should remain where placed, or, if built on compressible clay such as underlies some places and where settlement is unavoidable, the loads must be distributed with such uniformity that the settlements shall be substantially uniform.

Steel in Foundations.

The steel in the foundations should be heavier in the web than the calculations actually demand, as a safety against any possible injury by rust. Every precaution, however, should be taken to prevent any injury to the steel. The latter should be painted two coats. The paint should be elastic, so as not to crack or scale off by the expansion and contraction of the metal, and it should not dry out, harden and crumble. There are several good paints in the market, from the best old red lead and linseed oil, and also graphite paints, that have long been in use, to some of the new ones that promise well. But they must not be left to the selection of the contractor, who naturally will spend as little money on them as practicable. The architect must select what he considers the most lasting paint and see that it is used, and also that it arrives at the building in sealed packages, direct from the manufactory.

Then the steel should be imbedded in strong Portland cement concrete, well rammed into place, and the surface should be troweled smooth and hard, using mortar composed of equal parts of Portland cement and clean sharp sand so as to be impervious to water. This concrete is itself an excellent protection to the steel, both against fire and against rust.

Wind Pressure.

One of the greatest dangers to tall buildings is from the excessive wind pressures from a cyclone. What pressure a cyclone may exert on the side of a tall building has not yet been fully determined. All observations have been made on small surfaces, usually not exceeding 1 square foot in area. It is generally admitted that the total pressure on large areas is not in proportion—that is to say, the pressure on the side of a building measuring 50 x 150 feet, or 7500 square feet, is not 7500 times the observed pressure on a single square foot, but is materially less

It is usual to provide against a wind pressure of 40 pounds per square foot over the entire area exposed, using a fiber strain of 16,000 pounds on the steel, while a pressure of 80 pounds, or more, may be exerted on a single square foot for a short time. It is not probable that on the large surfaces of a tall building the total pressure would be so great as to run the fiber strain up so high, for the short time during which these great pressures continue, as to become actually dangerous.

The Home Insurance Building, in Chicago, was on one occasion struck on its long side by a wind sufficient to blow in some of the window sash and the plate glass in some large, single light, bank windows, but the building was not otherwise affected in any manner. The writer was in the building at the time, but did not notice any jar or vibration, nor did the draftsmen, with their pencils on the paper, in his drafting room, which is on the eleventh floor, in a long wing, particularly exposed. But the squall was not as severe as the one in St. Louis.

In Chicago there are two very long buildings, forming one block, known generally as the Monadnock Block, which is really only the north half of the block. The north half is of old fashioned fire proof construction—that is, heavy masonry walls several feet in thickness; the south half of the block is of steel skeleton structure. This long block is only about 63 feet in width. The long side is to the east. It is 16 stories high, with pent houses on the roof fully equal to another story. About three years ago there was a very heavy gale blowing from the east, square against the long side of the building. The agent, who was anxious to know how the building would behave under such circumstances, called in several experts to estimate the vibration. They reported that the extreme movement of the cornice was ⅜ inch in either direction from the perpendicular, and was more pronounced in the old fashioned heavy masonry wall construction in the north half of the block than in the light steel skeleton forming the south half. This is as one would naturally expect. The steel skeleton, being riveted together and braced in every direction, is more rigid than masonry walls that rely solely on their weight for their stability.

Connections to Steel Columns.

It is best to make the connections of floor beams and girders to the steel columns with 6 x 6 inch angles, with four rivets in each leg, instead of the standard connections of 3 x 3 inch angles with two rivets in each leg. By the rigidity of the connections a material proportion, often 25 per cent., of the wind pressure can be provided for. The balance is taken by the exterior steel. The connections being stiffened by gusset plates, the sections of the columns are increased to resist the bending moment in the direction of the pressure. As the fiber strain used in the calculations is only 16,000 pounds, giving a coefficient of safety of about four, it can easily be doubled for a short period with perfect safety, as the ultimate is never less than 65,000. The maximum wind pressure that may reasonably be expected to occur is, therefore, amply provided for, and the greatest danger is removed.

In a store building where there is a large stock of inflammable goods, such as dry goods or groceries, the inadequacy of the fire proofing becomes a source of danger. A great fire which occurred in the city of Pittsburgh last year demonstrated that there is much room for improvement in the fire proof material and in the method of putting it on. About one-half of the steel in that case was stripped and left naked, and the lower flanges of many of the floor arches were scaled off. The steel made an excellent showing. The injury to the metal under the very trying conditions of that fire was estimated by the appraisers to be only about 2 per cent. of the whole, not considering the accident of a 25-ton closed steel elevator tank that fell through the building from roof to first floor—an accident that, now the danger is known, never need occur again.

The material for fire proofing should be what is known as porous terra cotta, made by adding six volumes of sawdust to four of clay. On burning, the sawdust is consumed and a tile is produced that is full of air holes, or little cells, rendering it impossible for any hurtful heat to penetrate to the metal. The usual practice of laying fire proofing in lime mortar is to be condemned as weak and insufficient. Strong Portland cement mortar only should be used. It is well to add sufficient lime mortar to cause it to work freely under the trowel. A good proportion is, equal volumes of best lime mortar and of one of the well proven Portland cements, thoroughly mixed at the time of using. No inferior or untried material should be employed. The fire proof material should be tested by heating it to bright redness and plunging into cold water, repeating the experiment several times. If the material is seriously injured by these tests it should be discarded as worthless.

(*To be continued.*)

Heating and Ventilating a School House.

THE necessity of providing a better method of heating and also furnishing some means of ventilating the Carmen Street School at New Brunswick, N. J., was upon investigation of the system then in use brought prominently before the Board of Education of that city. A plan of the first floor and second floor is presented in Fig. 1, showing the system as remodeled. At the time attention was given to the heating and ventilation problem the different rooms were provided with wall coils four pipes high, made of ¾ inch pipe, extending along two sides of the room. These coils presented about 50 feet of surface, while the rooms were 23 x 20 x 11 feet in size, with a capacity of 5060 cubic feet, so that the ratio of heating surface to the cubic contents was 1 square foot of surface to 101 cubic feet of space, and even with the best efficiency of a steam heating plant this was hardly adequate to the requirements of the building. The School Board consulted with T. B. Cryer of the firm of T. B. Cryer & Co., 28-30 Lawrence street, Newark, N. J., who found that the board had at their disposal a horizontal tubular boiler of about 12 horse-power. As economy in expenditure was important the system was improved after the method described herewith, and the success that has attended the effort is shown in the satisfactory results obtained last winter. The boiler is located in a space excavated for it, or rather blasted for it, in the rock under the school building, as shown in Fig. 2, which also shows the location of the main and return to the different wall coils and radiators, and also to the aspirating coils placed in the ventilating shafts. The pipes which are underneath the building were run in a space of 18 inches between the rock and the bottom of the floor joists, making the work of securing a correct alignment and pitch more than ordinarily difficult. Risers to supply the wall coils are taken from the ends of the heating main in the cellar, and come up in the corners of the school rooms on the outside wall near the hall in each case.

An elevation showing the arrangement of the piping is presented in Fig. 3, being on the line C D of Fig. 1. It will be noticed that the main and returns from the wall coils and the radiators run along the outside walls of the building, affording additional heating surface, and that the highest point of the heating main is at the hall side of the building, a relief pipe being carried from the point where the main rises to supply the wall coils and radiators to the main return to the boiler. Separate returns are connected with the radiators and the heating coils. In order to prevent short circuiting, or steam backing up the return pipe in some of the coils or radiators, a false water line is established by forming a trap in the return pipe, as shown in Fig. 4, which is an elevation on the line of A B of Fig. 1. It will be noticed that the steam main in the basement is relieved at the point where it rises to connect with the radiators and coils. By the establishment of the false water line the returns from all the radiators are attached to the return main at a point below this water line, which effectually prevents steam from one return passing up another and interfering with the circulation in the coil or radiator.

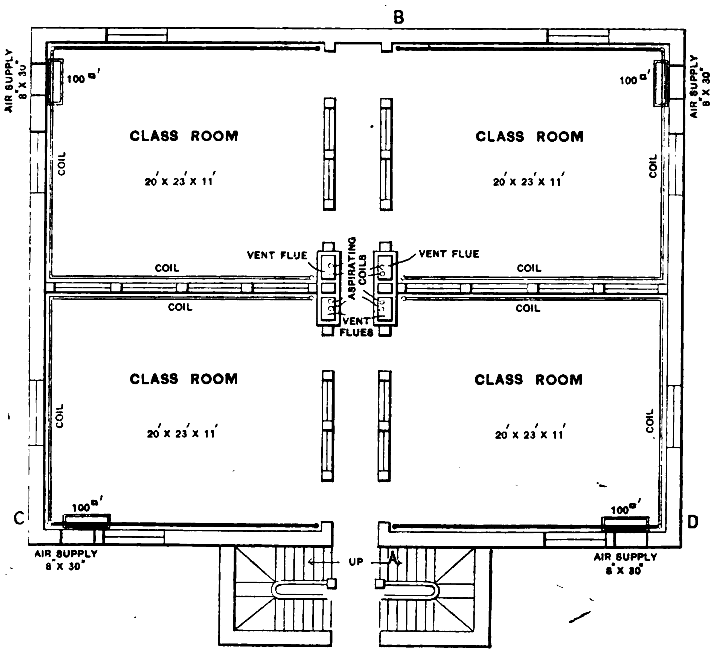


Fig. 1.—Plan of First and Second Floors.

Heating and Ventilating a School House.

Having devised a piping system, the addition of the necessary radiation to provide a comfortable temperature was made in such a manner as to effect also a change of air in the school rooms. In order to prevent interference with the wall coils already in place, radiators presenting 100 square feet of surface were supported at a point above the heads of the scholars and openings prepared in the walls for an influx of fresh air, the openings being 8 inches in hight and 30 inches in length, controlled by dampers. To secure a positive outflow of air from the room a series of flues were built, as shown in Fig. 1, making available for each tier of rooms one 12 x 20 inch ventilating flue. From this it may be readily seen that the fresh air inlet and the ventilating outlet were of equal dimensions. To secure a positive outward flow of the air in the room through these vent flues a connection was made with the steam main, and an aspirating coil was placed in each flue, extending to the ceiling of the second floor room, and presenting about 25 square feet of surface. These aspirating coils were connected with the steam main on the one pipe system, there being no return except through the flow connection, the pipe throughout being 2 inches in size.

Without considering the surface presented by the main and return on the outer wall of the building, it will be noticed that the available radiation in each room is equivalent to 130 feet of direct radiation. The common custom is to calculate that to secure the same efficiency in direct-indirect radiation 25 per cent. must be added to the amount of surface that will be required for direct radiation. Then as the direct-indirect radiators present 100 feet of surface it may be considered that only 80 feet is available as direct radiation, and this added to the 50 feet of surface present in the coils makes the 130 feet of direct radiation, and a proportion of 1 square foot of heating surface to about 40 cubic feet of space. Each room is supposed to accommodate 40 pupils, and since the system has been in operation experiments to test the efficiency by Dr. Helm of the Board of Education with an anemometer have demonstrated that about 8 cubic feet of air per pupil per minute is secured by the system now in use, and that the air in the room is changed three or more times an hour. This air supply is about one-third of what is required by law in some States, but that it is far superior to the atmosphere previous to the change is said to be clearly shown by the comfort of the pupils and their increased interest and improved standing in their studies.

The Baltimore Building Trade.

A correspondent in Baltimore, Md., sends the following interesting account of the way building operations are carried on in that city :

The building operations of this city, so far as residences and the more moderate sized stores are concerned, are conducted on what they call the ground rent plan, which is something like this—viz: The owner of the land, if he wishes to improve his property, will seek out some carpenter or contractor, and offer him a bonus of, say, $1000 per lot to build a block of houses. If there are 25 houses in the block he gets $25,000, payable as follows: One-sixth when the joists for the first floor are laid, one-sixth when the joists for the second floor are laid, another sixth when the third-floor joists are laid, another sixth when the roof is on, another sixth when the plastering is all on, and the final sixth when the buildings are completed. The contractor is then the actual owner of these houses for a term of 99 years on lease, and proceeds to sell them. The owner of the ground has, in the meantime, issued what are termed ground rents, if he cares to sell them, and they are negotiable in the market as mortgages—in fact, are first mortgages on the whole property—to the amount of twice the sum, or nearly so, of the amount of the bonus furnished to the contractor. The ground rent is 6 per cent. on this amount, making in the above supposed case a rent of $105, or sometimes rather more, that has to be paid in addition to the rent of the store or dwelling.

The contractor, when he gets his lease, before he moves a shovelful of earth, makes his arrangements with the lumber dealer and with the brick maker for the material to build the houses on the best terms he can get, also with the hardwaremen and the plumbers and the tinners. If he is an honorable man and meets with good success in selling he can pay them, but if times are not good, or for any cause whatever he fails to sell, it not infrequently happens that the houses go into the hands of a receiver, and the persons who supplied the materials and trimmings, &c., get a per cent. of their bills, or get left. The ground rent man is perfectly secure, however, more so than a savings bank, and looks on with as much complacency as the woman did when her husband was fighting the bear—didn't make much difference to her which whipped.

Hence there are but few hardware stores that care to estimate on contracts, owing to the uncertainty of payment. The plumbing and tinning contracts are very much in the same category, in very few hands, and everybody who has land in or near the city is desirous of having the ground built upon for the sake of the ground rents, which are clear of taxes. The result is, I understand, that the city is overbuilt; the houses are apt to be small, sometimes poorly built; undesirable persons get possession of one or two houses, say, in a block, and the character of the block is ruined. Just now there appears to be general stagnation in the building business.

The hardwaremen are complaining a little, and the plumbers and tinners are complaining a good deal, saying they never knew things to be so dull. The usual result follows, as a matter of course, that there are so many men with little or nothing to do that prices for work are cut until there is absolutely no profit left, as witness the following: The block of houses are each 15 x 60 feet, three stories high, and I believe high stoop, on lots 15 x 90 feet. Galvanized cornice 18 inches, sometimes 2 feet, in depth; galvanized gutter and spout; tin roof (good); tank water closet; iron bathtub; one sink; galvanized hot water boiler, piping complete; marble washstand; furnace in the cellar with hot air piping complete for heating the building throughout—all for $160.

I have never heard of such a condition existing in any other city or town I have visited, and people here tell me there is none. There are between 300 and 400 plumbers here, with more than 100 stove stores and tinners, and they almost without exception complain of dull times and lay the blame at the door of the ground rent business.

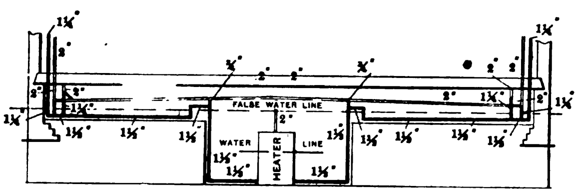


Fig. 4.—Partial Elevation on Line A B of Fig. 1, Showing False Water Line.

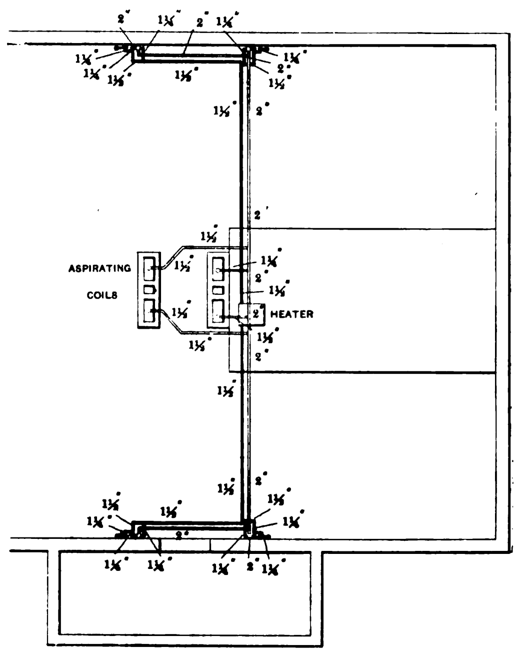


Fig. 2.—Partial Plan, Showing the Boiler and Piping Under the Building.

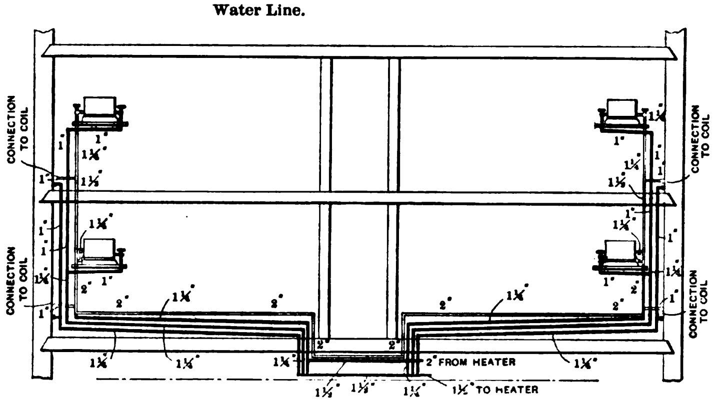


Fig. 3.- Partial Elevation on Line C D of Fig. 1, Showing Arrangement of Piping.

Heating and Ventilating a School House.

EXPERIENCED lumbermen say that in the process of seasoning wood should occasionally be repiled and decayed or defective pieces removed, lest they infect the others

The Builders' Exchange

Directory and Official Announcements of the National Association of Builders.

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The "Union Labor Clause" in Building Contracts.

Two decisions have recently been made by the courts, one in Massachusetts and one in Illinois, in relation to the legality of introducing into building contracts made by municipalities the requirement that union labor only shall be employed. In the Massachusetts case the contract, which was between the city of Boston and Lynch *et al.*, required that preference in employment shall be given to citizens of Boston and to members of the various trades unions. The contractors claimed that they attempted to give preference to union labor, but were prevented from so doing by a conspiracy on the part of the labor unions. The contractors had formerly conducted a "non-union" shop. Work was ordered stopped by the Mayor on the ground that the provisions of the contract were not being fulfilled. The contractors asked that the city be enjoined from preventing the progress of the work, which was otherwise perfectly satisfactory. The court sustained the plaintiff, and the city was enjoined from further interference. The court held that a clause requiring that only union labor be employed was contrary to the statutes of the State, in that it operated to prevent certain citizens from obtaining employment from the city, it being claimed that all men should have equal opportunity for obtaining work within the gift of the city.

In the case in Illinois the question arose over the insertion of the requirement that union labor only be employed in a contract issued by the Board of Education of Chicago on the ground of excessive expense. A certain contractor agreed to make certain changes in one of the public schools for $1900 if the union labor clause were omitted, and $2090 if union labor were required. An injunction was asked to restrain the Board of Education from inserting the union labor clause; but Judge Ball decided that the board could not be restrained by the courts from inserting the clause objected to. The judge held that such a requirement was not illegal, but was a matter within the discretion of the board. The wisdom of inserting a union labor requirement may be a matter of opinion, he held, but the right of the board to determine the matter for itself is clearly within the administrative powers of that body.

This decision is in harmony with one rendered a short time previously, in a somewhat similar case, by Judge Tuley.

A Case of Interference.

During the past month an interesting case was tried at Waukesha, Wis., to determine the rights of a walking delegate in attempting to compel a contractor to discharge his non-union workmen and employ union men in their stead. The question of right of interference by the walking delegate hinged on the fact that the Brewers' Association of Milwaukee is under an agreement with the Building Trades Council of that city that none but union workmen shall be employed on any work done for any of the members of the Brewers' Association.

The contract in question was made for the erection of a hotel at Waukesha between the Jos. Schlitz Brewing Company and George Mindeman, both of Milwaukee, and contained the following stipulation:

It is to be understood and agreed upon that union labor is to be employed if there is such.

In due time Contractor Mindeman commenced work, and finding that there were no unions in Waukesha employed such workmen as offered themselves, believing that the words "if there is such" in the clause in the contract relating to the employment of union labor permitted him to use non-union labor, there being no union men in the city where the building was to be erected.

The work had been progressing satisfactorily for several weeks, when the walking delegate of the Building Trades Council of Milwaukee appeared and demanded that the non-union workmen be discharged and that workmen belonging to unions holding membership in the Milwaukee Building Trades Council be employed to do the work. The contractor declined to comply with this order, on the ground that there were no union men in Waukesha, whereupon the walking delegate revisited Waukesha accompanied by a number of union workmen from Milwaukee.

As a result of the refusal of the contractor to discharge his non-union workmen the walking delegate during a controversy said to the workmen: "You cannot build this building. I will fight it if it takes all summer, and if your city will not protect us we will get the militia." This language was believed to constitute a breach of the law providing that "any person who shall attempt by threats, intimidation, force or coercion of any kind to hinder or prevent any other person from engaging in or continuing in any lawful work or employment." Complaint was made to the district attorney by the non-union men and a warrant was issued, and the walking delegate was arrested on the charge of attempting to hinder and prevent certain men from following their lawful employment. The case was tried before a jury in the Municipal Court for the Eastern District of Waukesha County, and after several adjournments was finally concluded by the jury finding the walking delegate guilty. After motions for a new trial and in arrest of judgment had been argued and denied, the court sentenced the defendant to a fine of $10 and costs.

The attorney for the prosecution argued that the defendant had used threats and intimidation, and that furthermore he had no right to interfere with the workmen, who were innocent parties, having no connection with the agreement between the Brewers' Association and the Building Trades Council of Milwaukee. If the council objected to the employment of non-union workmen it should have proceeded in a civil action against the Brewers' Association to compel the fulfillment of the agreement between the two.

(*Continued from page* 120.)

will probably be a number of dwellings built this year on the Prospect Heights property, opened last fall, and the Williams property on King street will be partially built upon. There may also be a number of dwellings erected this season on Orchard street, the recently opened highway between Bridge and North street.

Wilmington, Del.

The war scare is said to have had a depressing effect upon the building interests of Wilmington. One of the most prominent architects recently stated that he had orders for four new buildings to cost about $60 000 for which the plans have been made, but the owners prefer to wait until some conclusive action in relation to the war with Spain has been taken before proceeding. Other architects report a similar condition of affairs.

Worcester, Mass.

C. C. Brown, secretary of the Builders' Exchange, writes that the prospect for building in Worcester during the coming season is excellent, in spite of some hesitation to undertake certain contracts while the general business conditions are disturbed by the likelihood of war. Builders generally seem to feel that the outlook is favorable for a good season's business.

A feeling of uncertainty exists as to what may be done by the labor unions owing to demands that have been made by the workmen. The journeymen carpenters have asked for $2.50 per day for first class men and $2.25 for second-class men, and that but one second-class man be employed to every two first-class men. The Building Laborers' Union has asked for 25 cents per hour for nine hours' work, but no trouble is anticipated from this demand, as nearly all contractors are already paying the wage and working the hours asked.

The Builders' Exchange, Mr. Brown states, is considering the advisability of moving in the direction of securing the enforcement of the lien law. The annual banquet of the exchange, which was held recently, was one of the most successful in its history. The after dinner speaking was of an unusually excellent character, and the whole affair was thoroughly enjoyable.

Notes.

At a meeting of the Builders' Exchange of Toledo, Ohio, April 6, P. H. Degnan was elected secretary, John W. Lee treasurer and P. J. Kranz assistant secretary.

The Builders' Exchange of Lorain, Ohio, has been reorganized and the following officers elected : F. W. Edison, president ; John Kipp, vice-president ; John B. Gary, secretary ; Louis Weitzel, treasurer.

The Master Plasterers' Association of Minneapolis has been formed with the following officers : Hugh Longstaff, president ; Andrew Smith, vice-president ; John Bannister, secretary ; Stephen Leslie, treasurer ; A. Sandquist, financial secretary. There are 35 firms engaged in the plaster business in the city, and 30 members of these have joined the association. Several others have expressed their intention of joining, and the officers expect to have all the firms in the city in the association in a short time.

Racine, Wis., carpenters struck early in April for an average wage of 25 cents per hour, but after being out about a week the matter was settled by the employers agreeing to pay 21¼ cents per hour as a minimum and 27½ cents per hour as a maximum rate, nine hours constituting a day's work.

Ex-Fire Chief Winchell, at present a successful contractor, is preparing the initial arrangements for the organization in Zanesville, Ohio, of a Builders' Exchange, the membership of which will be made up of material men, contractors and mechanics.

The Builders' Exchange of the city of East Liverpool, Ohio, has been incorporated for the purpose of promoting social enjoyment and friendly interchange of views. Robert Hall, Josiah T. Smith, Daniel J. Nellis, George Phillips, Frank W. Milligan, Ed. Cook, Harvey McHenry, Judson A. McCain and William Kent are the incorporators.

New York Trade School.

The closing exercises of the seventeenth season of the New York Trade School, Sixty seventh street and First avenue, New York City, were held on the evening of Thursday, April 14, in the presence of a large number of guests prominent in the various trades. Brief addresses were made by F. A. Schermerhorn and Edward Murphy, after which the certificates of proficiency were distributed by the representatives of the various trade school committees. A pleasing incident of this feature of the programme was the presentation of medals to the students making the greatest progress during the term. One of these, offered by William O. Allison, went to Frank C. Rivers of the house painting class, and another, offered by the Master Steam and Hot Water Fitters' Association of New York, to William H. Kuhn of the steam fitting class. The certificates to the various classes were then distributed, there being 15 graduates in the day and 7 in the evening carpentry classes, 5 each in the day and evening bricklaying classes, 5 in the day and 7 in the evening sign painting classes, 5 in the house and 3 in the fresco painting classes, 81 in the day and 73 in the evening plumbing classes, 18 in the day class in steam and hot water fitting, and in the various other evening classes the graduates numbered 3 in stone cutting, 4 in plastering, 17 in cornice work, 20 in electrical work, 8 in blacksmithing and 10 in printing. The evening exercises closed with the commencement address by Willam E. Dodge, one of the trustees of the school.

Mosaic Floors.

The manufacture of mosaic floors has been brought within economical accomplishment and satisfactory attractiveness. Small particles of wood, such as sawdust, wood flour and fine shavings, are treated first with a mixture of shellac and alcohol and then with a cement made of curd and slacked lime; and while this mixture is still damp it is put into hot molds of the desired shape and size and placed under pressure; the joint action of the heat and pressure unites the wood most thoroughly with both the shellac and cement, and after a few minutes the compound is taken out of the molds and completely cooled and hardened. Great care is necessary that no foreign substances, especially of an oily nature, be present, as this would prevent the cement from being absorbed into the pores of the wood. In making different colored mosaic the natural color of the woods used is taken into account, then the wood itself is dyed and, last, dyes dissolved in alcohol are mixed with the shellac. The process is then performed as before. It is said that, notwithstanding its hardness, this compound possesses all the perfection of wood, thus rendering it of particular adaptation for use as floor covering in the case of living rooms and private dwellings, and the important advantage is claimed for it of being unaffected by any change of temperature.

CONTENTS.

CARPENTRY AND BUILDING

WITH WHICH IS INCORPORATED

THE BUILDERS' EXCHANGE.

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232-238 WILLIAM STREET, NEW YORK.

JUNE, 1898.

Committees on Legislation.

The Building Trades Club, together with the Mechanics' and Traders' Exchange and the Mason Builders' Association of New York City, have set similar bodies in other cities an excellent example in acting upon their recognition of the fact that the best way to obtain good laws is to prevent the enactment of bad ones. These organizations, finding that legislation is being constantly sought in behalf of special class interests and against the welfare of builders and building interests as a whole, have appointed and are maintaining a committee whose sole duty it is to watch all proposed legislation and prevent the enactment of laws which menace the building industry, wholly or in part. The Builders' Association Exchange of Buffalo is an able assistant of the organizations mentioned, and the number of bills introduced into the Assembly that are inimical to building interests not only demonstrates the usefulness of work of this kind, but indicates also that there is a similar need in the other States of the Union. Individual builders are powerless to accomplish very much, acting alone, even if they were willing to devote the time necessary to determine the character and operation of proposed legislation, and without some such body or committee as that named they are helpless and at the mercy of any particular class that seeks the enactment of laws for its exclusive benefit.

New York's New Prison.

Among New York's most ancient appearing buildings, from an architectural and every other standpoint, was the old Tombs Prison. In fact it became so antique that the municipality decided to replace it with a building which would be better adapted to the confinement of modern roguery, and hence the Tombs is no more. The old Egyptian building is steadily giving place to a structure which will rank with New York's most modern specimens of architecture as well as with the most modern prison methods. The foundation has already been laid and the iron columns and steel beams are rising higher each day. It will require almost 500 tons of structural material to complete the frame work of the building. The main structure will be 186 feet long by 45 feet wide and 125 feet high above the street level, exclusive of the conical towers, which will rise 25 feet above the roof. The building will be semicircular at each end. The structural work of this main prison is to be supported by one row of longitudinal columns in the center and will be imbedded in the walls. There will be four tiers of beams. One will be a few feet above the street level and will serve as the ground floor of the building, containing offices, reception room, &c. Twelve feet 3 inches above this the main prison floor will be placed, and the third tier will be 36 feet 6 inches above the main floor. An equal distance above this the fourth tier will be placed. The floor will be utilized as an airing court and it will be 22 feet below the roof. It will be on the second and third floors that the rows of cells will be placed. These will be arranged in the center of each of the two large floors. They will be entirely of steel and will be supported in the center by steel columns so that they do not touch any of the walls. They will be arranged in tiers four high on each floor and there will be two rows back to back in each tier. The construction of these cells has not yet been contracted for. There will also be installed in the building a good sized electric lighting plant, together with an extensive heating and ventilating plant. This machinery has not been contracted for and, in fact, the specifications are not yet completed. A large laundry and kitchen will also be part of the equipment of the building. The most modern machinery will be installed, but as yet bids have not been asked for. Withers & Dixon, whose offices are in the Bible House, Ninth street and Third avenue, are the architects for the building.

Philadelphia's New Apartment House.

Probably one of the most elaborate examples of Italian Renaissance architecture in this country will be the imposing apartment house soon to be erected on the site of what was known as the Singerly Mansion, at the corner of Broad and Jefferson streets, Philadelphia, Pa. The location is in one of the most desirable residential sections of the city and the plot has an area of 125 x 200 feet. The structure will be of steel skeleton frame, ten stories and basement in hight, the exterior being of granite, Indiana limestone and Roman pressed brick with terra cotta ornamentation. The design is that of Henry E. Cregier of Boston and Chicago, who is also the architect of the handsome ten-story apartment house now rapidly approaching completion on Copley square, Boston, brief reference to which was made in one of our late issues last year. The main façade of the Philadelphia structure, 200 feet in length, will be relieved of monotony by a liberal court beginning at the third story, where the balcony thus formed will be inclosed by a balustrade of cupids. In the center of the façades on Broad and Jefferson streets will be the main entrances, two stories in hight, with ten polished granite shafts at each entrance, surmounted with carved capitals and elaborately sculptured arch and windows, patterned after the Palace of the Medicis in Italy. It is in connection with the upper part of the building, however, that the most notable decorative features of the design are to be found. The top story will be composed of groups of draped and elaborately sculptured caryatides which will support a massive cornice with harmoniously outlined cresting. The roof will be used as a palm garden and promenade for the guests. The main floor and public rooms will be finished chiefly in mahogany, marbles and mosaics with elaborate fire places. One of the features will be a suite of Oriental rooms for the use of the guests. There will be 184 apartments and the elevators and main staircase will lead direct to the roof. In addition there will be two absolutely fire proof staircases, one at each end of the building. We understand that nearly $1,000,000 will be expended in the erection of the building, this being exclusive of the cost of the site on which the apartment house will stand. The building will be erected by the Pennsylvania Construction Company, of whom we understand Mr. Cregier is an officer and a director.

The Eight-Hour Day.

The American Federation of Labor acted commendably in deciding not to force the issue this year on the adoption of the eight-hour day. The contest was to open up on May 1 with the machinists taking the initiative. It was deemed inadvisible and unpatriotic at this juncture to precipitate such a struggle. It is to be hoped, however, that the matter has not merely been deferred a year, but indefinitely postponed. Nothing would please our trade rivals in foreign countries so much as to see American manufacturers and their machinist employees locking horns in such a struggle as that witnessed in England last year. The hold we have gained on the trade of the world would be lost, many valuable connections which have been established abroad at great cost and which promise much for the future would be broken, and the United States would be seriously set back in its triumphant march toward industrial pre-eminence, to say nothing of the distress, privation and financial loss which would be entailed on the participants. It is useless to argue in favor of or against an eight-hour day on theoretical grounds when the fact is so apparent that employers in this country will undoubtedly resist the attempt to knock two hours off the working day as stubbornly as their cousins did on the other side of the Atlantic. Some things are practicable and a little force may overcome opposition, but other things are utterly impracticable and an attempt to force them through is useless. The eight-hour day for general workingmen is one of the latter. It is to be hoped that in the year of grace which has been given to employers before the conflict begins they will be able to convince their workmen of the utter uselessness of such a strike. The sorrowful outcome of the English engineers' strike should be sufficient warning.

Some New Business Structures.

Among the more important building enterprises now under way or immediately in prospect may be mentioned the ten-story office structure to be erected of brick and sandstone at the corner of Broadway and Wall street, running through to New street. The building will resemble the Italian Renaissance in its style of architecture, and will cost in the neighborhood of $450,000, the plans having recently been filed by Architect W. Wheeler Smith of this city. The work of tearing down the old buildings on the site has already commenced, and operations will be pushed forward as rapidly as possible. The new building will be erected by day's work, John J. Tucker having the masonry contract, James C. Hoe's Sons the carpentry work and J. B. & J. M. Cornell the iron work. The building will be equipped with hydraulic elevators furnished by Otis Brothers. Another building, costing about the same amount, is the mercantile structure for which plans have just been drawn to be erected on Hudson street, running from Vandam to Spring streets, and having a frontage of 160 feet on them. The building will be a brick and stone warehouse, eight stories in hight, and will be put up in accordance with plans prepared by John C. Haight, architect, for the Corporation of Trinity Church. The tearing down of the old buildings on the site of the 12-story apartment hotel at the corner of Forty-fifth street and Fifth avenue has been commenced, and operations will be vigorously conducted. The structure will be put up by the Matthew Byrnes estate in accordance with plans drawn by J. O'Rourke & Sons of Newark, N. J.

Collapse of Uncompleted Buildings.

During the past month occurred one of those distressing building accidents which are becoming altogether too frequent through the greed of gain and the apparent indifference to the value of human life. A number of flat buildings were in progress of erection in the upper part of the city when the rear portions of two suddenly collapsed, resulting in the death of several persons and seriously injuring a number of others who were employed about the structure. An investigation was ordered by the Mayor of the city, and in his report Commissioner of Buildings Brady stated that the stone foundation walls of the rear shafts were built on filled-in ground and bowlders; that the cement mortar used in the construction of the stone foundation walls was of a very inferior quality and did not adhere to the stone work to make it one solid compact mass, which was absolutely necessary in all foundation walls. He also found that the stone in the foundation walls was neither properly bonded nor bedded. As the result of the collapse of these structures the building inspector who supervised the work for the Department was removed from his position as building inspector, and various arrests ensued. The coroner's jury found the owner of the buildings and the contractors who built the foundation walls responsible for the disaster.

A Growing Barn.

It is not often that a man builds a one-story structure and has it transformed into one of two stories almost without effort on his part, but this is said to be the experience of J. W. Fesler, who lives north of Morgantown, a village a few miles southwest of Franklin, Ind. He has a barn which threatens to develop into a "sky scraper." In 1891, having need of a new barn, he built a small structure and in its construction he used green willow posts at the corners and along the sides. These he sunk into the ground in the usual manner, says the *Inter Ocean*. For some time nothing unusual was noticed, but after a year he saw that whereas he laid the floor near the ground, it was now 3 feet above the soil. On examination he discovered that the willow posts, instead of being dead, as he supposed they were on putting them in, were in reality alive, and had taken root and were growing. In their upward movement they carried the barn along. He watched this with interest month by month and year by year. Of course, he had to build another barn, for it was inconvenient to use the constantly rising structure Last spring the first barn was on stilts 9 feet high and in August he put in a new floor and surrounded the posts with siding, thereby making it a two-story affair. There is now a space of 7 inches between the new floor and the ground, and Mr. Fesler expects to have a three-story barn in course of time. He has built outside stairs to the second story. The neighbors come from miles around to see "Fesler's elevator," as they call it, and he and his barn are the subjects of a great deal of fun in and around Morgantown.

APRIL'S fire losses continue the favorable comparison with former years made so far by 1898 According to the statistics compiled by the New York *Journal of Commerce* the fire losses in the United States and Canada during April reached $8,211,000, as compared with $10,833,000 in April, 1897, and $12,010,600 in the same month of 1896. The total losses for the first four months of this year are just under $40,000,000.

THE feat of engraving the Lord's Prayer on a dime has been beaten by a New York engraver, Frank J. Mollenhauer, who has inscribed the 26 letters of the alphabet on the head of a pin. Under a magnifying glass the letters are said to be clear and distinct, and each as perfect as any ever engraved for a visiting card or a wedding invitation, although with the naked eye nothing but indistinct scratches are visible.

A MODERN HOUSE AT ELIZABETH, N. J.

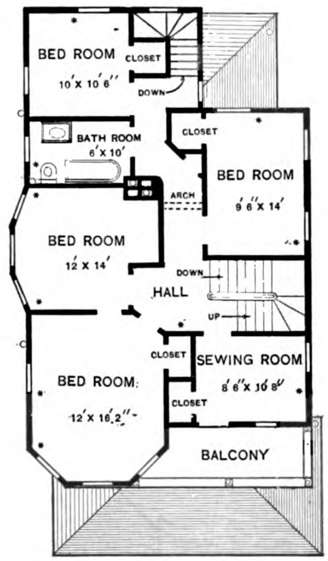
THE subject of our half-tone supplemental plate this month is a modern house which will doubtless appeal to those whose requirements call for a home of nine rooms and bath, not counting a hall of such size that it may readily be used as a reception room. The building is substantially constructed, and is finished throughout in a neat and thorough manner, having the appearance of a home costing much more than the amount involved in the present instance. A careful study of the half-tone engraving will show the style in which the exterior has been finished, while an examination of the floor plans shows the disposition of the interior space of the structure. One of the interesting features is the balcony above the front piazza, this being sufficient in size to

Front Elevation.—Scale, ⅛ Inch to the Foot.

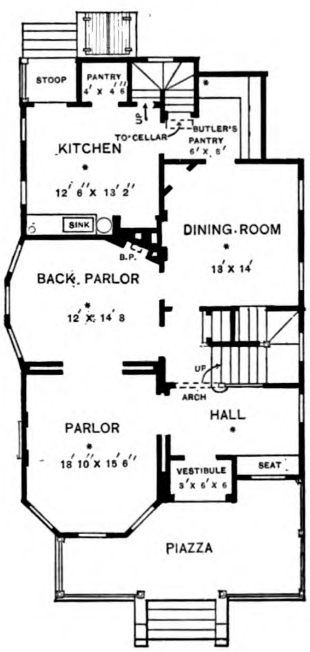
A Modern House at Elizabeth, N. J.—D. B. Provoost, Architect.

make it of practical use, measuring as it does 5 feet 6 inches wide by 14 feet in length, the general treatment being the same as the main building. The roof of the main structure extends over the balcony, and is supported by turned columns the same as on the front piazza. On the main floor there are double parlors, dining room and kitchen, communication between the two latter being by means of a butler's pantry measuring 6 x 8 feet in size. On the second floor are four sleeping rooms, sewing room and a good-sized bathroom, while in the attic are one finished and two unfinished rooms.

The house is located on Stiles street, Elizabeth, N. J., and was completed last fall for John L. Precheur, in accordance with plans drawn by D. B. Provoost, architect, of that place. According to the specifications the foundations of the building are brick laid in cement and then cemented on the outside. The cellar is concreted, and contains the laundry, furnace room, servants' closet, coal rooms, &c. The frame of the structure is of spruce, sheeted, papered and covered with narrow white pine siding, the roofs being covered with slate. The hight of the cellar is 7 feet in the clear; the first story is 9 feet 6 inches and the second story 9 feet. The first and second stories have double floors with heavy paper between. The interior is finished in white pine, varnished and polished in



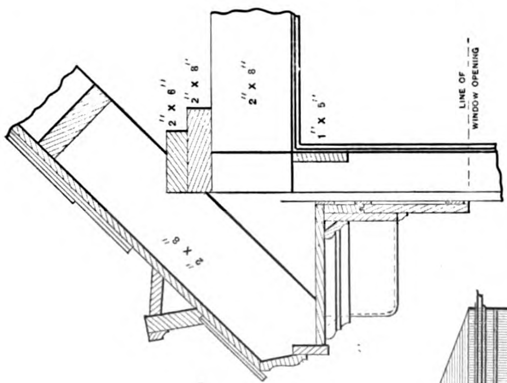
Second Floor.



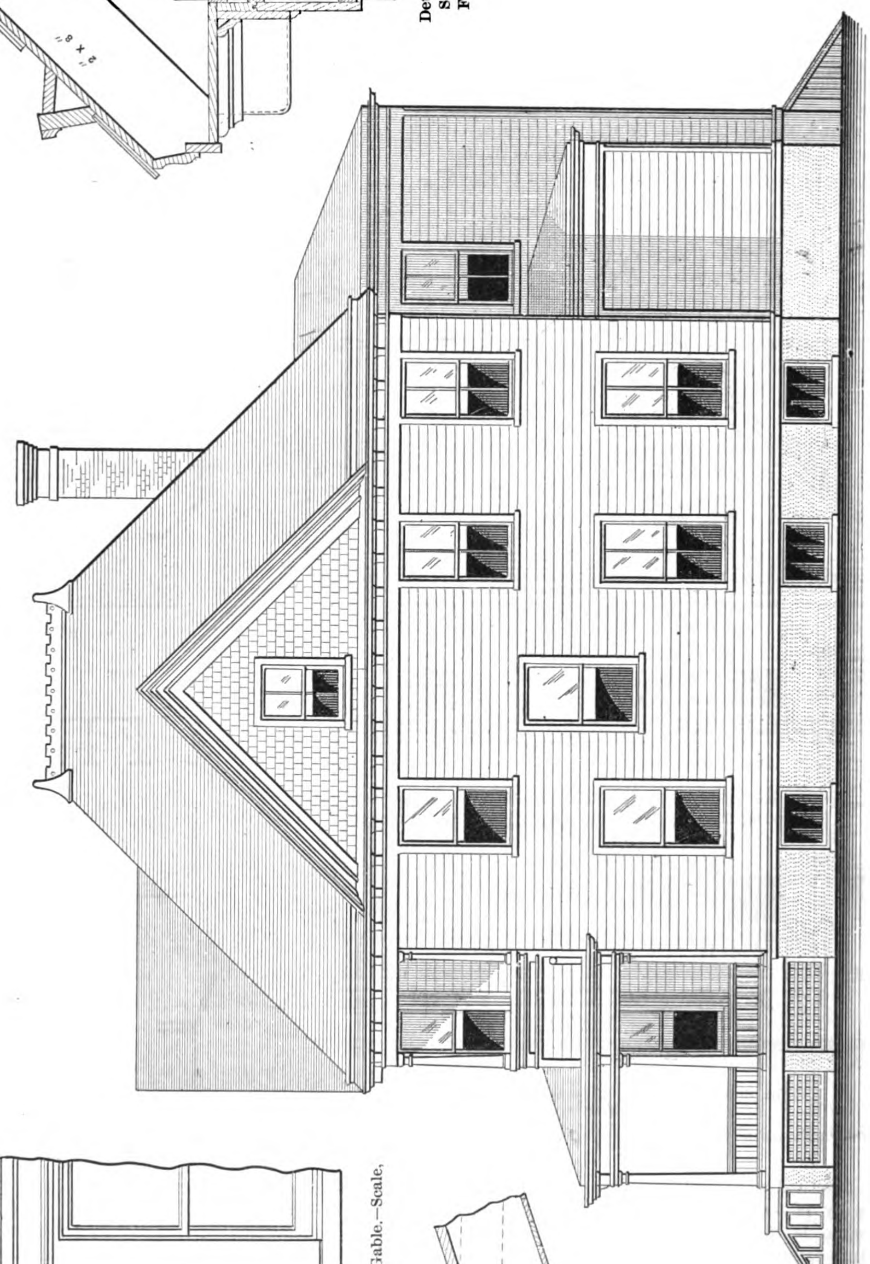
First Floor.

Scale, 1/16 Inch to the Foot.

the natural state. The hardware is of good quality, with all metal work of polished bronze. In the rooms indicated are hardwood mantels with open grates and tile hearths. The building is lighted with both gas and electricity and provided with call bells and speaking tubes. The plumbing is of the modern open type, and the heating is by means of steam with the double pipe system and direct radiation.

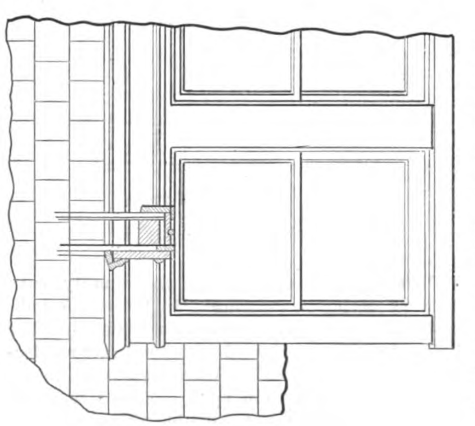


Detail of Main Cornice.—Scale, ¾ Inch to the Foot.

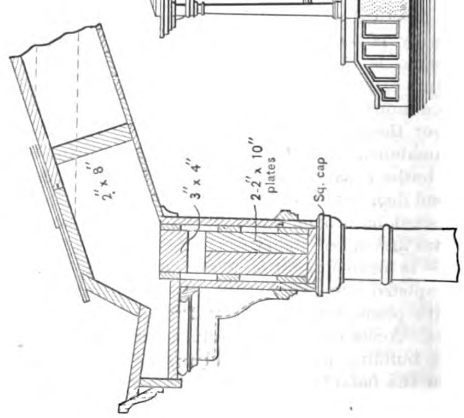


Side (Right) Elevation.—Scale, ⅛ Inch to the Foot.

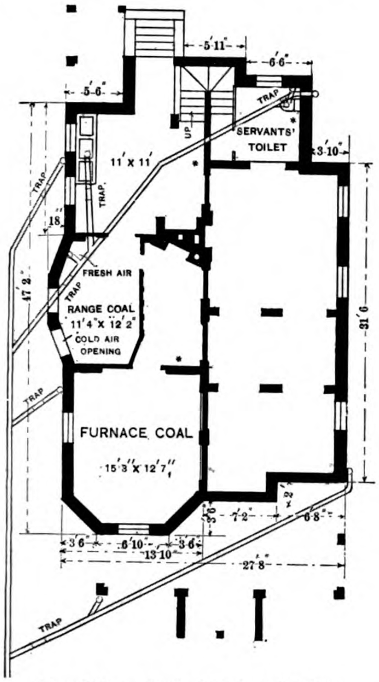
Miscellaneous Constructive Details of a Modern House at Elizabeth, N. J.



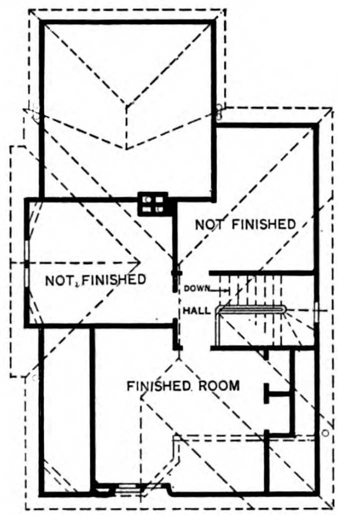
Details of Double Window in Side Gable.—Scale, ½ Inch to the Foot.



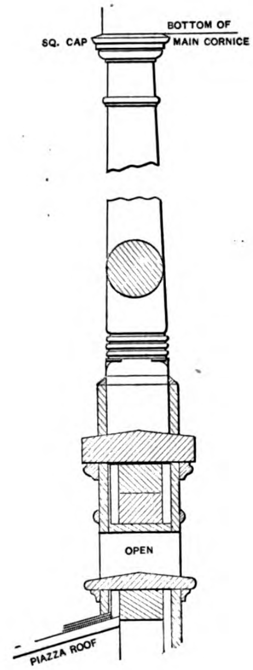
Detail of Piazza Cornice.—Scale, ¾ Inch to the Foot.



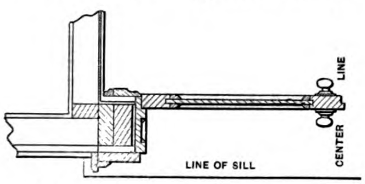
Foundation.—Scale, 1/16 Inch to the Foot.



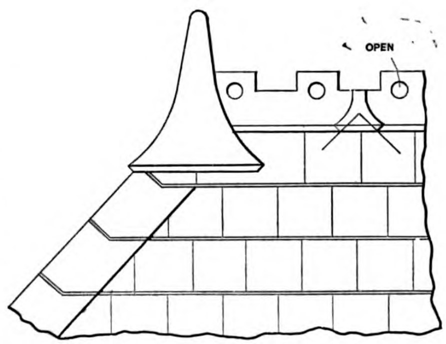
Attic.—Scale, 1/16 Inch to the Foot.



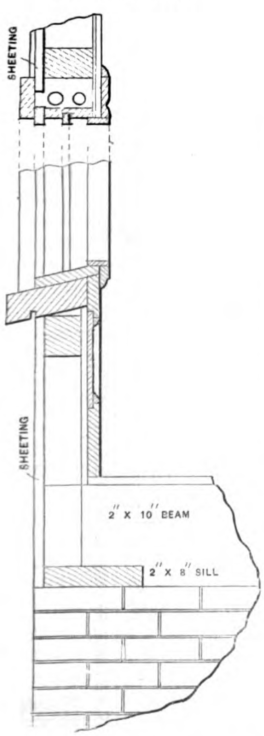
Detail of Balcony Rail and Column.—Scale, 3/4 Inch to the Foot.



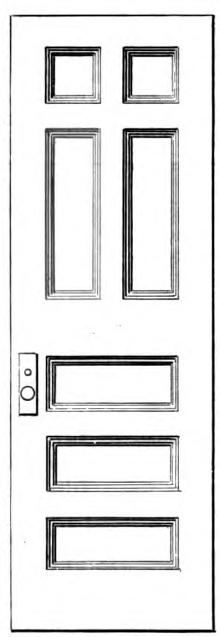
Horizontal Section through One of the Front Doors and Frame.—Scale, 1/2 Inch to the Foot.



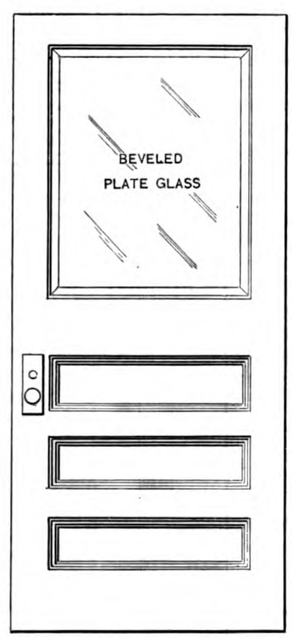
Cresting and Finial of Main Roof.—Scale, 1/2 Inch to the Foot.



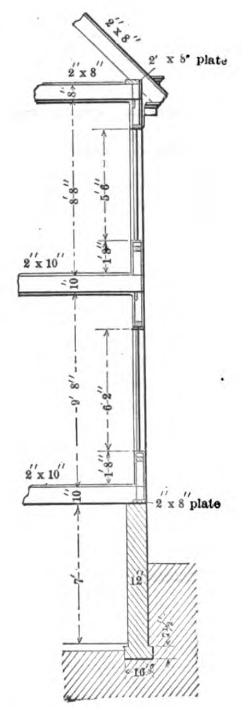
Detail of Window Frame and Panel Back.—Scale, 3/4 Inch to the Foot.



Elevation of One of Double Front Doors.—Scale, 1/2 Inch to the Foot.

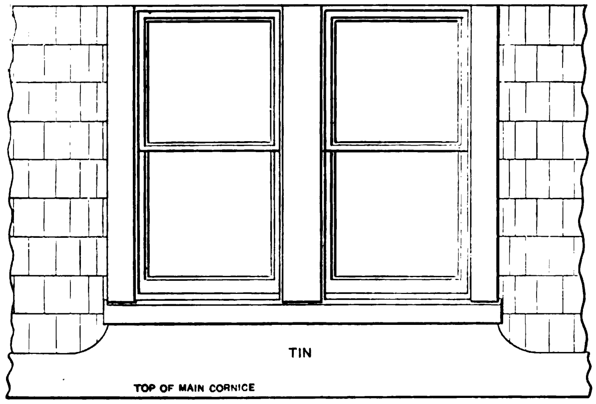


Vestibule Door.—Scale, 1/2 Inch to the Foot.

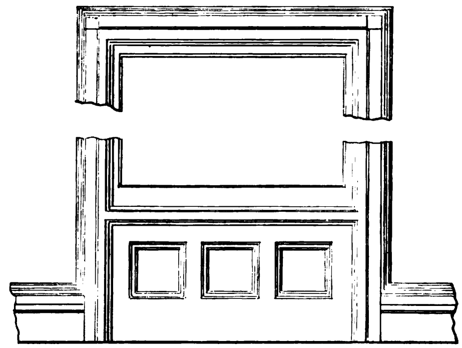


Section through Main Wall.—Scale, 1/8 Inch to the Foot.

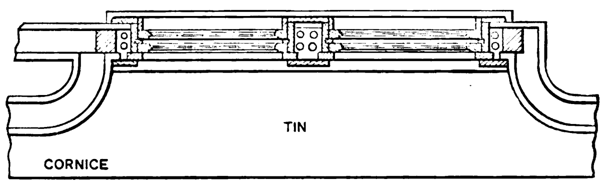
Miscellaneous Constructive Details of a Modern House at Elizabeth, N. J.



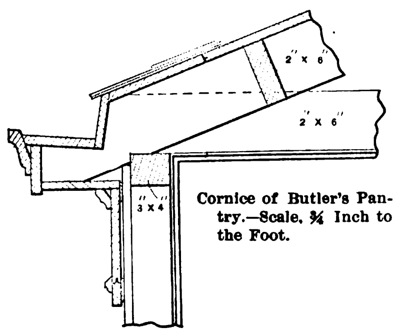
Double Window in Front Gable.—Scale, ⅛ Inch to the Foot.



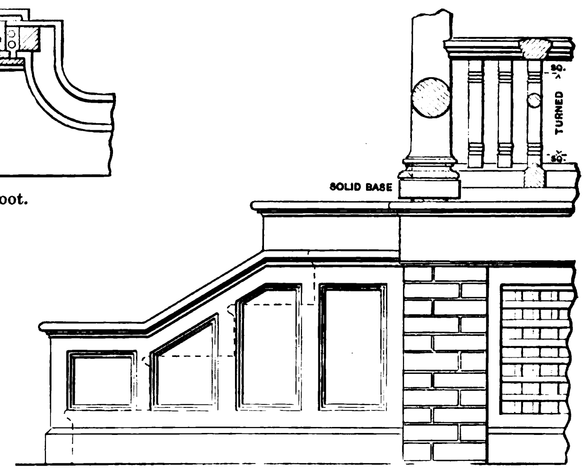
Detail of Trim of First-Story Windows.—Scale, ⅛ Inch to the Foot.



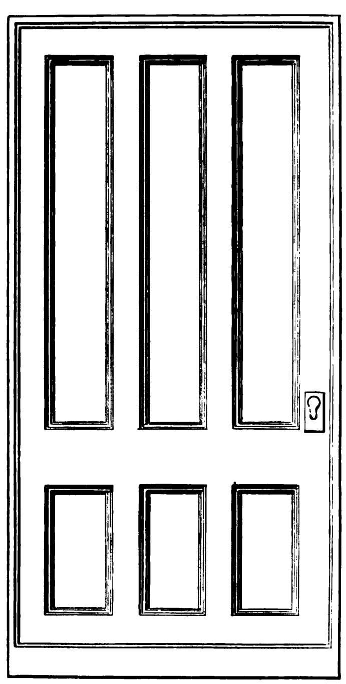
Plan of Double Window.—Scale, ⅛ Inch to the Foot.



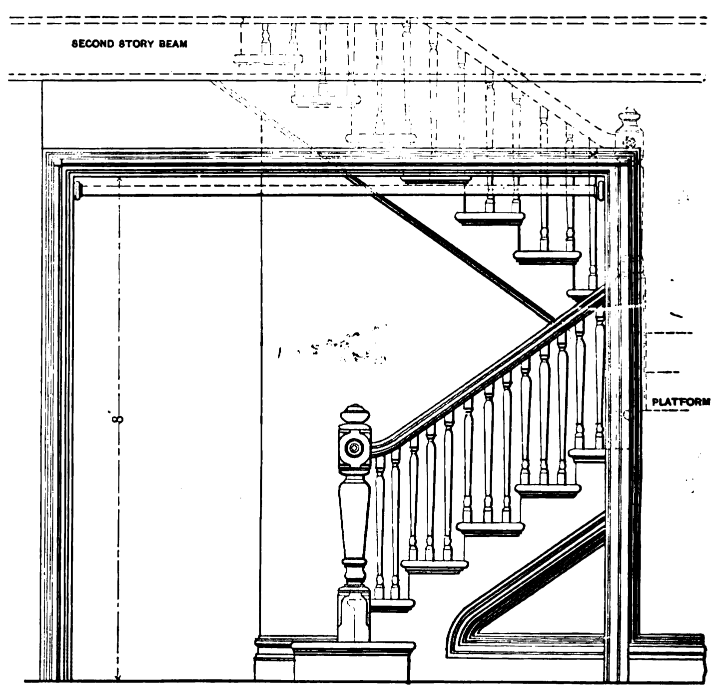
Cornice of Butler's Pantry.—Scale, ¾ Inch to the Foot.



Details of Front Piazza.—Scale, ⅛ Inch to the Foot.



Single Sliding Door.—Scale, ⅛ Inch to the Foot.



Stairway in Main Hall.—Scale, ⅜ Inch to the Foot.

Miscellaneous Constructive Details of a Modern House at Elizabeth, N. J.

DANGERS OF TALL STEEL STRUCTURES.*

IN laying the fire proofing every opportunity should be taken to anchor it together and to the metal. As often put on, there is no protection against the shock of the water in case of fire, and, as in the Pittsburgh fire, a large proportion is stripped off as soon as it is struck by the first water. Particular attention must be given to the protection of the lower flanges of the beams and girders. The architect should design the fire proofing and show the shapes and the anchorage. The use of cinder concrete must be condemned, as the cinders perish in a fierce fire. An aggregate composed of broken waste, fire proof material, or crushed blast furnace slag is far better and very satisfactory. None but Portland cement mortar should be used. The fire proofing should be the very best that the ability of the architect can devise and the fire proofing contractor execute. This is no place for economies that reduce quality, either in material or workmanship. None but the very best is worthy of consideration.

As to partitions, the Pittsburgh fire demonstrated that 4-inch tile partitions blew away into dust when struck by the water. The firemen testified that they seemed to melt away, and as a matter of fact little *débris* of disturbed partitions was found after the fire. A substantial partition can be made of T iron supports, well secured at top and bottom, and filled with concrete with twisted iron rods imbedded in it on the plan of what is known in the United States at the Ransome system. This Ransome system is more than a fire proofing; it is a system of construction. It is described in a recent book by Kidder—"Building Construction and Superintendence, Part I."

Concrete System.

The report of the adjusters of the Pittsburgh fire, employed by the insurance companies, in speaking of the Methodist Book Concern building in Pittsburgh, where the concrete system had been used, and which was scarcely injured, although everything combustible was consumed in the building, stated: "The fire resisting qualities of properly made concrete have been amply proved to be equal to, if not better than, fire clay tile, as shown by the series of tests carried on by the Building Department of the City New York."

In the Pittsburgh fire every particle of combustible material perished. The amount of such material in the construction of the building should be reduced to the minimum, particularly in a store. The base and the casings of all openings should be of concrete or metal. They can be as ornamented as desired. The wainscot should be either of cement or marble. Floors should not be of wood; concrete is recommended. Doors should be of metal. All stairs should be of iron. The treads may be of marble.

If there are any combustible buildings in the vicinity, near enough to be a menace, the openings either on alleys or on street fronts should be protected by fire proof shutters. Those of street fronts can be made to roll up into a pocket in the window head so as not to be a disfigurement. At the Pittsburgh fire, again, the rear shutters in the building, which were nothing more than wood covered with tin, stopped the fire and prevented much loss; without these shutters the fire would have spread into an adjoining theater building and no one knows where it would have stopped.

Until recently all the known plasterings were utterly destroyed in case of a very serious fire. They offered no protection to the lath or to the fire proofing. There is now on the market a new plastering made of asbestos mixed with lime, known as "asbestic," that, from personal knowledge, seems very promising. The reports of experiments state that it adheres firmly to any material on which we usually plaster and resists the fire completely, and that thus far none of it has ever been washed off in experimental fires. It is not only itself preserved, but it protects all that is behind it and is a valuable assistant in holding the fire proofing in place, which is very strong recommendation. The cost of this material on the walls is said to be no more than any of the good plasterings generally in use.

One of the dangers in a big store is due to the extensive area covered by inflammable goods. Substantial division walls, with a minimum number of openings, protected by fire proof doors, materially lessen the risk, as it is quite possible then to confine a fire to one compartment. In the wholesale business this subdivision offers no difficulties. In large retail stores, however, it materially injures the effect, and is so much objected to that an owner is rarely willing to admit the cross walls, claiming that through them he loses all the benefit derived from the big store, and that many of his customers come there originally simply to see the fine display and then make purchases. Against these arguments, of course, there is nothing to say.

Dangers of Lightning.

Lightning is not dangerous to the steel skeleton building. The entire skeleton, in fact, is a lightning rod of the most efficient type. It is closely riveted together, forming a continuous rod; the steel columns extend through the basement to a broad steel foundation below the basement floor, and are usually in a damp soil.

The iron water pipes in the building, too, are connected with the iron street pipes of the city water supply, which form a very effective ground connection. The same is true of the gas pipes, so that in the way of protection from lightning nothing is left to be desired. The Home Insurance Building in Chicago was struck by lightning on one corner some time ago, but the only injury was the displacement of a few bricks where the lightning entered the cornice to reach the steel, through which it was taken off harmlessly. There is no record of any person ever having been injured by lightning when in a steel or iron frame building, or when on board of a steel or iron ship.

Earthquake effects on tall buildings have always been matters of interested speculation. The native hut in the Malay Archipelago is the one building that is never injured by an earthquake. Its construction closely resembles the steel skeleton in its general engineering principles. Posts are set in the ground and the skeleton frame work is all notched and lashed together. The exterior is simply a covering to keep out the weather. The steel skeleton is much like a bird cage, firmly riveted together at every joint, so that the shaking of an earthquake might shake off some of the exterior masonry, but could not injure the building nor its inhabitants.

In building in an earthquake country, special precautions should be taken whereby any injury, either external or internal, could be entirely avoided, and one of these tall buildings would be as safe as the middle of a ten acre lot. The extra earthquake precautions are neither difficult nor expensive. They consist in putting in additional ribs in the partitions and external walls, to which the masonry is firmly anchored. In such a building all the partitions should be of concrete with steel rods imbedded in it.

A building constructed as herein outlined would be fire proof, cyclone proof, lightning proof and earthquake proof.

IN the foundations of the new Chicago Post Office piles have been driven to a depth of over 75 feet, these being surmounted by broad timber caps covered with a deep bed of concrete which forms bases for the stone piers, which in turn support the 208 steel columns carrying the building. It is said that in this foundation when completed there will have been used over 5000 piles, nearly 800,000 feet board measure of timber capping, 150,000 cubic feet of concrete and over 350,000 cubic feet of stone.

* Continued from page 126, May issue.

Effect of Sea Water on Mortars.

Some interesting observations relative to the action of sea water on mortars are contributed by E. Candlot, whose investigations in the harbor of La Rochelle cover a period of something like 40 years Blocks of 60 cm (2.36 inches) in length were exposed to the open sea from 1856 to 1875, and were above the water surface at low tide. The mortars were of hydraulic limes of different origin, of natural cements from Pouilly, Vassy, &c.; of artificial pozzuolanas mixed with lime and sand; of trass from Andernach, &c. Nearly all blocks had completely lost their cohesion after different periods. The few blocks of Portland cement experimented upon were in good condition; but blocks of neat cement (English and French) were decomposed. From these tests Viennot draws the following conclusions: 1, Neat cements are destroyed more rapidly than mortars of a certain composition; 2, mortars made of one volume of cement to one of sand, and, again, of one volume of cement to two of sand, are those which offer the greatest resistance to sea water. They will last for 20, 36 and 38 years.

Thurninger commenced new tests with blocks of masonry, and concrete made of lime and Speil mortar, with a length of edge of 40 cm. (about 1.6 inches). In 1895 the masonry blocks disappeared, their destruction having commenced four years after their exposure, and out of 32 concrete blocks only 26 remained, but they were in advancing decomposition. In 1880 other tests were commenced on blocks submerged, of various limes. Many of these have perished. "Out of 31 masonry blocks laid in Portland cement mortar, and submerged between 1881 and 1892, 23 are still intact, while some have commenced to disintegrate." Viennot points to the following conclusions: 1, Mortars of hydraulic lime, mixed in any proportion, in most cases commence to disintegrate after one or two years' immersion in sea water—they crumble into pulp after periods varying in length, but apparently not exceeding 15 years; 2, concrete resists better than masonry, owing to the greater density imparted to it by ramming; 3, rapid setting cements may commence to disintegrate after six or eight years, but may last longer than 38 years without crumbling; 4, the mortars offering the greatest resistance are those consisting of one part cement to one or two parts sand. This mixture corresponds to the weight of cement required to fill the spaces between the grains of sand. These, therefore, are the least porous mortars.

Construction of Slow Burning Dwellings.

A GREAT deal of attention has been given to the question of fire protection, or fire proof construction, so far as it relates to business and office structures, but comparatively little seems to have been given to the extension of the same principles to dwelling houses. In an article contributed by Francis C. Moore of the New York Board of Fire Underwriters to a recent issue of the *Engineering Magazine* he discusses the question of slow burning construction as applied to buildings intended for dwelling purposes, dealing with it in a manner which is of such obvious interest to a large class of the readers of this journal that we present the following extracts and accompanying illustrations:

It is possible, of course, by the exclusive use of iron and brick to construct a dwelling so that its owner may sleep complacently without anxiety as to fire; but such construction is expensive, and there are few fire proof houses outside of the largest and wealthiest cities. The majority of dwelling houses in the United States, by reason of the relative cheapness of lumber as compared with masonry, are of wood. Probably the dwellings of Europe are built so largely of masonry because wood is expensive and safer construction is an economic necessity. "For lack of wood the fire goeth out," but sometimes even in Europe not before it has wrought immense damage. While this article, therefore, is addressed especially to American practice, the principles and methods advanced are applicable on both sides of the Atlantic. If the writer, therefore, claims—and he does so claim—that it is possible to construct a dwelling house of wood throughout in the most economical manner, and yet by such methods as will probably prevent its taking fire or, in case of ignition, will so retard the progress of the flames as to admit of the escape of the inmates, if not, indeed, of the extinction of the fire without their being driven out of the building, he ought to find willing readers.

Prevention of Fires.

Flues.—In nothing is the adage "an ounce of prevention is worth a pound of cure" more true than in dealing with fire. Fortunately the precautions necessary to prevent fires are inexpensive, and quite within the means of any one who builds a home, for he can make his dwelling secure for less than he usually expends in unnecessary ornamentation. The main thing to be observed is the proper construction of chimneys, fire places, furnaces, &c. Probably 80 per cent. of the flues in dwellings throughout the United States are unsafe, being only 4 inches, or half a brick, thick. Where the walls surrounding a smoke flue are less than 8 inches thick they should be lined with burned clay flue lining. Ordinary, well burned drain pipe makes good flue linings, although it is best to use linings manufactured especially for the purpose. I advise lining all flues, however—even those having 8 inches of inclosing brick work. Where the chimney comes next to the weather the 8 inches will be worth all it costs in improving the draft of the flue, which would otherwise be chilled and result in a smoking fire place. The flue lining also improves the draft, and—what is more important—insures something that cannot always be counted upon at the hands of masons—a flue for the full uniform size stipulated in the specifications.

No floor timbers or other wood work should come within 8 inches of the inside of any smoke flue, or within 2 inches of the outside of such flue. It is, however, customary for carpenters, in fastening their work, to drive wooden plugs, or wedges, into the joints of the brick work. Where the inclosing wall is only 4 inches in thickness there can be but one result. The statistics of fires show that more than 20 per cent. of those occurring in the United States each year are due to defective flues. This means a loss of more than $20,000,000 annually and an inexcusable drain upon the prosperity of the country; for, although insurance companies pay a large percentage of the property loss, they must, in turn, recoup themselves by higher rates of premium collected from property owners, so it is equally a loss to the country.

Hearths.—All hearths to fire places should be supported by what are called "trimmer arches" of brick, illustrated in Fig. 1 of the accompanying engravings.

These arches rest at one end on the brick work of the chimney, the other abutment being on what is known as a "header" beam (also shown in the illustration), so that the hearth does not in any way rest upon wooden beams. This simple, but important, precaution is frequently neglected, and the most reprehensible carelessness, amounting to criminal indifference to the safety of human life, is to be observed in many of our most expensive dwelling houses. In one case coming to my notice, after the extinguishing of a fire in a costly dwelling, it was found that not only did the hearth of a fire place rest upon the wooden floor beams which had been carried under it, but the builder had actually swept the shavings and wooden rubbish into the space beneath the hearth before laying the tile.

While on the subject of hearths and flues, it may be well to note that the illustration, Fig. 1, shows what a chimney should be, and to say that the shape of the fire place, the inclination forward of the brick work of the back, the contraction of the throat, and the square shelf observed in the drawing are all necessary to insure a good draft and to prevent that most disagreeable feature of a home—a " smoky " chimney.

It will be observed that an ash dump has been provided and an ash chute. This costs nothing, and a person building can just as well secure it without extra expense, the bricks saved more than offsetting the labor of arranging the chute.

All chimneys should be built from the ground. Under no circumstances should they rest, as they frequently do, upon floor beams; and the frame work of the building should be trimmed clear of them, so as to allow them to settle without opening cracks or joints. Especially is this precaution necessary where the chimney passes through the roof. At this point it is sometimes customary to enlarge the chimney so as to form an overhang or projection. The shoulder so formed is almost certain to cause a fracture in the chimney at the most dangerous of all any case. This whole matter is more fully explained in Fig. 2 of the accompanying illustrations.

Furnaces.—These are fruitful sources of fires. They are generally provided with wooden cold air boxes. The result is that a back draft from the furnace will cause a fire; also dried leaves or other rubbish blown in from the outside are apt to ignite. Metal cold air boxes should in all cases be provided. They cost more money, but they insure the house as well as the health of the inmates. Wooden boxes open joints or seasoning cracks, and take the dangerous air of the cellar from wet coal, decaying vegetables, &c., sending it throughout the living rooms of the house, whereas a galvanized iron cold air box insures pure air from the outside. In this respect alone air tight metal cold air boxes are worth many times their extra cost.

Furnace Hot Air Flues.—These, where they pass between floors or wooden partitions, should be double, with an inner and outer pipe, separated by an air space of, say, ½ inch. It is well to stipulate also that the wooden studs in partitions shall be covered with bright tin, and

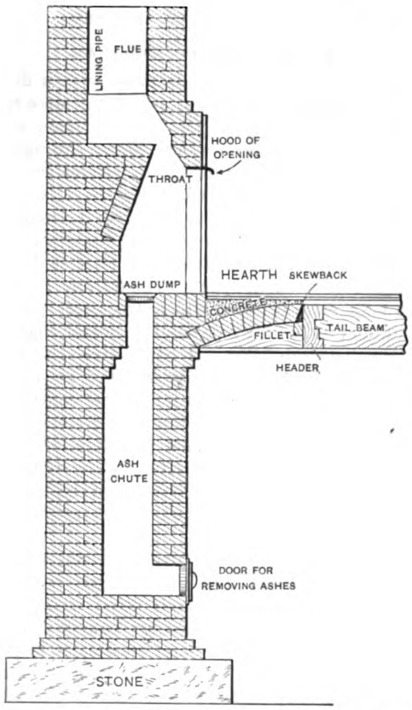


Fig. 1.—Vertical Section of a Properly Built Hearth and Chimney.

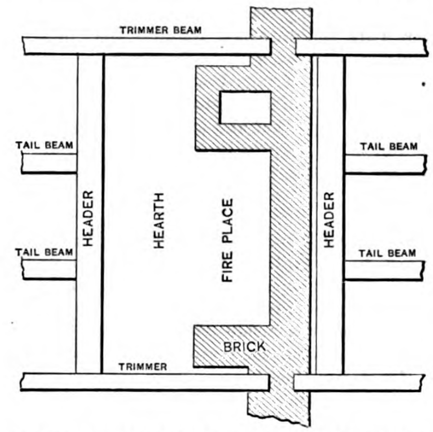


Fig. 2.—Plan View of Hearth and Fire Place Showing Headers, Trimmers and Tail Beams.

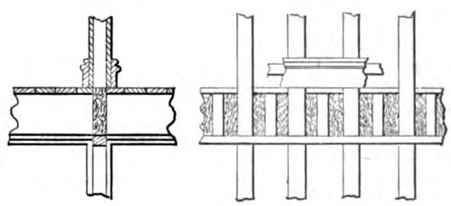


Fig. 3.—Construction Showing Fire Stops in Floors and Partitions.

Construction of Slow Burning Dwellings.

points, in consequence of the brick work settling faster than the wood work of the building.

All floor timbers should be trimmed clear of the hearths and brick work of the chimney so as not to be in contact with it at any point. This is easily secured by what are known as header beams, carried in front of the fire place, and at least 20 inches from the chimney breast, supported by the trimmer beams, which enter the wall at each side of the chimney. These should be at least 4 inches from the side of the chimney. The intervening tail beams, as they are called, are mortised into the header. Where more than three tail beams are framed into the header, however, it should be supported in stirrup irons (sometimes called bridle irons), by which the weight is carried on the trimmer beams without mortising into them by tenon and tusk joints, which sacrifice material and carrying capacity. In this way the floor beams are free of contact with chimney flues. The building law of New York City requires (what should not in any case be neglected) that all hearths shall be laid on trimmer arches of brick carried across from the chimney breast to the header beam already described, so that the hearth shall not rest upon or near wooden beams in an additional precaution, and one which will insure safety, is to fill the space in the partition around the pipe with gauged mortar—that is, mortar mixed with plaster of paris to insure hardness. Wooden lathings should not be used across the joists between which hot air flues pass; in all cases metal lathing should be employed.

Fire Stops in Hollow Partitions, &c.—Having considered precautions which tend to prevent fires from starting, it is next in importance to prevent them from spreading. Unfortunately most American structures are built upon plans which seem to insure the rapid progress of flame from the starting point to the roof. The inclosing walls of frame buildings, and all of the partitions which divide the rooms and hallways, are hollow; between every pair of studs, or joists, is a flue with a wooden lining of lath and plaster in which fire secures an easy passage. It is very easy to correct this fault, it being necessary only to fill in at each floor all spaces which lead to the floors above with incombustible material to stop a draft. Probably the best material is bricks and mortar, filling to a hight of about 1 foot, although mineral wool and other like substances may be employed. Even a few shovelfuls of mortar would, under ordinary circumstances, be sufficient. The accompanying illustration, Fig. 3, shows how this may be done. It is possible in this way to insure such slowness of burning as will enable the inmates to escape with their lives, or, better still, to extinguish the fire itself and save the structure with its contents.

Probably not 2 per cent. of the dwellings of the United States have been erected with regard to this simple but inexpensive precaution. That thousands of lives are not lost annually is due to the fact that fires seldom start in dwelling houses, rather than to proper precautions in construction. Even as it is, the mortality list is serious, and sufficiently large to justify the most stringent laws as to the construction of dwellings and careful official inspection of them while in process.

Buildings the inclosing walls of which are of brick or stone are usually furred off for plastering—that is, wooden strips are nailed against the wall, to which the plastering laths are in turn nailed to receive the plaster. This leaves an air space of about 1½ inches, through which flame finds ready progress to the upper levels of the building, working insidiously where it cannot be seen. The New York building law requires that in all furred walls the course of brick above the under side and below the top of each tier of floor beams shall project the thickness of the furring, to more effectually prevent the spread of fire—a most important and inexpensive precaution.

The following specifications would provide, in any contract for building, the various precautions I have suggested:

Specifications.

Chimneys and Flues.—The chimneys shall be carried up, as per drawings, from the ground. Above the roof black cement mortar shall be used, and all smoke flues shall be surrounded with 8 inches of good brick work, and shall be lined on the inside with a burned clay or terra cotta flue lining, from the bottom of the flue or from the throat of each fire place continuously to the extreme hight of the flue. The ends of such lining pipe shall be made to fit close together, and the pipe shall be built in as the flue or flues are carried up. All flues for fire places shall be of a capacity 8 x 12 inches, and the furnace and range flues shall also be 8 x 12 inches inside capacity.*

All flues which are not lined shall have struck joints; no parging or plastering will be allowed on the inside of any flue.

Fire Places.—Here limit hight of fire place—I advise 25 inches. The back of all fire places shall be inclined toward the front, beginning six courses of brick from the floor of the hearth, as per drawings (see diagram), to secure a good draft, and the fire places shall be lined with fire brick, laid with close rubbed joints (or with cast iron fire place lining, as per design and pattern specified, if cast iron is preferred). The front opening of all fire places shall be supported by two iron bars ½ x 2 inches, 9 inches longer than the width of the opening, and shall be fitted with automatic ash dump grate. This to be furnished by mantel man.

Furnish and set proper iron thimble in furnace flue.

The tops of all chimneys shall be laid in black cement mortar, and shall be capped with a 3-inch capstone, and the openings in the capstone shall correspond in size with the dimension of each flue, so that no shoulder or other projection will extend over the opening.

No chimney shall be enlarged where it passes the roof to form any overhang or projection over the roof.

The chimney walls from the cellar to first floor shall be carried up to form ash pits, securely inclosed with brick work, these to have 12 x 16 inch iron doors, with frame, in cellar, to be built in during construction. The contractor to furnish said iron doors and ash dump.

No chimney shall be started or built upon any floor or beam of wood, and in no case shall a chimney be corbeled out more than 8 inches from the wall, and in all such cases the corbeling shall consist of at least five courses of brick.

All hearths shall be constructed with trimmer arches extending 20 inches from the chimney breast to a skew back, or wedge shaped piece of wood, spiked to the header beam, and the top of the arch is to be filled with 2 inches of concrete to the top of finish floor.

The header beam shall rest securely in stirrup irons, to be furnished by carpenter, and there shall be no wooden lath or furring on the chimney breast.

It will be observed in Fig. 1 that the trimmer arch abuts upon a wooden skew back, or wedge of wood, securely spiked to the header beam. The skew back is, in turn, supported by a fillet of wood spiked to the beam. This is necessary to secure a proper arch. If the footing of the arch comes squarely against the wooden header beam, the shrinkage of the latter will in time release the arch and allow it to fall. It is unfortunately, however, the practice not only to omit this skew back, but to omit the trimmer arch altogether, and to support the hearth directly upon the floor joists. This is a most dangerous construction, and a fire is only a question of time. It seems incomprehensible that an honest builder having any decent regard for safety to life would build in this way; yet fires from this cause are frequent.

Furnace Hot Air Pipes, &c.

All hot air pipes shall be provided with a damper or valve at the furnace, and shall be of the sizes specified. The principal register shall be fastened open so that it cannot be closed. The heating pipes throughout the house to the various registers are to be constructed of the best (one cross) tin, and wherever they pass between floors or other hollow partitions are to be made double, with an air space of ½ inch between the inner and outer pipe. The wood studs nearest the pipe shall be lined with bright tin with air space. The lathing from stud to stud on both sides between which the pipes pass is to be of metal, and no hot air pipe shall be nearer than 3 inches to any wooden studs; and the contractor shall notify the carpenter as to studs between which hot air pipes are to pass to secure requisite separation. The contractor is to furnish said metal lathing and attach the same; and any hot air pipe entering a wooden partition, or passing between a wooden floor and the ceiling below, within 10 feet of the furnace, shall be made double, and shall be wrapped with ¼-inch asbestos board to a point 15 feet distant from such furnace.

The contractor is also to furnish a cold air box of 24 B B gauge galvanized iron of the best workmanship, double seamed and well braced, fitted with regulating damper so secured that the cold air cannot be cut off by negligence or otherwise, the outer opening to be protected with wire netting; and the inlet for cold air shall be so arranged as to supply an adequate amount of air to the hot air chamber of the furnace, and shall be at the top of the furnace between the cover of the hot air chamber and the cover of the furnace, in order to prevent the overheating of the furnace cover near the ceiling or wood work.

The contractor is to furnish also a metal shield of galvanized iron 1 inch larger in diameter than the top of the furnace, and suspend the same from the ceiling above the furnace so as to leave an air space between the shield and the ceiling.

Fire Stops.

Beam Filling.—The contractor shall beam fill all exterior walls between the beams with bricks laid in lime mortar to their top level, same thickness as wall.

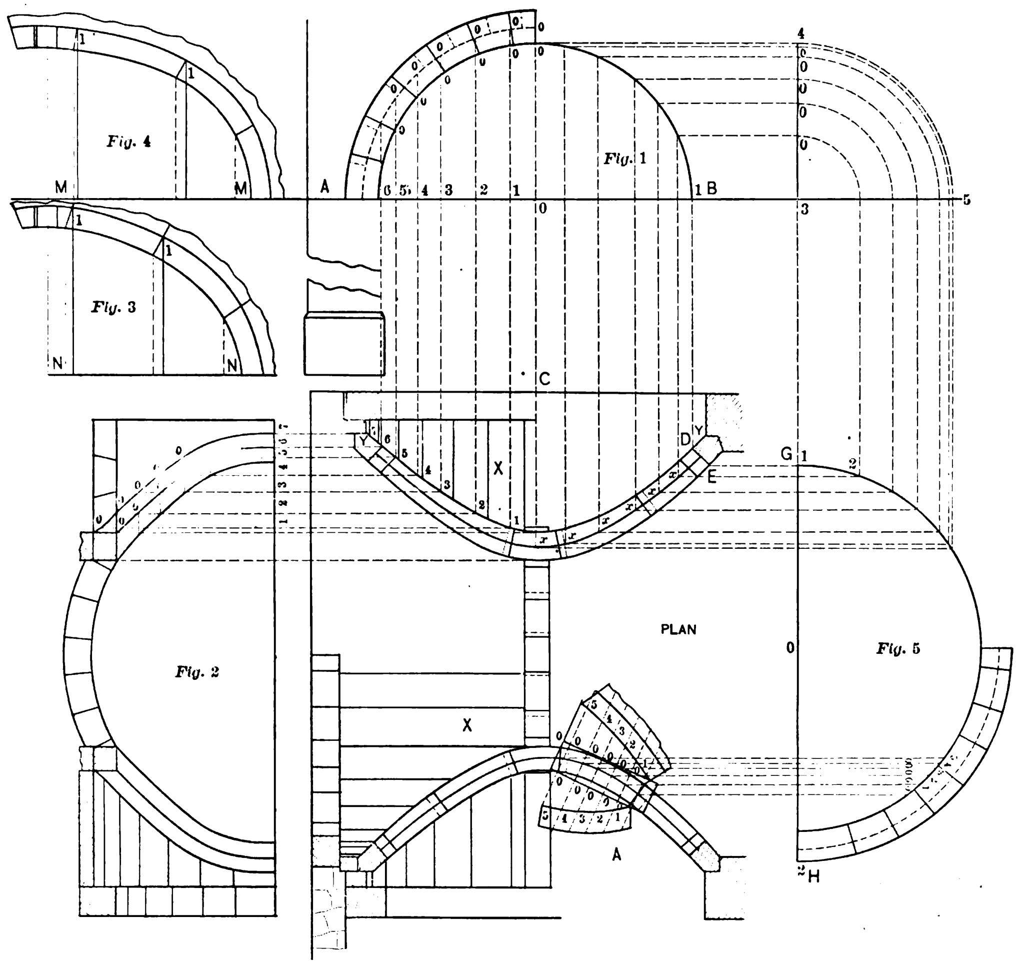
Fire Stops.—The contractor shall provide fire stops at each story in all hollow walls and hollow partitions. He shall fill in solid between all upright studs or timbers to the depth of the floor beams with suitable incombustible materials, using, wherever possible, bricks and lime mortar for the purpose. Where it is impossible for any reason to use bricks and mortar, he shall use sheet tin, which shall be carefully and closely nailed to prevent the passage of flame.

In all furred brick walls the course of brick above the under side and below the top of each tier of floor beams shall project the thickness of the furring, to more effectually prevent the spread of fire.

* If 8 x 8 inch flues be desired, so specify.

UNDERPITCH GROIN WITH RIBS.*

IN the April issue we discussed the underpitch groin, with the angle stones formed by the arches intersecting one another, while in the present article the ribs take the place of them. In such work as tunnels, where first-class masonry rules, the above is the most convenient method, but where the arches are exposed or above ground ribs give the groin a more finished and pleasing appearance. This method of underpitch groin can be used to advantage in the construction of a *porte cochère*, in open vestibules of churches or in temples. The use of ribs in a groin of this kind saves a great deal of time and expense, as a stonecutter would be able to cut a piece of rib in less time than he could an angle groin radius 0 1 of Fig. 1 draw a semicircle, as shown. With radius 0 2 of Fig. 5 erect another semicircle, the two being the basis curves to draw the ribs in plan, which will be a curved line. As the semicircles are the outside or face ribs of the arches, divide the smaller one into the number of arch stones required—in this case 11. From the several divisions draw lines parallel to the ground line A B to touch 3 4. With radii 3 0, 3 0, &c., draw quadrants to touch 3 5. From the different points draw lines parallel to G H to touch the curve of the large arch. Drop lines from each point in both arches, prolonging them till they meet in plan, as *x*, *x*, *x*, *x*, &c. Draw curves through these points which will be the center line of rib. On



Underpitch Groin with Ribs.—Showing Method of Laying Out the Ribs.

stone. We will endeavor to explain the different parts necessary for the construction of the work in as simple language of the stoneyard as possible. The foreman would probably receive from the architect, in the shape of drawings, a plan and cross sections properly figured. The patterns required for the ribs would be made at the shop, and to thoroughly understand the problem it is best to go over all the diagrams and get an insight into each part. Having the sizes of the different parts, the first thing to do is to lay out the plan, or enough of it to work from, as X X, the other parts being a repetition, or a careful man could work from an enlarged drawing to make the molds.

In order to draw the ribs proceed as follows: Let Y Y be the bases of the spring line of the ribs, and from D and E raise lines to the ground lines A B and G H. With each side of this draw the half thickness of the rib and it is complete in plan. Divide the plan of rib into any number of stones. If they are divided into short pieces they can all be worked from plan patterns. We have divided them both short and long, showing two methods of working. It will be seen that the rib is divided into seven pieces, three on each side of the key. The solid lines represent the joint lines at soffit, and the dotted lines the top or extrados lines, which will be subsequently explained.

Fig. 1 represents the elevation of the small end, the dotted curve and joint lines being the ceiling elevation with its divisions. Fig. 2 is a transverse section, the part on the left showing the ceiling stones with the ridge piece removed. On the right side the straight ridge is shown with radiating joints, this being necessary to hold in position, the divisions of the ridge depending on its

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length. The center is the curved ridge rib butting against the two angle ribs.

To raise the rib in section, Fig. 2, take any number of parts of the plan, as 1, 2, 3, 4, &c, and draw lines indefinitely to Fig. 2. Now erect lines to Fig. 1, cutting the dotted ceiling line. Next transfer the distances 1 0, 2 0, 3 0, &c., to Fig. 2, as shown. Draw curves through the points 0, 0, 0, &c. For the view of soffit, draw from the points 0, 0, 0, &c., lines parallel to the spring line, and erect from the corresponding points in plan to intersect them; then finish. The points are the same hight on the concave and convex sides, and are found on the plan where the lines touch the convex and concave sides that are used to find the central line x x x, &c., in plan.

We have made the springer equal to 1 2 on the left of Fig. 5, and in order to divide the ribs we will first draw a line parallel to D E of the plan. The other joints are drawn radially from C. To find the dotted top lines of the stone we first find a developed pattern of the convex side, as in Fig. 4. Find a line eqtual to half of the convex side of the rib, as M M, and the concave side, as N N. This can be done by stepping around with the compasses, or if full size by driving pins into the several points and bending a flexible rod. By doing this one can mark the divisions perfectly. Erect lines from these points equal in hight to corresponding ones in Fig. 1. The joints are drawn to suit the eye. Drop lines from the points 1, 1, 1 to the ground line; then transfer to plan. Draw dotted lines parallel to the solid lines. Transfer from plan the points for the joints of convex pattern, Fig. 3. In Fig. 5 is shown the half elevation of the large arch.

We will now proceed to cut the stones, taking the keystone, an enlarged view of which is shown in Fig. 6, for the first work. The size of stone required equals the plan pattern and the hight of the developed key of Fig. 4. The first work would be to work the top as a basis, which must be perfectly true and out of twist. Then lay on the plan pattern and mark the lines. Cut the concave and convex parts through; also the joint Y. Apply the part of the convex and concave required, as 1 1 for concave and 2 2 for convex, to mark the lines to cut the joints. The pattern marked 3 is for the springing part of curved ridge. The lines are all on the stone. It can then be finished. Fig. 7 is a sketch of the key and shows the corresponding numbers.

The springer is the next in order. Figs. 8, 9, 10 are an enlarged plan and developed patterns of the sides. The size of stone required equals the plan and the hight of Fig. 9. This piece can be sawn to the dimensions, which will save a lot of cutting. Assuming that the two sides and bottom are cut, we apply the plan pattern to get the line to work that part that goes in the wall. The reason it is cut to that shape is so that the stones of the ceiling at the springer shall have no feather edge. Apply the side patterns, Figs. 9 and 10, and finish by cutting joint and soffit. The line parallel to the soffit is the line of ceiling. This stone and the key are the only two that can be worked from plan patterns to an advantage. The intermediate stones have to be cut by another method—that is, by side patterns, which must be made according to the following explanation:

Inclose the stone A of the plan by lines and divide the center curve into several points, as shown. Draw lines from these points to touch the soffit of Fig. 5; also raise perpendicular lines from each of them. Then transfer the distances from Fig. 5 to these perpendicnlars, as 0 1, 0 2, &c. Draw curve through points; then draw a line parallel to it for the thickness of stone. Figs. 11, 12 and 13 show this clearer and also give the size of stone. To cut the stone, first work the two sides, 1 2 and 3 4; next enough of the soffit edge to apply the bevels. To find the lines of soffit at joint, as at Fig. 14, so we can obtain the points x, x for the pattern, Fig. 13, apply both patterns and work the soffit and joints. We are now ready to apply the patterns for the lines to cut the curved sides, but we will first find them.

In Fig. 15 make line 5 12 equal to the soffit line, Fig. 13; from 5 12 raise lines to these points, then take the distances 5 0, x 0, 7 0, &c., from plan, Fig. 11, and transfer them to Fig. 15. Draw curve through, which will be the center line on soffit. Take the pattern and hold it on the soffit, being careful to have the points x, x at the right place. Draw the line 0, 0, 0, &c., Fig. 15; on each side of this line draw half thickness of rib, which will give the lines to work the two sides. They must be worked by drafts cut plumb from the soffit. The ceiling stones require no explanation other than saying the patterns to cut the stones which butt against the rib are found by the method explained in April issue.

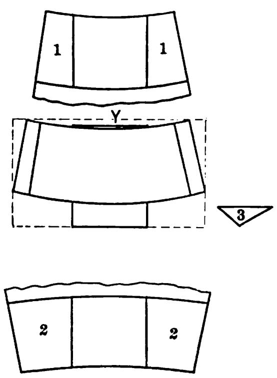


Fig. 6.

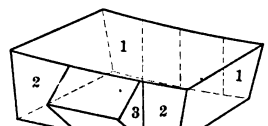
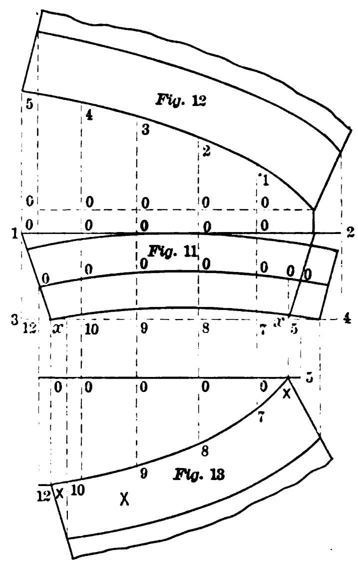


Fig. 7.



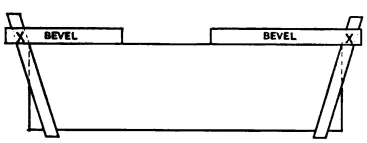


Fig. 14.

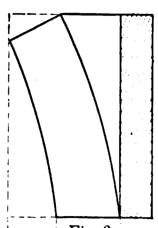


Fig. 9

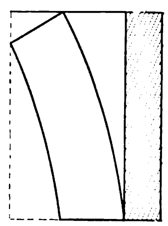


Fig. 10

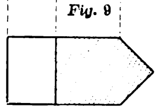


Fig. 8

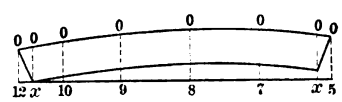


Fig. 15.

Underpitch Groin With Ribs.—Diagrams Showing Method of Cutting the Stones.

WHAT BUILDERS ARE DOING.

THERE is little change manifest in the general conditions of the building business throughout the country from that reported last month. The general state of affairs may perhaps be best described as quiet and waiting. War with Spain has undeniably affected many localities directly, and in others the uncertainty as to the duration of the war and its influence upon general mercantile conditions reflects a depression upon building. No serious labor complications have occurred during the past month and the present condition seems tranquil.

Atlanta, Ga.

Building Inspector Pittman of Atlanta is authority for the statement that the war is having its effect on the building interests in that city. Although this is one of the busiest seasons of the year with the contractors and architects, there is practically nothing doing in the building line on account of the war. Numerous small houses are being put up all over the town, but none of any importance. This time last year Atlanta was on a boom, new office buildings and magnificent residences going up on all sides. Mr. Pittman states that the cause of the delay in building circles is the fear of builders to invest their money in this period of financial unstability. As soon as the war is over the erection of sky scrapers will be continued. Last year was a record breaker in the number and value of new buildings put up in the city.

Baltimore, Md.

Secretary E. D. Miller of the Baltimore Builders' Exchange writes that the builders of the city are greatly interested in the outcome of the repeal of that part of the lien law giving the right of lien on building materials. As the law stands now a building may be liened only to recover unpaid wages of mechanics. It is hoped that the present law will prevent material dealers from selling building supplies to irresponsible contractors, as they can no longer compel an owner to pay for material sold to a contractor.

As the spring advances the activity in the real estate market steadily increases, and both architects and builders report a brisk business. The indications now point, if not to an actual building boom in Baltimore and its suburbs this season, to at least a larger volume of work than has been known for years. The material men have been busy for a month past supplying the increased demand for lumber, bricks, iron, glass, mill work, &c., and the number of houses now actually under construction exceeds by 20 per cent. that of any year since 1891 92. Most of this building, it is true, is confined to the Annex.

The Baltimore division of the Standard Oil Company has purchased a lot fronting 308 feet on Winchester street, and running back to the tracks of the Baltimore & Potomac Railroad. It has been inclosed by a substantial brick wall on three sides, with a stone wall and high board fence in the rear. It is the purpose of the company to establish a plant there with a capacity of 1800 barrels. Bricklayers and carpenters are now at work erecting stabling for the horses and sheds for the tank wagons. Work has been begun on the erection of two 30,000-gallon tanks.

Boston, Mass.

In spite of the fact that there seems to be a general feeling among the builders of Boston that business is being considerably affected by the war, there is a large amount of work being figured and already begun. The majority of the new work is confined to residences and apartment houses located in the suburban districts. Three public schools, one in East Boston, one in South Boston and one in Dorchester, are to be constructed this season on the most modern and approved plans, and notwithstanding the profusion of hotels in which Boston already rejoices, their number is to be still further increased, one in the North End and one on Copley Square having, it is understood, been already determined upon, while gossip has it that at least two more are being seriously contemplated. In some respects the war scare is likely to prove a stimulus to trade. New fortifications and repairs to old ones mean that much heavy masonry work must soon be under way, and the demand, always expanding, is likely to prove very brisk within a short time.

The question of a trade school for giving instruction in the building trades is again being actively considered, with good prospect of taking effective shape in the near future.

Buffalo, N. Y.

Work on the Buffalo Post Office building was stopped at the time of going to press by a strike of structural iron workers for a level wage of 30 cents per hour. The hoisting engineers, brick layers, tile setters and all workmen on the building were "out," but the contractor felt that the matter would soon be adjusted.

The stock company owning the building occupied by the Builders' Exchange, and who are composed of members of that organization, have elected the following officers for the ensuing year:

President, H. C. Harrower. Secretary, J. C. Almendinger.
Vice-pres., George W. Carter. Treasurer, Alfred Lyth.
Building Committee: John Feist, Henry Schaefer, A. A. Berrick, George W. Schmidt and Ballard I. Crooker.

Chicago, Ill.

On May 2 1500 Chicago stonecutters, bedrubbers, sawyers and hoisting engineers struck against the reduction of the wages of stonecutters from $4 to $3 per day. The employers' association announced in April that the cut would be made May 1, and were notified that the same would not be accepted. The workmen claim that their offer to arbitrate the difference was refused.

The building trade is feeling the evil effects of the war excitement. Last month the number of permits issued by the Building Department was 30 per cent. less than the corresponding month of last year.

The Building Trades Club, whose rooms were recently destroyed by fire, is still searching for a new home. Quarters in the Chamber of Commerce building are at present under consideration.

Cleveland, Ohio.

The present outlook for building in Cleveland seems to be less favorable than it was last month. Building Inspector Thomas reports 322 building permits issued for the month of April, representing an estimated valuation of $327,577. During April of last year 343 permits were issued, with an estimated value of $320,578. Inspector Thomas says he believes the war scare has a great deal to do with checking the big building boom which started this spring.

Columbus, Ohio.

Building Inspector Dauben reports a total of 74 building permits for the month of April, representing a proposed expenditure of $59,125. The new work is well distributed through the city, the largest amount being in Ward 10.

Denver, Col.

Building in Denver seems to have been somewhat affected lately by a supposed combination of contractors to raise the price of work. The architects and builders were at variance, the former claiming that the builders were pooling bids and otherwise combining for their private benefit. The contractors denied all charges against them and have taken action to clear themselves from the imputation of unfair dealing.

So far as can be judged at this time there seems to be about the same amount of building under way that has prevailed for the past year or two. There has been no labor trouble of serious significance for some time, and there is little prospect that work will be disturbed in the near future.

Detroit, Mich.

Building in Detroit still continues to feel the depression from which it has been suffering for several years past. It is stated that there will be less speculative building this year in dwellings, stores, &c., for the general market than usual, there being practically nothing done in this direction. On the other hand there is a greater number than usual of residences being built to be occupied by the owners. Among other building operations are the County Building, the new Wonderland Building, several public schools and business buildings, amounting in all to about $1,000,000.

Harrisburg, Pa.

Allen B. Rorke of Philadelphia has been awarded the contract for the new capitol building at Harrisburg, his bid being $325,000, with an additional $8000 if pressed brick is used.

Of the appropriation of $550,000 for its completion about $500,000 remains, after making all allowance for the 5 per cent. commission which Architect Cobb is to receive for his services and other expenses incurred, leaving $175,000 to be used in making other necessary contracts not embraced in the one given out.

The contractor is required to give a bond for $150,000 for the faithful performance of the contract.

Lowell, Mass.

Secretary Charles P. Conant of the Lowell Builders' Exchange sends the following account of the annual meeting of his exchange:

The reports that were presented and accepted were all satisfactory. That of the treasurer showed an increase in the surplus of $209 over last year.

The secretary reported the standing of the association at 62, an advance over 52 last year. The attendance during the exchange hour has shown an increase of 1000 over 1897. The interest in the organization has never been better.

Officers were then elected as follows: President, William H. Kimball; vice-president, Frederick O White; secretary, Charles P. Conant; treasurer, Clarence H. Nelson; directors, P. F. Conaton, Wm. H. Fuller, James Whitthet, Philip P. Conners, Patrick Conlan, Clarence H. Nelson.

At 7 o'clock in the evening the annual dinner was served, and later there was informal speaking, Mr. Kimball presiding. The general subject discussed was "The Relation of the Architect to the Exchange," and the majority of speakers were architects.

Minneapolis, Minn.

Minneapolis builders report building as being fairly active, though not equal to the business of recent years. The workmen's unions report most of their men employed, especially stone masons and bricklayers. The Master Plasterers' Association and the Plasterers' Union have established a joint agreement, the former pledging themselves to employ only union men.

New Orleans, La.

Building in New Orleans is reported as being unusually quiet, with little prospect of immediate improvement. The architects and contractors acting together are preparing a new building law for the city, which they hope to substitute for the old law now in force.

New York City.

The figures covering building operations for the first three month of the present year show a considerable falling off in the amount of work contemplated as against a year ago. Permits were issued for 946 buildings, estimated to cost $20,373,850, for the first three months of 1898, while for the first quarter of 1897 permits were taken out for 978 buildings, estimated to cost $22,468,890. This shrinkage is accounted for by the reduced amount of capital which is being put into office buildings, hotels, &c., the figures being $5,628,150 for the first quarter of this year, as against $10,071,000 for the first quarter of last year. The increased feature of the exhibit is in connection with flats and tenements, for which 491 permits were granted, to cost $12,151,600, as against 425, estimated to cost $8,812,000, in the first three months of 1897.

At the time of this writing there seems to be a prospect of a fight between the Building Trades Council and the Board of Delegates over the right of sympathetic strike. The trouble was precipitated by the action of the Plain and Ornamental Plasterers' Society, which supported the council in its opposition to the sympathetic strike. The following unions are represented in the council: Journeymen Stonecutters' Union, United Housesmiths and Bridgemen's Union, Manhattan local unions of the United Brotherhood of Carpenters and Joiners, Amalgamated Society of Painters and Decorators, Slate and Metal Roofers' Union and the Enterprise Association of Steam Fitters. Three of these unions are also represented in the Board of Delegates and have been ordered by the board to withdraw from the council. The Builders' League, an organization of employers, has taken a hand in support of the position of the council.

Employers in the building trades are growing more and more restless under the constant irritation created by the methods now in vogue among the unions for securing their ends. There seems to be no opposition to the existence of organization among workmen; in fact, there is a strong feeling in favor of properly conducted unions, but employers have been so hindered by feuds between labor organizations and other causes for which they feel that they are not responsible that they are casting about for some plan to improve the condition of affairs. The principal point of friction is the walking delegate. A plan is being agitated looking to the substitution of trade stewards for walking delegates. These stewards are not to draw salaries, as the walking delegates do at present, but are to consist of committees of actual workmen appointed by the unions for conference with the employers when differences arise. Several trades are considering the advisability of following the lead of the stonecutters. The master stonecutters recently locked out the members of the regular union, hired other men and organized a new union, which within six weeks boasts a membership of 800. The success of this movement and the welfare of the building trades—both employers and workmen—has developed an active interest, which has taken shape in frequent consultations among employers, for the purpose of devising some plan which will meet the needs of the situation.

The old agreement between the bricklayers' unions of Manhattan and Bronx Boroughs and the Mason Builders' Association was recently renewed and signed for another year at the rooms of the Mason Builders' Association, 1123 Broadway. The agreement was signed by one delegate each from Bricklayers' Unions 4, 7, 11, 33, 34, 35, 37 and 47, and an equal number of representatives from the builders' association. The renewal of the agreement was somewhat delayed by the strike and lockout of the stonecutters.

Bricklayers' Unions 4 and 7 decided to allow their members to resume work on all jobs where the stonecutters had quit work or been laid off.

On April 22 a meeting was held at the rooms of the Building Trades Club looking to the establishment of a national association of manufacturers of architectural iron work. At subsequent meetings a constitution and by laws were drafted and the name National Iron League adopted. The object of the league, as set forth in the constitution, is to lawfully foster, protect and promote the welfare and interests of persons actually engaged in the manufacture of architectural iron and steel work. This league shall have nothing to do with the fixing of prices on work or materials of any kind. W. R. Brown of Indianapolis, Ind., was chosen president, William H. McCord of New York City first vice president, Charles C. Schrieber of Cincinnati, Ohio, second vice president, W. H. Winslow of Chicago, Ill., secretary and treasurer. There were 14 directors elected, distributed over 12 States, New York State being given two—namely, J. M. Cornell and B. E. J. Eils. We understand that the next meeting of the League will be held in Chicago in February, 1899.

An idea of the amount of building in prospect in the city of Brooklyn may be gathered from the number of permits issued during the month of April, together with their estimated cost. The permits covered 91 brick buildings and 213 frame structures, involving a total estimated outlay of $1,154,827. Permits were also issued for 272 alterations, estimated to cost $220,917.

At the annual election of the Architectural League, held May 4 in their rooms in the Fine Arts Society Building, 215 West Fifty-seventh street, Bruce Price was re-elected president, C. S. Lamb first vice-president and S. W. Ruckstuhl second vice-president.

Philadelphia, Pa.

The corporate members of the Philadelphia Master Builders' Exchange at a special meeting recently adopted a new set of by-laws, making radical changes in the organization. These are in accordance with a plan conceived several months ago, to increase the membership and usefulness of the exchange. The most important change is in the classification of membership. This under the old by-laws consisted of two classes, corporate and non-corporate. The new by-laws provide for three classes—corporate, associate and honorary. To the first of these only those actively engaged in the building trades will be eligible; the second will consist of dealers in material and agents of such dealers, and the third of persons who for any reason satisfactory to the exchange may be elected by the corporation.

The union bricklayers and their employers have reached an agreement for a sliding scale of wages, with 37½ cents per hour as the minimum rate for an eight-hour day and a Saturday half holiday from May 1 to September 1. This schedule was arranged by a Conference Committee composed of members of the Journeymen Bricklayers' Protective Association and the Bricklayers' Company, the employers' organization. The minimum rate of wages heretofore was 45 cents per hour for a nine-hour day, and the reduction in the rate caused some dissatisfaction among the journeymen, while the reduction in the hours constituting the working day met with opposition from some of the employers. This dissatisfaction, it is said, can have no effect on the schedule, as the agreement was signed by authorized representatives of both organizations, and the schedule must stand for the current year.

Pittsburgh, Pa.

The Pittsburgh chapter of the American Institute of Architects is holding its first annual exhibition in the art galleries of the Carnegie Institute. The exhibition is very complete, embracing designs and sketches of new and old buildings, sculpture, stained glass, decorations, &c., and is attracting considerable attention and large attendance.

The union carpenters have been contending with the employers on the question of hours and wages, and state that it is expected that the eight-hour day will go into effect on July 1, the wage clause to be embodied in a minimum figure of $2.25.

The carpenters' council had decided some time ago to stand for 30 cents an hour on June 1, but this will not be done if the eight hour day is granted.

The masons and bricklayers of Pittsburgh and Allegheny have secured a minimum wage scale of 40 cents per hour from the employers without a strike. Over 1000 bricklayers are affected by the new scale. Heretofore the men have been working without any established rate or hours, the wages ranging from $3 to $4 per day.

San Francisco, Cal.

At a meeting of the Board of Directors of the Builders' Exchange held a short time ago the following officers were elected and appointed to govern the exchange for the coming year: S. H. Kent, president; G. V. Daniels, vice-president; James A. Wilson, secretary; E. B. Hindes, treasurer; S. D. Worth, financial secretary; William Cobb, attorney; W. E. Ashland, doorkeeper.

St. Louis, Mo.

Again the old feud between the St. Louis bricklayers and the Master Builders' Association has been renewed, and as the result a strike is on. Twenty brick masons employed on the Hamilton-Brown Building at Eleventh street and Washington avenue quit work recently. At the same time, at the McCarthy Building, Eleventh and St. Charles streets, 15 men threw down the trowel. The bricklayers claim the association is trying to impose on them and retain certain rights heretofore conceded to the workmen. It is also intimated that the masons are trying to break up the Master Builders' Association.

There is a strike of carpenters in force at the time of this writing for an increase of wages to $2.80 per day. The employers are willing to grant the increase, but the union will not permit its members to return to work until the employers sign a contract to pay the wages named. This the contractors refuse to do. The carpenters of East St. Louis, Ill., are following the lead of their fellow workmen across the river and considerable obstruction to the progress of work is the result.

Toledo, Ohio.

The builders of Toledo report that there is a prospect of a busy season in 1898. With but few exceptions local architects have their hands full in preparing plans for many different kinds of buildings, such as business blocks, apartment houses, flats and private dwellings. Contractors at the Builders' Exchange rooms in the Gardner Building are busy figuring on these plans, and very few outside contractors succeed in securing local contracts. Many of the large real estate dealers are figuring with local and outside capitalists on the sale of valuable tracts of property in and about the city.

Zanesville, Ohio.

About 25 or 30 of the contractors of the city met recently in the convention room of the court house and organized a Contractors' Club. E. L. Winchell was made chairman and W. S. Frazier secretary.

After a brief discussion of plans the chairman nominated the following Committee on Incorporation: A. J. Sheppard, W. S. Coulson, W. S. Frazier, Charles Shaw, A. W. Evans, E. L. Winchell and E. C. Hatcher.

Another meeting will be held when the incorporation papers are received for the purpose of perfecting a permanent organization.

Notes.

At the meeting of the Master Plumbers' Association, at the Builders' Exchange, Baltimore, April 29, the Baltimore delegates to the national body, which recently met at San Antonio, Texas, detailed the proceedings of the convention. The returned delegates were John Trainor, P. T. Barry, D. N. Sullivan, A. W. Beam, J. F. P. Carey, H. D. Krothe, P. A. Sullivan, C. H. Frederick, M. J. Delaney, A. G. Hassel, Samuel Bennett and Aug. Erdman.

ONE of our Northern contemporaries in referring to the scarcity of timber in Great Britain shows by comparison the extent to which wood is employed in that country and in the United States. It is stated that the annual consumption in England is placed at only 18 cubic feet per capita, while in this country it is about 350 cubic feet. The introduction of iron and steel in building construction, however, has greatly lessened the use of wood for this purpose in the large cities of this country, and in the opinion of the paper referred to is destined to restrict its employment to a much greater extent in the future. This change is referred to as being opportune in view of the great scarcity and costliness of white pine and other varieties of timber largely used in building construction.

CORRESPONDENCE.

Laying Out Mortises and Tenons in Heavy Framing.

From JAMES F. HOBART.--It is generally regarded as the fashion in connection with heavy frame work, like the flumes of mills, dams, &c., to lay out each mortise and tenon with the aid of a steel square and a sharp awl, supplemented with a lead pencil. While it is true that the best of work can be done in this manner, the operations are necessarily slow. Laying out the frame of a house in this way, although still followed by some carpenters, and especially by those who have worked at millwrighting, is altogether too slow and antiquated a plan to be followed for a single hour. In Figs. 1 and 2 of the accompanying sketches I show the method of applying the steel square when laying out a mortise in the old way. First the ends of the mortise are struck, as indicated at A and B, and while the square is in the position indicated the mark C is made for the working side of the mortise, which is always the narrower side unless the two are equal. In practice I like to mark the cut off at the end of the timber first, or if it does not need cutting off I place the square over the end of the stick and mark back along the blade the 1½, 2 or 3 inches required for the shoulder.

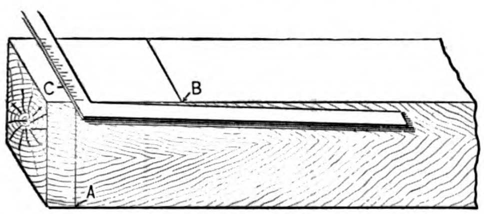


Fig. 1.—First Position of the Steel Square in Laying Out a Mortise in the Old Way.

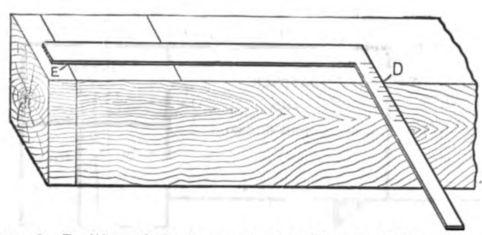


Fig. 2.—Position of the Square for Marking the Sides of the Mortise.

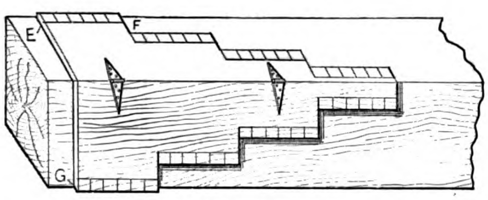


Fig. 3.—First Position of Home Made Tool Used in Laying Out Mortises and Tenons.

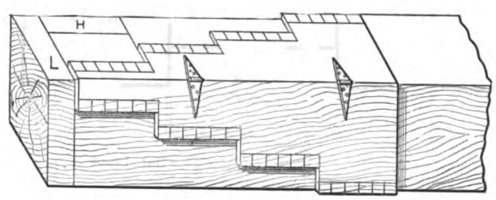


Fig. 4.—Reverse Position of the Tool.

Laying Out Mortises and Tenons in Heavy Framing.

This makes sure that there is no projecting corner to give trouble later on.

If a tenon is being struck the same method is followed, going entirely around the stick, but working in both directions from the face corner. The ends of the mortise or shoulder of the tenon being thus treated, the sides are marked by reversing the square, placing the inside of the blade at E fair with the mark C previously made, and taking the same distance—in this case 2 inches—on the tongue of the square, as shown at B. Now by holding the square firmly with the thumb and fingers of the left hand both sides of the mortise of the tenon can be marked, but great care is necessary to prevent the slipping of the square. If there is any wane on the stick it is hard to tell when the mark D is exactly in line with the vertical face of the timber, and this matter must be determined by sighting down the side of the stick. It is also necessary to drop the blade of the square a little further, as at B, when squaring across a wany stick. At best the steel square is a very unsatisfactory tool, in my estimation, when laying out mortises and tenons on very wany or half round timber.

The device illustrated by means of Figs. 3 and 4 is a much handier tool and is home made, although it would be a good one for the tool makers to improve upon and manufacture. I have frequently seen crude tools of this kind used in laying out frames, but I have never seen any one else have a tool like the one which I shall proceed to describe. It is made of well seasoned pine ¼ inch thick, three thicknesses being glued up to form a board 8 inches wide by 24 inches long. The boards are then mitered together lengthwise, as shown, and a pair of ornamental brass hinges put on, these being clearly indicated in the sketches. Each part of the board is then notched into four steps of 6 inches each, being made 1½, 3, 6 and 8 inches respectively. The other side of the tool is divided into 4, 6 and 8 inch steps, each 6 inches long. If much heavy work is to be laid out it will pay to make one side 1 inch wider, thus securing 1½, 3, 6 and 9 inch steps on that side. The notched edges of the board are finished with a great deal of exactness, and after cutting a little scant the edge is bound with a heavy strip of sheet brass, which is shaped and screwed to the marking edge. The marking edge, and the end as well, is marked off in inches and quarters, the same as a framing square, and this proves a great convenience when using the tool.

In order to lay out a mortise, slide the tool along until the end comes flush with the longest corner; then mark the end of the mortise, as at E of Fig. 3. At the same time mark the other end of the mortise, F, Fig. 3; then slide back the marker and strike that line after having first struck the line E. Next reverse the tool and select the width of shoulder required—2 inches in this case—and mark alongside the board on the timber. This fixes one side of the mortise or tenon, and a mark alongside the right width of tool finishes that mortise in very quick time.

Painting Bricks.

From E. J. OLIVER, *St. Martinville, La.*—Will some one who has had experience with paint tell me the best way to make red paint adhere to bricks? In my experience I have not succeeded very well, as the dampness in the bricks makes the paint fall off. I have used a cement wash which does very well, but I find some people want paint and to strike white joints.

Leaky Chimneys.

From ALLEN SYLVESTER, *Reading, Mass.*—In regard to leaky chimneys, as mentioned by "A. W.," Winnebago City, Minn., in the last issue of the paper, I would say that the leaks are probably due to improper flashings, which do not usually have more than ½ inch lap and are not properly shingled in. Even with the greatest care it is almost impossible to keep out the water during the furious driving rain storms we have, especially if the house is located in an exposed position. For the purpose of illustrating how the wet will penetrate, I will say that I have frequently seen wet spots on the inside of the boarding of a house where the driving rain has followed the clapboard nails clear through. This was before the house was painted or plastered. Even where the chimneys are properly flashed ice will sometimes form inside and crowd the flashings away from the chimneys so that rain can drive in. My remedy in such a case is to stuff in a lot of elastic cement and then fasten the flashings up tight against the chimney again. Where a broad chimney comes out low down on a roof, as, for example, near the gutter, the flashing on the upper side should be a single sheet and should enter the chimney at least 5 or 6 inches up. It should also run up on the roof some 1½ to 2 feet, no slate or shingles to come within a foot or more of the chimney on this side. Zinc is hardly durable enough and I would suggest the use of 4 or 6 pound lead, or, better still, 16-ounce or 18-ounce copper. The laps should be 3 or 4 inches or more on the sides.

From CANADIAN.—If "A. W." of Winnebago City, Minn., will tell us where his chimney leaks it will be possible to prescribe for it. If he means the roof leaks where the chimney shaft pierces it the answer is very simple—that is, put a saddle behind it and have stop-flashing built in the chimney to attach to the saddle and to run down the slope of the roof. If he wants to prevent rain from getting in to the opening of the chimney at the top, though I cannot see the necessity for this, he can adopt the method suggested by the editor, or he can throw a barrel arch over the top, leaving openings on two sides, taking care not to have these openings front the direction from whence come prevailing winds or another blessing may arise in the shape of a smoking chimney.

Design for a Small Opera House.

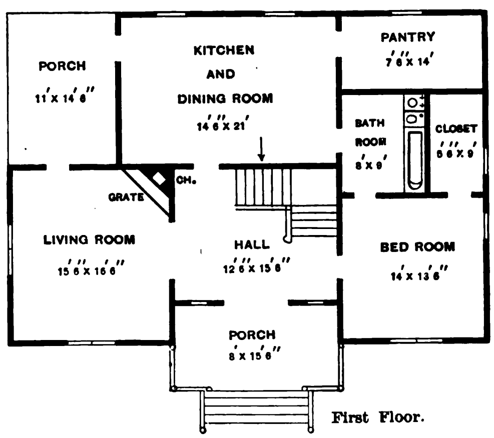
From C. K. S., *Wayland, Iowa.*—Will some of the architectural readers of the paper submit for publication floor plans for a small opera house, capable of seating, say, 400 people? I shall be very glad to have some one take up this question, so that the sketches may be published in the next issue.

Laying Copper Valleys.

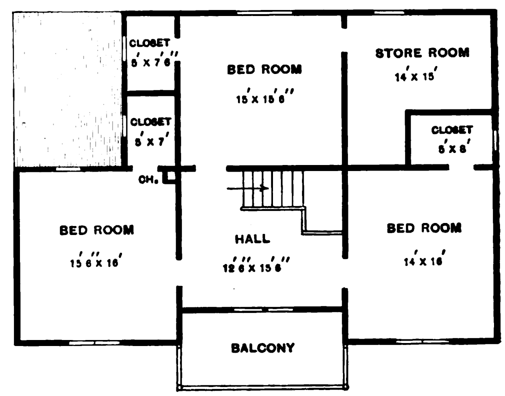
From H. T. F., *Ontario.*—Replying to the inquiry of "C.," Mansfield, Ohio, in the March number, I would say that the best method is to strip the valley of the slate, take away the old material used to form the gutter and then lay down the copper in as long lengths as may be convenient. I once had a similar job in Milwaukee and the owner insisted that I insert the new gutter, which was of sheet lead, under the slate. Owing to the pliable quality of the metal it was found impossible to make a good job of the work, and after breaking a number of slate and wasting considerable time that method had to be abandoned and the valley stripped far enough back to admit of the lead being properly put down, after which the slate was relaid. This roof was considerably flatter than that referred to by "C.," being a little more than one-third pitch, and on this account would be easier to work upon than one of two-thirds pitch, which "C." says is the pitch of his roof. The correspondent will find it more economical and easier to make a good job and a certainty of results by stripping the valleys and doing the work in a systematic and workmanlike manner, rather than botching it by driving the copper under the slate, thereby breaking many of them and loosening others, besides finding it impossible to make close joints of the copper at the lapping.

A Girl's House Plans.

From A. B., *Wellington, Ohio.*—My father is a carpenter and subscribes for *Carpentry and Building*, in which I also am interested. I have tried to draw house plans a little, and I send my third and best one, which you may print if thought worthy. As I am only 14 years old, and a girl, I have not had much experience, so papa helped me about heating the rooms. The plan is exactly like the original, except that the order of the bathroom and closet is reversed, and I changed it at my father's suggestion.



First Floor.



Second Floor.

A Girl's House Plans.—Scale, 1-16 Inch to the Foot.

The arrow shown on the plan of the kitchen indicates the cellar door. The house is intended to be heated either by stoves or a furnace. A sink might be put in the pantry, a chimney in the corner of the bathroom and a stove or range with boiler in the kitchen, so that water can be piped from the boiler to the sink and bathtub. I would like to know what others think of the arrangement.

Glass Surface for School Rooms.

From R. H. D., *Lancaster, Pa.*—Will the practical readers of the paper inform me how many square feet of glass surface should be placed in a well lighted school room? I am about to build a school house, and one of the professors states that one-fifth of the floor surface is the correct rule. Now, the trouble comes from the fact that the rooms are 16 x 21 feet in size and 12 feet high. I proposed to make the frames between the brick jambs 4 x 8½ feet and fill in with sash and glass, but he is not satisfied. I can only get light from one side of the building.

Note.—This is a question in which many of our readers should be interested, and we trust they will feel free to express their opinions as to the points involved.

Position of Leather Belt on Pulley.

From C. H. L., *Fairfield, Maine.*—In answer to the question submitted by "C. E. G.," Frederick, Md., in the March issue of the paper, I would say that having had a wide experience in connection with belting and machinery driven by means of it, I take pleasure in submitting the following suggestions: Always run the smooth side of a leather belt—that is, the hair side—next the pulley, if you would gain the most friction from the least belt surface. The face of the pulley should be perfectly smooth, and then the smooth side of the belt will conform to it with exactness, and is far less liable to slip. Never use soap on a belt to make it carry its load. Keep the belt soft and pliable by the use of belt oil. Keep it well laced and not overstrained and you will have little or no trouble.

Door and Window Clamps.

From G. J. SHUSTER, *Millersburg, Iowa.*—I notice in the January number of the paper a sketch of a door clamp to hold a door in place while fitting. I use a clamp myself for this purpose, but as it is somewhat different from the one illustrated I send a short description of it, with sketches, for publication. In Fig. 1 are shown front and top views of the device, while Fig. 2 represents a door held in position for fitting and planing. This device holds the door solid and firm, as one edge of the door rests on the floor while the clamp holds it firmly near the top. The clamp is fastened on the door jamb, opposite the side from which the door is hung. I also send sketches of a window jack, shown in Fig. 3, for holding sash while fitting. This I consider a very handy device. I generally make a clamp and jack in connection with each job, as this saves moving them around, as it is only a minute's work.

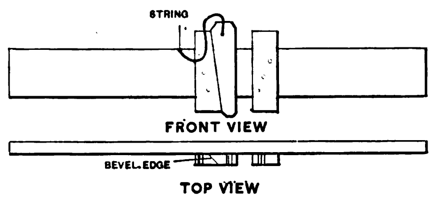


Fig. 1.—Front and Top Views of Clamp.

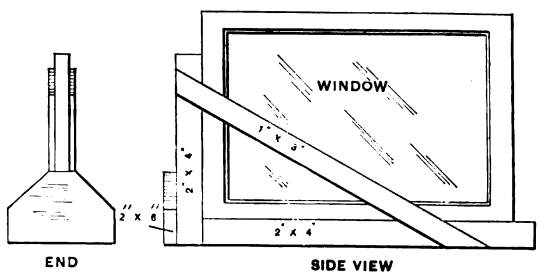


Fig. 3.—End and Side Views of Window Clamp

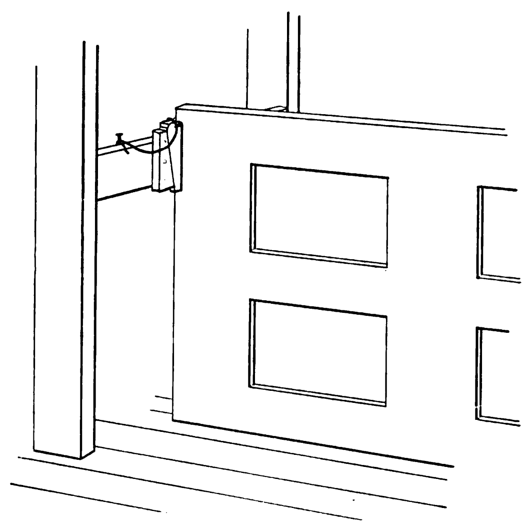


Fig. 2.—Showing Clamp Holding Door in Position.

Door and Window Clamps.—Sketches Accompanying Letter from G. J. Shuster.

Design for Self Supporting Roof.

From C. K. S., *Wayland, Iowa.*—I would be very glad to have some of the readers of *Carpentry and Building* furnish for publication sketches of a self supporting roof for a hall 36 feet wide. I want a tin roof on the building, and would like to space the joist and rafters 2 feet on centers. I want the ceiling to run level.

Note.—It is possible that our correspondent may be able to obtain some valuable hints with regard to self supporting roofs from the letters which appeared in the Correspondence department during 1895 and 1896. As the subject, however, has by no means been exhausted, we trust our practical readers will come forward with sketches adapted to the specific requirements of our correspondent.

Question in Tower Framing.

From GEORGE ABREY, *Memphis, Tenn.*—In the March issue of our valuable paper "Down East" asked for information on tower construction, and in answer I suggest that he make a scale measurement of the proposed tower. Suppose the tower is 100 feet high and half the base 20 feet; then 10 inches on the blade and 2 inches on the tongue, with the diagonal from 10 to 2, will equal $10\frac{1}{5}$, which would be the scale measurement. The hypotenuse is the length of the corner post, also the inclination or batter. Fasten the fence on these figures and the tongue gives the foot cut, the blade the plumb cut, while the fence and tongue will give the down bevel for the girt shoulder. The line A B of the correspondent's sketch is square on square structures. This simple rule is applicable to all tapering structures.

Safe Load for Oak Timber.

From HARMAN, *Volant, Pa.*—I desire to ask what is the safe load for a stick of oak timber 12 inches square at each end, 18 inches square at the center and 20 feet in length, the log being supported at each end? Also what is the breaking strain of the timber and how many feet, board measure, would it contain?

Answer.—As there is no direct authority, owing to the unknown quantity of the shearing of the outer fibers, for the strength of such a timber as our correspondent describes, we referred his inquiry to F. E. Kidder, the well-known engineer and consulting architect, who furnishes the following in reply:

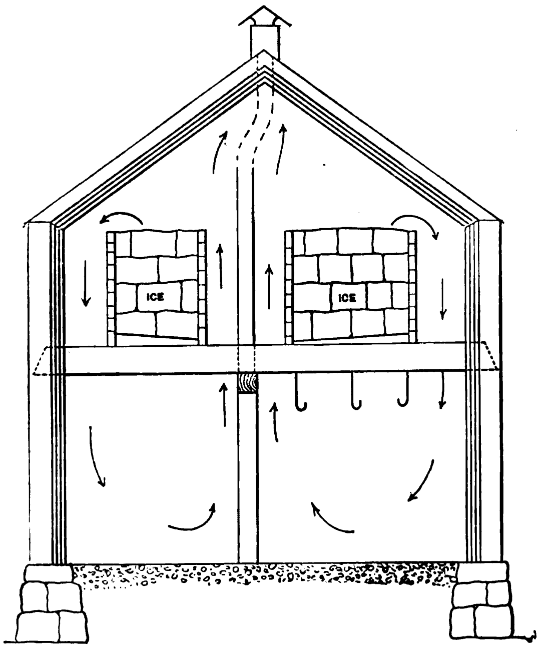
Just what the breaking strength of a timber 12 inches square at the ends and 18 inches square at the center would be can only be determined by testing to destruction, and the maximum safe load cannot be fixed as easily as a beam of uniform section, for the reason that there is a danger of the outside layers near the center shearing off. If the beam was made 18 inches square for a distance of 30 inches each side of the center and tapered from there to the ends it would probably develop as much strength as a beam 18 inches square for the full length, and it would be safe to determine the safe load on that basis. If the beam tapers from the ends to the center it would probably have the same strength as a beam 16½ inches square the full length.

A white oak beam 18 inches square and 19 foot span, allowing 6 inches bearing at each end, might sustain 133,520 pounds center load before breaking, or it might break under a center load of 75,202 pounds, as no two timbers show the same strength. The safe center dead load for this beam, if 18 inches square for a distance of 5 feet at the center, I would place at 23,000 pounds, or if tapered from the ends to the center 19,340 pounds. The distributed load would be twice as much.

The actual contents of the beam, tapered from end to center, would be 380 feet board measure, and if tapered to within 30 inches of the center 420 feet. As a matter of fact such a beam would probably be measured as containing 540 feet, as it would have to be cut from a solid timber to obtain the strength given above. It would be impossible to build up a beam of this shape which would have much more strength than one 12 inches square.

Ventilating Cold Storage Rooms.

From J. L., *Huntingdon, Pa.*—I would like some of the readers of *Carpentry and Building* to give their ideas on the subject of ventilating cold storage rooms, such as

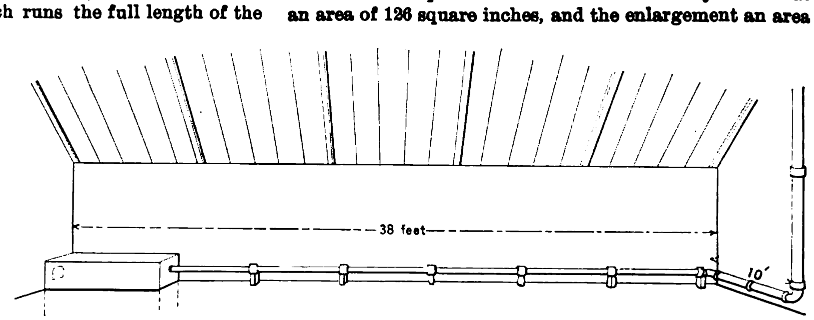


Ventilating Cold Storage Rooms.—Sketch Submitted by "J. L."

are indicated by means of the acompanying sketch, which represents a vertical section through the building. The two rooms are separated from floor to roof by means of a 4-inch hollow partition, the outside walls of the building being of brick 9 inches thick. As the smaller room is intended for vegetables and the larger room for meats, it is not necessary that the smaller room should be kept as cold as the larger one. I would like to know where and how to ventilate each room independent of the other.

Flue Heating for Greenhouses.

From E. C., *Saint Joe Station, Ind.*—I would like to know if a greenhouse can be heated with a furnace made of brick and with a flue which runs the full length of the greenhouse and across one end, the flue to be made of tile and covered with 12 to 18 inches of brick and stone in order that the fire during the day will make heat enough for the evening. If so, what size tile would be proper to use? The greenhouse is about 38 feet long and 10 feet wide, and the furnace is to be located in one corner and the chimney to be located in the corner that is diagonally opposite. The furnace is to be 5 feet in length, 2¼ feet wide and 4½ feet high. The smoke will be taken out of the furnace into the tile and carried along the side of the building across one end to the chimney, as shown in the sketch herewith. Should that tile be 7, 8, 9, 10 or 12 inches in size?



Flue Heating for Greenhouses.

Answer.—The danger of a leakage of gas from the joints in the flue, whether it be made of brick or tile, into the greenhouse and ruining the plants, has caused hot water and steam to be looked upon with more favor by those who have had the most experience in the greenhouse business. However, to answer the inquiry of our correspondent, would say that a furnace of the size that he proposes to use is ample for the work, and that the flue which he proposes to use in connection with the furnace will be sufficient to heat the building, but it is quite probable that the fire will have to be continued during the night to accomplish the desired results. Owing to the fact that soot or fine ashes carried through the flue has a tendency to fill it up, it has been found that a flue made of brick 8 inches wide and 12 inches high is better adapted for the work than a tile flue, and when care is taken in building the flue there is much less danger of gas escaping than when tile is used, owing to the fact that it is difficult to keep the joints between the different tiles gas tight. Whether a tile or a brick flue is to be used, it should be supported above the ground so as to prevent the damp cold ground from absorbing the heat of the flue, and also to afford an opportunity for the circulation of the air. A comparatively small hot water heater properly piped would heat the building more satisfactorily, and when the risk of ruining plants is taken into consideration will be cheaper in the long run, even though the first cost is somewhat in excess of what a brick heater with a flue system would cost. If a tile flue is used, not more than 8 inches should be provided or the filling up will require it to be cleaned frequently.

Construction of a Chimney.

From A. W., *Chicago.*—Will you kindly inform me through your columns how a chimney 60 feet high should be constructed so as to produce the greatest amount of draft? Where a chimney is 14 x 9 inches inside measurement, running to the roof of building 50 feet high, and then enlarges to 14 x 14 inches inside for a distance of 12 feet above the roof, would this increase have any effect on the draft? If so, why? Would it be better to have it go all the distance 14 x 9 inches? In a properly built chimney 60 feet high what would be the effect upon the draft of each foot of increased hight?

Answer.—A chimney to have the greatest efficiency should be so constructed as to have not only a smooth and regular interior wall surface, but should also have the least amount of wall surface for a given area. With this principle in view, it is found that a cylindrical chimney is the best, a square chimney next best, and rectangular chimneys of different dimensions decrease in efficiency with the greater difference in their dimensions. For example, a 12 x 12 inch chimney will have a stronger draft than a 6 x 24 inch, both having the same area. With the case our correspondent describes the chimney 14 x 9 has an area of 126 square inches, and the enlargement an area of 196 square inches. So great an enlargement gives a sudden check to the velocity of the gases up the chimney and adds nothing to the strength of the draft. If the upper section can be smoothly tapered to 14 x 12 at the top without detriment by the changed form, it will have a small increase in the strength of the draft by the additional hight. In larger chimneys an increase of about seven one-thousandths of the draft pressure has been realized per foot added.

MAKING A CEMENT SIDEWALK.

NOT long ago inquiries were presented in these columns relative to the proper proportions of the materials used in the construction of cement sidewalks, and with a view to supplying this information we have secured through the courtesy of Frank J. Grodavent, consulting architect, Helena, Mont., data covering an extensive piece of work of this nature lately executed at Fort Harrison in the State named. The work was done under the direction of Government officials, and the contractor was obliged to guarantee the walks against settlement and cracks for three years after completion. The walks are constructed of Portland cement, sand and screened gravel, although good coal cinders can be substituted in place of the sand if desired. In doing the work the ground was excavated to a point 10½ inches below the finished grade, which was then filled with 6 inches of screened clean sand, thoroughly wetted and tamped. This was then covered with

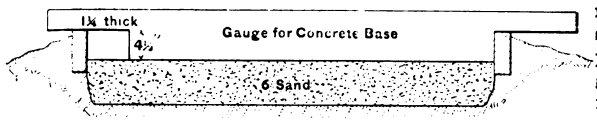


Fig. 1.—Section for Sand.—Scale, ½ Inch to the Foot.

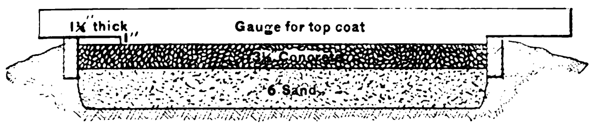


Fig. 2.—Section for Top Coat.—Scale, ½ Inch to the Foot.

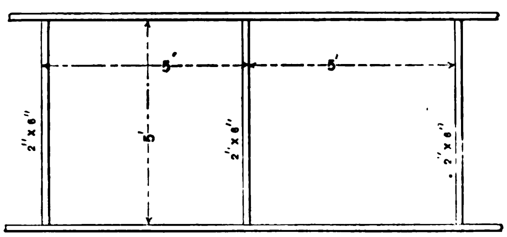


Fig. 3.—Diagram Showing the Size of Blocks in Which the Walk Was Laid Out.—Scale, ¼ Inch to the Foot.

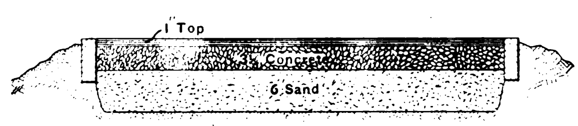


Fig. 4.—Section through Finished Walk.—Scale, ½ Inch to the Foot.

Making a Cement Sidewalk.—Sectional Views Showing Construction.

3½ inches of concrete composed of 1 part Portland cement, 5 parts clean screened gravel or screened, washed and crushed rock and 2 parts clean sharp screened sand. All gravel or rock used for the walks was screened over a sieve of ¼ inch mesh and no piece was larger than would pass through a 1¼-inch ring. The specified proportions of sand and cement were mixed dry, being thoroughly turned and incorporated, after which water was added and the mass tempered. The proportionate amount of gravel or rock, which was first thoroughly wetted, was then mixed with the sand and cement and the whole mass thoroughly mixed together before being placed in the trenches and thoroughly tamped until the water flushed to the surface. In mixing, the quantities were so divided that the amount made would not set before being placed in the trench. The top or finishing coat consists of a layer 1 inch thick, composed of 1 part Portland cement and 1 part torpedo sand, screened through a sieve of No. 5 mesh to remove all larger stones and again screened over a sieve of No. 12 mesh to remove the fine sand. In preparing this top coat, the sand and cement were thoroughly mixed dry and water then added to make a stiff mortar and applied to the concrete base before the latter was thoroughly set.

An examination of the sketches presented herewith will give the reader an excellent idea of the manner in which the walks were constructed. Fig. 1 represents a section showing the layer of sand and the gauge for the concrete base. Fig. 2 represents a cross section of the walk showing the sand and concrete in position and the gauge for the top coat, while Fig. 4 represents a section through the completed walk. The walks were laid in separate blocks 5 feet long and 5 feet wide, as indicated in Fig. 3 of the illustrations. The dimensions, however, may be made to vary according to circumstances. In laying the walks the blocks were separated with a strip of 2 x 6, as shown. After the cement had set the walks were covered with moist sand spread at least ½ inch thick and left a few days after the top coat was finished.

Legal Effect of Notes Given by Contracting Firms.

The material man should be interested in the legal effect given to notes signed in the firm names of those engaged in contracting and building, as the ordinary rules applicable to commercial paper do not apply in some particulars. Partnerships formed for a special purpose are limited in that regard, and principles that have grown out of necessities of mercantile transactions should not govern those of lesser scope. Hence the notes of a firm engaged in ordinary routine business rest on a different basis than those of a firm engaged in building. What is necessary for the proper conduct of the business in one instance is not a requisite of carrying on that in the other. We give below a statement of the rules and principles of each.

The general rule is that so far as a general partnership, or, in other words, a trading or mercantile partnership, is concerned, each partner constitutes the other his agent for the purpose of entering into all contracts for him within the scope of the partnership business. This power rests in the usage of merchants, and grew out of the necessities of commercial transactions. Therefore the doctrine of implied liability received the sanction of the law and has for a long time been, and now is, enforced by the courts.

But this implied liability does not extend to partners in non-trading partnerships. In such cases the rule announced above is reversed, and the presumption is that one partner has no power to bind the other partners. Hence, before recovery can be had upon a contract of this kind entered into by one partner of a non-trading partnership against the other partners it must affirmatively appear that the authority to bind the non-contracting partners was conferred by the articles of incorporation, or that authority had been specially conferred, or that it had been the custom of such partnership to recognize this right to such an extent as would give innocent dealers a right to rely upon the custom.

The test seems to be whether the paper is essential to carry into effect an ordinary purpose for which the partnership was formed. By such test it would seem that a note to pay a debt or to borrow money, even though it be borrowed to pay a debt or to make a purchase, may not be binding without proof of the assent of the other partners, or a usage of such business. It may, therefore, be briefly stated, as sustained by the overwhelming decisions, both ancient and modern, that such power can only arise from consent, ratification, custom or necessity, and the burden of proof is upon the one suing to enforce such note against the partnership to show one of these conditions by affirmative evidence.

The English Method of Building Cement Sidewalks.

According to a journal devoted to the interests of carriage and footway construction, the proper English method of building cement sidewalks is as follows : Excavate the ground to a depth of about 5 inches below the finished level, and upon this lay about 1 inch thickness of cinder or gravel ; upon this lay a layer of clean, hard stone, or other suitable material, broken so as to pass through a 3-inch ring, well watered and rolled, filling up inequalities and leaving the surface about 2 inches below the level of the footway (sidewalk). Divide into bays (sections about 6 feet in width, with battens of soft wood), and complete each alternate bay by laying on the stone foundation carefully prepared concrete composed of one part Portland cement, two parts coarse, clean gravel, or other suitable procurable material, passed through a 1-inch screen, and two parts clean, sharp sand, which must be well beaten or rolled into place ; and before it is set a finishing coat 1 inch in thickness of a finer and richer concrete to be added and brought up to the finished surface of the footway, and well troweled and smoothed into place. This finishing coat may be composed of one part Portland cement to two parts granite chippings, three parts gravel, or other suitable material which will pass through a ¼-inch sieve. As the work is finished the battens may be removed and the joints filled with fine sand.

Building Materials in Bermuda.

Nature has made it easy to build houses in Bermuda. The entire group of islands is made up of coral rock, so that every man can have a quarry in his back yard if he cares to dig deep enough. This stone when first cut is soft and white, and can be got out in square blocks with an ordinary hand saw. On exposure to the air, however, it soon becomes dark and hard. As there is no lumber in Bermuda, except that which is brought from Canada at considerable expense, stone is used for nearly the entire house. The walls are laid of blocks about 8 x 6 inches and 2 feet in length. Window sills and door jambs are also sawed out of stone in the proper shape, and even the roof is covered with stone shingles, which are made by simply setting a block of soft, fresh stone on edge and sawing it into thin slabs. Both roof and walls have to be kept whitewashed, or the stone would crumble away ; with this precaution it finally becomes hard and lasts a long time.

Coral islands are formed by the coral polyps or insects, which build up reefs to about the level of the sea and then die. On the rough surface of these reefs sea weed clings. The wind and the waves work together to grind up their substance and pile it in heaps of sand, which finally solidifies into the rock that can be cut so easily. The freshly broken stone makes admirable road material. Even the rubber tire of a bicycle will crush a piece of it flat and the rain soon solidifies it in that shape, so that the whole road bed, new stone and old together, becomes like a smooth track cut in solid rock.

Liability of Contractor's Bondsman.

A decision has recently been rendered in the Circuit Court at Cleveland, Ohio, which is of great interest to the building trades, involving as it does the question of the extent of ultimate liability of a contractor's bondsman Substantially the decision holds that any person or corporation signing a bond for a contractor in the erection of a building is responsible for the payment of the material used in the building, and also for the laboring men's wages. Peter J. Black had entered into a contract with the school council for the erection of the Sowinski street school, in Cleveland, the American Surety Company furnishing his bond. After he ceased work on the contract he owed money to some 60 workmen and also to a number of material men. A Mr. J. O. Reader bought up a number of the claims of the workmen and presented them to the surety company for payment. The company alleged that they were not liable under the bond for claims of this nature. Reader then commenced suit against the company in the Common Pleas Court. The case was tried before Judge Dellenbaugh, who held that the bond signed by the company rendered them liable for the payment of all labor and material used in the building. The company took exceptions to his opinion and appealed the case to the Circuit Court. That Court rendered an opinion confirming the decision of the lower Court in every particular.

Fire Doors and Shutters.

In discussing the question as to which is the best fire door and shutter a writer in one of the architectural papers says: "The best door to resist fire is the simplest. It should be made of pine and should be made of two or more thicknesses of matched stuff nailed across each other at right angles or at an angle of 45 degrees. If the doorway be more than 7 x 4 feet it would be better to use three thicknesses of stuff; in other words, the door should be of a thickness proportional to its area. Such a door should always be made to shut into a rebate, or made flush with the wall when practicable; or if it is a sliding door, then it should be made to shut into or behind a jamb, which should press it closely to the wall. The door and its jambs, if of wood, should then be sheathed with tin, the plates being locked at the joints and securely nailed under the locking with nails at least 1 inch long. No air spaces should be left in a door of this kind by paneling or otherwise, as the door will resist fire best that has the most solid material in it. In most situations it is much better to fit the door upon metal slides rather than upon hinges. This sort of a door may be fitted with automatic appliances, so that it will close of itself when subjected to the heat of a fire, but these appliances need not interfere with the ordinary methods of opening and shutting the door. They only constitute a safeguard against negligence. The construction of shutters varies from that of doors only in the use of thinner wood. All the other conditions are the same. Doors and shutters built after the manner described resist fire a dozen times better than the ordinary iron door, whether sheet, plate, cast or rolled, single, double or hollow, plain or corrugated."

Electricity in the Paris Exposition.

Some interesting details have been published as to the use of electricity in the Paris Exposition of 1900. The lighting will be entirely electric and will enable all the buildings to be open after dusk. The amount of current required for this purpose will necessitate machinery of 15,000 horse-power. Then, again, it is proposed to have all the machinery, wherever exhibited, in motion, and the necessary driving power for this purpose will be electricity, for the production of which another 5000 horse-power will be required. Altogether it is calculated that 450,000 pounds of steam will have to be produced each hour and two buildings will be devoted to the boilers. In the one will be boilers of French origin and in the other those of foreign make, and a comparison of the work done by them will not be the least interesting portion of the exposition to engineers.

THE durability of slate roofs is generally conceded, but its extent is a matter on which opinions vary. If the statement of a resident of Bangor, Pa., is reliable this durability is far greater than is generally supposed. This man asserts that in 1863, when he was living in England, he assisted in removing the slate from the roof of a building of the Plymouth dockyards that was known to have stood for at least 800 years. After the old building had been torn down a new structure was erected on the same site, and the slates, after being redressed, were placed on the new roof, and at last accounts were still there.

HEATING A CLUB HOUSE.

THE heating system lately installed in the house of the Northern Republican Club, at Newark, N. J., presents many details of special interest to the architect and builder. The addition of bowling alleys to a residence proper where a solid foundation for the alleys is desirable is the cause for a difference of about 2 feet in the floor levels at the front and back part of the building. This, of course, adds to the difficulty of the work of the heating engineer, particularly in the installation of a steam plant, the floor level of the bowling alleys being but 1 foot above the water line in the boiler. In Fig. 1 is a plan of the first floor of the building, giving the dimensions, the space heated and the ratio of radiation to the space heated. It will be noticed that there is a radiator on each side of the parlor, one in the hall, and two in the bowling alleys, one near the stairway and a large circular radiator further back. Owing to the exercise that is to be taken in this part of the building, the ratio of heating surface to the space heated is much smaller than in some of the other rooms.

In Fig. 2 is a plan of the second floor, showing a radiator at each side of the card room at the front of the building and at the front and back of the billiard and pool room. Fig. 3 is a plan of the basement, showing the location of a No. 20 Royal steam boiler and the piping system, the front portion of which is on what might be termed a single pipe circuit system. A 2-inch main leads from the header on the top of the heater toward the front of the building, where a 1¼-inch branch is taken off to supply the radiator on the south side of the parlor and the radiator on the south side of the card room on the second floor. The 2-inch main continues across the west end of the building, where a 1¼-inch branch is taken off to supply two connections, one for a radiator at the north side of the parlor and the other for a radiator at the north side of the card room. The branch continues 2 inches in size to the north side of the building, where it turns and runs east, a 1¼-inch branch being taken off to a 56-foot radiator placed in the first-floor hall. This main is the highest at the boiler and drops all the way to a point where a 1¼-inch riser is taken to feed an 84 foot radiator in the billiard room. The main is relieved at the bottom by a 1¼-inch pipe, which drops to the floor of the cellar and runs across and connects with a 2-inch return to the boiler. Another 2 inch branch is carried from the header on the heater to the back end of the cellar, where it runs south and connects with riser which runs to the ceiling. This branch supplies a connection for a 68-foot radiator placed at the front end of the bowling alley room. The bottom of this radiator is about 18 inches above the water line in the boiler, and in order to prevent any rapid condensing of this radiation from disturbing the water line the main riser which feeds it is relieved by a 2-inch pipe, which runs independent of other connection directly back to the return header at the left side of the boiler. The return from this radiator is connected to the main return from the overhead system.

The riser turns and runs along the ceiling of the bowling alleys, as shown in Fig. 4, which is an elevation showing the piping system. At the rear end of this main, which is 2 inches in size throughout, a riser connects with an 84-foot radiator in the billiard room on the second floor, the connection being made on the one-pipe system. The main then drops and connects with a circular radiator on the first floor of the bowling alleys, as shown. A bypass is arranged at this radiator, so that the system will circulate when the valves on the radiator are closed. At the lowest point of this return main, which is 2 inches in size before it drops down to run over to the boiler, it is less than 12 inches above the water line in the boiler, and it is pointed out that by using the large size piping and by carefully preserving the proper pitch in all the piping the circulation of steam continues so that the building is satisfactorily heated, and no trouble has been met with radiators flooding or the water line in the boiler being unstable. The system was installed by T. B. Cryer of 30 Lawrence street, Newark, N. J.

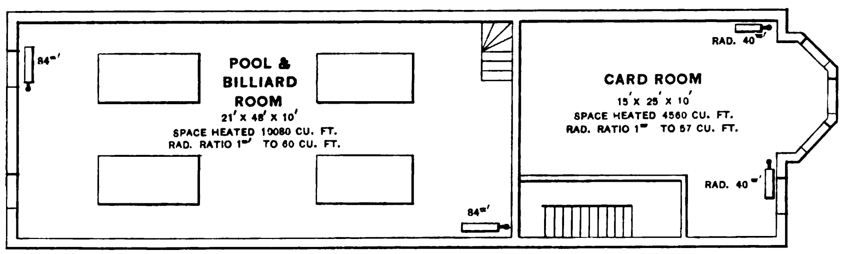


Fig. 2.—Plan of Second Floor.

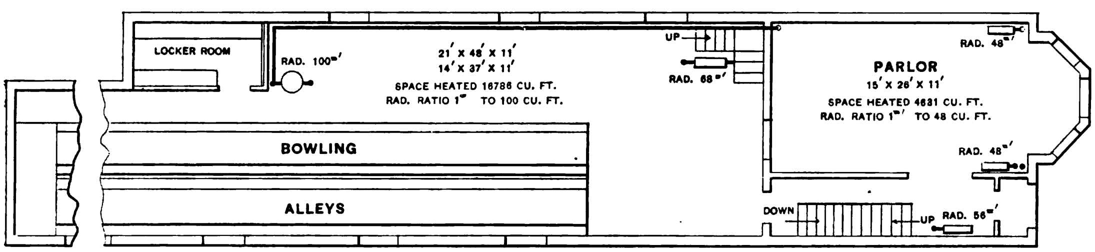


Fig. 1.—Plan of First Floor.

Heating a Club House.

Mechanics' Tools in Germany.

Frank H. Mason, Consul-General at Frankfort, Germany, in a recent report says: There ought to be in Germany a far more extensive market than has yet been developed for American mechanics' tools, but this branch of trade presents some peculiar difficulties. The carpenters' and joiners' tools used in this country, notably saws, hammers, planes and mortising and boring implements, are rude and poor compared with those made and used in the United States; but they have two important merits—they are very cheap and they are what the German mechanic has been accustomed to use since his boyhood. Hardware dealers will generally admit the superiority of American tools, locks and other hardware, but say that, by reason of their higher price, their sale is and must long remain limited in this country. There are indications, however, that the conservatism of German mechanics in this respect is slowly yielding to more progressive ideas, and with the increased use of improved machinery and machine tools the demand for mechanics' tools of improved forms and quality has been noticeably stimulated. But—and here is the marrow of the whole matter—whatever the article to be sold, it is useless for American exporters to expect, as so many of them obviously do, that German retailers and jobbers will order direct supplies of American manufactured goods from catalogues and circulars printed in English, in dollar prices and pounds avoirdupois, pay for them free on board at the factory or New York, and take all the chances and risks of importation in small quantities on their own account. Generally speaking, American goods, to be introduced in Germany, must be offered here as German and English goods are offered in the United States and other importing countries, either by established agents or by salesmen who can show and explain samples and make prices and conditions in currency, weights and measures that the purchaser can readily understand. If it be a machine, it should be sold by a man who can not only explain its working but can set it up and put it into operation ; if it be a tool or implement, it should be presented by a salesman who can show how it is to be used.

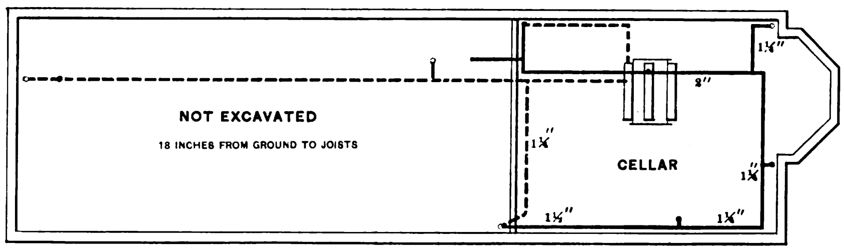


Fig. 3.—Plan of Basement.

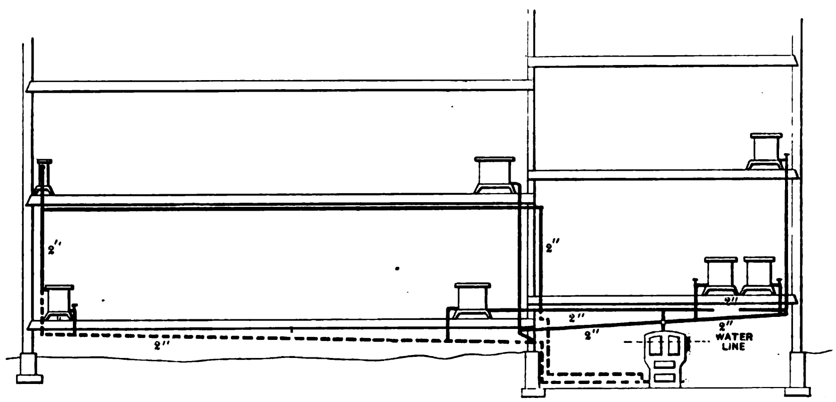


Fig. 4.—Elevation Showing Piping System.

Heating a Club House.

Painting Brick Work.

Painting brick work is a matter which does not seem to have been given the attention its importance demands, and just how much a good coat of paint adds to brick work does not appear to be universally known. However, it is not difficult to distinguish between painted and unpainted brick work, nor is it hard to see the improvement which the paint effects. Before applying the first coat to brick, care should be taken to clean the surface to be painted. The best priming coat for this work consists of glue size and Venetian red, mixed in the proportions of ten to one. Oxide of iron paint mixed with boiled linseed oil also forms a good priming coat and a little drier can also be added to this. In applying the priming coat, says William G. Irwin in the *Painters' Magazine*, care should be taken that it be well brushed on, and the paint should not be too thick when applied. As soon as the priming coat has thoroughly dried and all the joints and cracks have been puttied up, the second coat can be applied. For the coats after the priming coat Venetian red mixed with linseed oil and drier is used; also considerable turpentine, especially in the final coat.

The surface of painted brick work should be perfectly flat, and to effect this but little oil must be used in the last coats. An excellent final coat for this work can be made by mixing brick dust with Venetian red and ochre, using varnish and turpentine. In this no oil is used. It is the brick dust that gives the surface a natural appearance.

After the wall has been painted, attention must be given to the joints. These may be painted either in white or black. This is rather fine work, and a straight edge and a seamer are used in connection with it. There are many things in painting the joints in brick work which require more than ordinary precaution. In this work the horizontal joints are usually painted first, and then the vertical ones are easily filled in. It is a mistake to attempt to paint the joints directly upon the mortar joints. If this is attempted the result will be far from satisfactory. By painting just a little beneath the mortar joints far better results will be obtained. By doing this it will be possible to get a uniformity in the work and a satisfactory job will be the result. In some cases the joints are painted in oil colors and a glossy finish is the result; but this is not so much to be desired, especially with a dull surface like brick work.

Oil must be used in the first coat of paint for brick work, for it is the oil which forms the material which binds the pigments together. Brick work must be perfectly dry when the paint is applied, for otherwise it will soon scale off. If the proper precaution is observed in the painting of this kind of work there will be little cause for complaint, and the protection added by the paint is almost as great as is the protection added to wood work.

RESIDENCE OF Mr. JOHN L. PRECHEUR ON STILES STREET, ELIZABETH, N. J.

D. B. PROVOOST, Architect.

SUPPLEMENT CARPENTRY AND BUILDING, JUNE, 1898.

CONSTRUCTION OF ICE HOUSES.

THE proper construction of an ice house is a matter with which many of our readers desire to become familiar, and they cannot, therefore, fail to peruse with more than ordinary interest the following recommendations made by the committee appointed by the Association of Railway Superintendents of Bridges and Buildings of the United States to report upon the best method of constructing buildings of the character named. In making their recommendations the committee state that in all ice house construction the most important consideration is the insulation. The ideal ice house is simply a storage chamber absolutely protected on all sides against the absorption of external heat and supplied with well designed drains for the prompt removal of all water resulting from the little melting which will occur in spite of every precaution. The heat travels, or is conveyed, by radiation, conduction and convection. For the purpose of this discussion the outside of the building and ground, however they may be heated, may be assumed to be the source of heat against which it is desired to insulate the storage chamber. Experiment has shown that cells or small chambers of dry, dead air, form the best insulator. In the proportioning of these air spaces two facts must be borne in mind: 1, The intensity of radiant heat varies inversely as the square of the distance from the source, and, 2, as soon as a current, however slight, of air is formed in any air space, heat is carried by convection around in that chamber. Of course two air spaces are more effective than one and three more than two, but there is an economic maximum dependent upon the circumstances of each case.

Wood is best adapted for use in buildings of this character, being itself a non-conductor of heat, and, not retaining the heat as does either natural or artificial stone, it permits the cheapest and at the same time the most efficient construction. In some municipalities certain regulations have been established governing the construction of all buildings within the "fire limits," and such laws usually are directed first to the material of construction. At such a point it will be well to consider the advisability of locating the proposed ice house beyond these fire limits to conserve the use of wood in the construction.

All ice houses should be built in sections, the size of section being governed by the quantity of ice used. In some cases it is advisable to construct across each section lateral partitions, which will still further reduce the amount of ice exposed to contact with the outer air while part of the stock is being removed. At the center of each section, and at about the level of the first door, should be placed a platform, say 6 x 10.

Proportions.

Assuming that a cubic foot of ice weighs 57.2 pounds, a ton of solid ice would occupy about 35 cubic feet. Some years since 40 cubic feet were considered ample in which to store a ton of ice cut in such sized cakes as are usually stored, but that allowance has been increased to 45 and even 50 cubic feet. Any organic matter, such as that generally employed—hay or sawdust—not only dirties the ice, but, being dampened by the melting, soon begins to rot, decompose and become foul. For this reason the use of any organic matter between the walls is to be deprecated. The use of short fiber asbestos in the outer air space has been suggested, but not, to our knowledge, tried. However, at a weight of 12 pounds per cubic foot and at a cost of $16 per ton in carload lots, f.o.b. New York, the expense is practically prohibitory. This asbestos, if used loosely, as it should be if used at all, settles after being wet, and though it still retains its spongy character, is reduced in volume, leaving the upper portion of its confining chamber empty.

Site.

While little scope is usually given in the selection of a site, there are certain precautions to be taken in order to secure a good bed. If the site chosen be on a little rise above the adjacent ground level surface drainage will give no trouble; otherwise, provision for it, as well as for the water from the melting ice, must be made.

Preparation for the Bed.

Assuming the ground to be good, the excavation below frost line is made for the house foundations, and about 2 feet in depth inside the foundation for the reception of the bed. If the digging shows a clay soil, drains should be provided to carry off the water from the ice, and these drains should be air trapped.

Cinders or gravel should then be placed in the excavation, as a bed, whose top should be raised slightly above the surrounding ground level and inclined with an easy and gradual slope to the center. On this bed, before ice is stored, rough hemlock plank should be laid, with, say, 2-inch spacing, to keep the ice off the bed itself, yet permit the water to pass through readily. A good concrete floor, well drained from the center, would make a better job and be more satisfactory, but its cost precludes its general use in construction of this class.

The foundations also, whether of wood, brick or stone, should contain an air space as a further insulation. Heat may reach the storage chamber as well under as through the walls. In some cases this, we know, is the case.

Construction.

It is claimed by some that the side walls should be constructed with a batter, but your committee do not approve this idea. The idea is evidently to relieve the side walls of any pressure that may be brought upon them by the spreading of the mass of ice as it melts; but if the slightest care has been exercised in the storing of the stock that condition will not be found to exist, especially as the ice naturally melts most on the outside of the mass. At any rate, in order to be effective, assuming such a condition to exist, the batter would have to be increased over any we have yet heard proposed.

If considered necessary, to resist wind pressure, &c., the sills may be tied to the foundation. They should, on a brick or stone foundation, be laid in a lime mortar in any event. The sheeting, with the exception of the outside, may be rough. While there will be three extra courses of this rough sheeting over what is usually found, the lumber is cheap and the results obtainable will fully warrant the slight increase in cost.

The paper used should be saturated (not painted or coated) and laid with laps to the center of the sheet, virtually giving, then, two thicknesses of the paper in each lining. The sheets should be well cemented together and the paper tacked securely to the sheeting. A paper similar in character to the Giant of the Standard Paint Company is recommended, which, running, say, 80 to 85 pounds per roll of 36 inches width and containing 1000 square feet, will cost about $6.25 per roll in place, including cement and tacks. With this paper should be used a cement similar to that used for roofing purposes, which must be flexible (not brittle), strong, inodorous and lasting. The job, when properly done, will make each space air and water tight. The construction here recommended is the best practice of commercial cold storage houses, only so modified as to be cheap to construct, while yet retaining practically all the advantages of a more expensive construction.

At each gable end ample ventilators should be placed, permitting a free and full current of air over the ceiling of the storage chamber. The roof should be shingled and the valleys between sections well lined. There is nothing, apparently, gained by having the doors, through which to handle the ice, vertically continuous. A stiffer frame, freedom from excessive sag of the lower doors, and a closer, tighter fit of each door are secured by introducing a stiff sill framed under each door.

As may be inferred from the foregoing, we do not approve the use of tie rods to "stay" the sides of the sections, because of their unreliability; they must of necessity sag under the weight of the superimposed ice, and then they either spring the side walls in or, because of the low temperature and tension to which they are subjected, break; even in the latter event they spring the side walls more or less before they let go.

A rigging amply stayed should be located over each line of doors to take the hook of the pulley for the hoisting rope in handling the ice in and out of the house.

A couple of coats of good, light colored zinc paint should be applied to the outside of the house.

Crushing Strength of Brick Piers.

Some very interesting tests of brick piers were made last year at the laboratories of the McGill University by Prof. C. B. Smith, the results of which are set forth in the accompanying table:

These tests are valuable, not alone for the loads recorded, but because they show that the quality of the brick determines the strength of the pier. This is indicated, says Professor Smith, in the fact that the first and second brands of cement are rather superior to the third and fourth, as is shown by the tests of a cube of mortar from the same mixing; but the superior strength of the pressed brick became evident in spite of this.

Another interesting point always brought out by such tests is that the pier strength per square inch is considerably less than that of a single brick on its flat, but considerably more than cubes of mortar—*i. e.*, beds of mortar are far stronger than cubes, and single bricks than built walls. The compressions recorded are very small, owing to the rigidity of the mortar, but piers laid in lime mortar give very much greater compressions per unit load.

Dimensions of Pier.	Mortar.	Brick.	Crushing Strength, lbs. per square i ch.		Age.	Failure.		Compression per foot.		Strength of Mortar. 3 in. x 3 in. cube.
			At 1st Crack.	Maximum Load.		Initial.	Final.	400 lbs. per square inch	800 lbs. per square inch.	
8.1 ins. x 8.1 ins., 11.6 ins. high, joints ⅛ in. thick.	1 Canadian Portland, 3 sand.	Ordinary well burnt flat brick.	822	1,234	3 weeks	In the brick.	In the brick.	0.001 ft.	0.0025 ft.	711
8.1 ins. x 8.1 ins., 11.6 ins. high, joints ⅛ in. thick.	1 German Portland, 3 sand.	Ordinary well burnt flat brick.	990	1,230	3 weeks	In the brick.	In the brick.	....	....	....
8.2 ins. x 8.3 ins., 10.5 ins. high, joints ⅛ in. thick.	1 English Portland, 3 sand.	La Prairie pressed, keyed on one side.	1,130	1,524	3 weeks.	In the brick.	In the brick	0.0025 ft.	0.004 ft.	....
8.4 ins. x 8.4 ins., 10.75 ins. high, joints ¼ in. thick.	1 Belgian Portland, 3 sand.	La Prairie pressed, keyed on one side.	1,204	1,985	3 weeks.	In the brick.	In the brick.	0.003 ft.	0.0045 ft.	677

N.B.—The crushing strength of a brick similar to those in piers Nos. 1 and 2, laid on flat and bedded in plaster of paris, was 1,400 lbs. per square inch for first crack, and 2,400 lbs. per square inch maximum load.

LAW IN THE BUILDING TRADES.

WHEN WAIVER UNDER BUILDING CONTRACT MUST BE IN WRITING.

A provision of a building contract that no claim shall be made for extra work unless such work has been authorized by the architect and that such claim shall be made in writing within a certain time, being for the benefit of the employer, proof of a waiver must either be in writing, or by such clear and convincing evidence as to leave no reasonable doubt about it.—Ashley *vs.* Henahan, Sup. Ct. Ohio, 47 Northeastern Rep., 573.

ARCHITECT'S CERTIFICATE CONDITION PRECEDENT.

Where a building contract provided for final payment to be made on the certificate of the architect in writing that the work had been completed to his satisfaction, there can be no recovery without such certificate, unless it has been waived, or wrongfully refused by the architect on demand.—Ashley *vs.* Henahan, Sup. Ct. Ohio, 47 Northeastern Rep., 574.

WHAT IS NOT AN "EXTRA."

A building contract provided that the contractor should make the excavations and put in the stone foundations of the proposed buildings according to the plans and specifications, including all labor and material necessary thereto. In order to make the excavations it was necessary to underpin a building on the adjoining ground, and to use a quantity of lumber to do this. The court held that the underpinning of the house and the lumber used in the trenches were included in the terms of the contract, and that a recovery for same could not be had on an implied obligation to pay what they were reasonably worth.—Ashley *vs.* Henahan, Sup. Ct. Ohio, 47 Northeastern Rep., 575.

WHEN WIFE'S LAND CANNOT BE HELD.

Where one contracts by instrument under seal in his own name for a building on land belonging to his wife, which ownership, however, is not disclosed by the contract, a mechanic's lien cannot be had against the property, on the ground that the wife is the undisclosed principal, under the laws of Illinois, giving right to a lien only where labor or material is furnished by contract with the owner of the land.—Walsh *vs.* Murphy, Sup. Ct. Ill., 47 Northeastern Rep., 354.

NO LIEN FOR DAMAGES.

In the case of a building contract, where the owner has wrongfully interrupted the contractor and prevented his completing the work, the contractor is entitled to a lien for the reasonable value of the work already done and the material furnished, but he cannot have a lien for the damages he has sustained by reason of the breach of contract by the owner.—Pardue *vs.* Mo. Pac. R. Co., Sup. Ct. Nebr., 71 Northwestern Rep., 235.

MEASURE OF DAMAGES FOR BREACH OF BUILDING BOND.

In an action for breach of a bond conditioned that the principal obligor would erect buildings of a specified value on land purchased by him from the one to whom the bond was given, and for which he had given a deed of trust to secure the price, the measure of damages is the difference between the value of the land at the time of the breach without and with the buildings.—United Real Estate Co. *vs.* McDonald, Sup. Ct. Mo., 41 Southwestern Rep., 913.

SEPARABLE CONTRACT FOR A NUMBER OF HOUSES.

A contract to erect five houses, on lands to be designated, to be completed by a fixed time, for a definite price for each house, is a separable contract.—Barnard *vs.* McLeod, Sup. Ct. Mich., 72 Northwestern Rep., 24.

LOSS OF PRICE BY ABANDONMENT OF CONTRACT.

A party contracted to erect a building, to be completed by August 1, 1894, and performed labor on same until October 28, 1894, when he voluntarily abandoned the work. All the services and materials were furnished in fulfillment of the contract, apart from which no agreement for service or materials was made. He lost his right to a lien on the premises by failure to comply with the laws relating to mechanics' liens. The court held, in a suit against the former owner of the building, that the contractor had by voluntary abandonment of the contract lost his right to recover the value of his services and the material used.—Marchant *vs.* Hayes, Sup. Ct. Cal., 49 Pacific Rep., 840.

REJECTION MUST BE AT TIME OF INSPECTION.

Under a contract providing that a builder is to make a job to the "satisfaction" of the owner, who has power to reject all work and materials not the best of the kind specified, and that the work is to be inspected as it goes on, and accepted by the owner before final settlement, such owner waives all defects in work and materials not rejected at the time of such inspection and during the progress of the work.—Laycock *vs.* Moon, Sup. Ct. Wis., 72 N. W. Rep., 372.

The Builders' Exchange

Directory and Official Announcements of the National Association of Builders.

Officers for 1897-8.

President,
Thos. R. Bentley of Milwaukee, Wis.

First Vice-President,
Wm. H. Alsip of Chicago, Ill.

Second Vice-President,
Stacy Reeves of Philadelphia, Pa.

Secretary,
Wm. H. Sayward of Boston, Mass.

Treasurer,
George Tapper of Chicago, Ill.

Directors.

Baltimore, Md.	S. B. Sexton, Jr.
Boston, Mass.	C. Everett Clark.
Buffalo, N. Y.	Charles A. Rupp.
Chicago, Ill	Wm. M. Crilly.
Detroit, Mich.	John Finn.
Lowell, Mass.	Wm. H. Kimball.
Milwaukee, Wis.	W. S. Wallschlaeger.
New York City	Chas. A. Cowen.
Philadelphia, Pa.	Geo. Watson.
Portland	George Smith.
Rochester, N. Y.	John Luther.
St. Louis	P. J. Moynahan.
Worcester	John H. Pickford.

An Example of Association Work.

The Building Trades' Club, the Mechanics' and Traders' Exchange and the Mason Builders' Association of New York City are setting the constituent bodies of the National Association of Builders an excellent example in the matter of preventing special or class legislation that is menacing to the well being of the whole building industry of the State. The list of bills now pending which are enumerated, by the organizations mentioned, in an appeal for the support of builders generally, show that there is ample cause for the existence of some agency to prevent the enactment of dangerous laws.

The following, taken from an announcement and address to builders throughout the State by the three bodies named, indicates the lines upon which they have proceeded, action which could be followed with benefit in all other States:

We beg to direct your attention to a matter of vital interest to all those engaged in the building trades of this city. The unparalleled development of scientific construction, presenting an inviting field for the investment of capital, has transformed the "building business" of minor importance into one of the principal industries of this country. Building operations being, therefore, brought clearly within the view of the public eye, the law makers have been incited to the enactment of laws regulating the exercise of this trade and controlling those engaged therein. The numerous employees made necessary by the diversity of its innumerable branches have accentuated the difficulties of that universal problem, capital and labor, and redress for real and imaginary infringements of rights and the attainment of new privileges is sought in legislation by the labor element. As an inevitable consequence of these, as primary causes, bills affecting the building interests are being daily introduced, and the vicious and unfair tendency of many of these makes it imperative upon all those concerned to co-operate to protect themselves against unwarranted discrimination and unjust restriction in burdensome laws.

Realizing the importance of such combined effort, the Mechanics' and Traders' Exchange, the Building Trades' Club and the Mason Builders' Association, immediately upon the opening of the present session of the Legislature, each appointed a Committee on Legislation, which committees united in a joint Legislative Committee, retaining a well-known attorney as counsel. This committee has closely followed all bills that affect the building industry, and has and is making every effort to defeat proposed injurious laws. We are firmly of the opinion that very few employers are aware of the pernicious character of many of the bills that are now pending; we are convinced that if the true import of these were fully understood, and the amount of influence there is supporting them, endeavoring to force them through the Legislature, this committee would have the hearty and personal support of all employers.

Membership in the National Association.

Builders' Exchanges that are not at present members of the National Association of Builders are urged to consider the great desirability of joining in a work that is conducted for the benefit of all and lending the help of their members and co-operation to the further extension of that work and to the protection and advancement of the welfare of the fraternity as a whole.

Every local exchange that recognizes the importance of protecting its members against the undesirable conditions which obtain in the locality where it exists should recognize the equal importance of protecting the fraternity of the whole country against evils which menace its welfare, and therefore the welfare of the local exchange and its individual members. Many of the most serious evils which restrict the profit and obstruct the transaction of the building business are internal, and no amount of local effort can defend any given community of builders against the methods and practices of builders in other communities, who are not bound by uniform and established business laws.

The National Association of Builders seeks to make clear and distinct the profitable nature as well as the great help to the transaction of business of uniform business practices based upon the judgment of as large a body of actual builders as possible. The builders of the country, as a whole, are as dependent upon the strength of numbers to establish better customs and practices as are the members of a local exchange in their efforts to better the conditions existing in the city in which they are located. The National Association stands, in relation to the builders of the whole country, in exactly the same relation that the local exchange stands to the individual builders in the city in which it exists. The same arguments which are used by a local exchange to secure the help and co-operation of individuals hold good in demonstrating the obligation of exchanges to join in a national effort to improve and protect the building business of the whole country.

Relationship to Building Trades.

The character of the National Association and its relation to the building fraternity of the United States is indicated by the following brief extract from the secretary's report at the last annual convention:

The National Association lives and acts only for the good of its constituent bodies. It has no life of its own to cultivate as a separate existence. It is but the piece of machinery needful to keep up the tone and poise of the many parts that center on it as a means of common impulse and a uniform movement. The mistake is often made in thinking of such a central body, of concluding that its existence is of some special consequence to itself and that whatever is done by its constituent bodies for its support is a contribution to its personal and private advantage. Nothing was ever further from the truth; for such bodies as our National Association exist but to produce a better state of things for their various parts and have no axes of their own to grind, no purpose but the betterment of the individual members and of the whole. It is only as the whole is fed and nourished that the individuals can be benefited, for unless the reservoir in which are collected from many sources the thousand rills of experience be furnished with the means to filter and distil the knowledge that flows to it, and provided with methods and power of distribution, then no good can come to the individuals who have with so much labor constructed the dams and created the storage chambers. I can think of no better simile of the National Association than to speak of it as a great settling basin in which many streams pour their waters, there to be preserved, treated, purified, so that the flood may be returned in state more fit and safe for use for the very individuals who have turned the waters to a certain spot for the purpose of refining it and getting the best out of it. In all the processes which lead up to this final good the basin itself receives no benefit, expects no benefit. It was not built for that purpose. It was only prepared that it might help and protect and strengthen those who contribute to its wise design and permanent establishment. The need for consulting together with the end in view of devising safe and proper methods which all might follow to secure relief from harassing and injurious conditions was at the outset declared and is still fully conceded, but it is quite as needful, nay, it is imperative, that the various parts should carry out their share of the programme, else the whole is a labor lost.

Water Proofing Damp Walls.

In describing the manner in which bricks may be rendered water proof and the dampness kept out of walls, a correspondent in one of the London architectural papers suggests that the brick or rough cast wall be saturated with several applications of hot boiled oil or linseed oil in which glue has been dissolved. The latter compound is prepared by soaking the glue for 12 hours until soft, then pouring away the surplus water and dissolving the soft glue in linseed oil in a glue pot. Another process which may prove satisfactory is to saturate the walls with a strong solution of gelatine in water and before this dries on the wall applying a solution of bichromate of potash. It is claimed that the result, if the wall be an exterior one and exposed to the light, will be a coating of water proofing gelatine fixed in the pores of the brick or plaster. Still another plan which is suggested is to make a strong solution of good tallow soap in boiling water. Brush this well over the wall or plaster and before it dries lay on a solution of green copperas or of bluestone, chemically known as sulphate of copper. This solution will be decomposed by the soap solution in the pores of the brick or plaster and a sebate of iron or of copper be produced in the pores, the sebates being impervious to water. Another way of using such a sebate is to mix a solution of tallow soap with a solution of either of the above salts, collect the flucculent sebates that precipitate, and after draining this, or drying off all moisture, dissolve it in hot turpentine, and use the liquid on the walls as a varnish.

The Cost of Heating Schools.

At a meeting of the School Board of Lancaster, Pa., the report of the Property Committee contained the following statement showing the cost per room for heating the various schools during the year:

South Duke	$28.20	High School annex	34.26
Mulberry	24.10	High School	32.60
Pearl	12.10	Walnut	25.00
Strawberry	19.25	New	29.84
West Chestnut	29.22	Prince and Chestnut	16.65
Franklin	50.00	South Prince	35.42
Lemon	19.80	James	35.42
Manor	35.42	Rockland	24.30
Clay	48.00		

The committee intends to change the grates in several of the heating plants so that pea coal can be used, with a view to lessen the cost.

Acetylene Lighting.

In the annual report of the Mineral Commissioner of the Province of Ontario, says a Pittsburgh paper, there is an interesting section devoted to the application of calcium carbide and acetylene lighting in that district. He states that there are eight manufacturers of acetylene generators in the province, and that one company claim to have installed during the last year 94 of their machines, mostly in Ontario, but several also in the United States and Mexico. The plants range in size from 15 to 100 lights. They are used for lighting stores, churches, manufactories, rinks and dwellings. Another firm mentions a few of their principal patrons, 35 in number, and a third firm enumerates 55 places in which they have set up 186 machines, ranging in size from 5 to 150 lights, but having a total of 4535 lights. Another firm gives a list including four churches and one Government institution.

Carbide at present costs about $60 a ton, and during the past year the Wilson Carbide Works Company, the principal producers of calcium carbide in America, turned out 574 tons. At this price for carbide and illuminating gas at 90 cents per 1000 cubic feet the respective costs of the coal gas and acetylene work out about as follows: It is estimated that 1000 cubic feet of gas burning for one hour would give 4036 candle power and cost 90 cents, while 1000 cubic feet of acetylene burning for one hour would give 53,333 candle power and cost $7.50. At present the cost of carbide is excessive, and when other competitors enter the field its price will be reduced at least 30 if not 50 per cent.

Inquiry among some of the users of acetylene, according to the report above quoted, brings out the fact that even under existing conditions acetylene is considered economical, as well as satisfactory, particularly for isolated plants. Knox Church, in the town of Goderich, is cited as an example. The plant was installed after the building was remodeled and enlarged in the summer of 1897. A 60-light machine, including 110 burners, was put in at a cost of $170. The carbide costs 3½ cents per pound delivered, and 17 pounds supplies 82 lights with gas for two hours at a cost of about 55 cents. Since there is a short period of the year when little or no light is required, it is calculated that the cost of lighting the church, the auditorium of which measures 60 x 90 feet, is about $25 a year.

CONTENTS.

CARPENTRY AND BUILDING

WITH WHICH IS INCORPORATED
THE BUILDERS' EXCHANGE.

DAVID WILLIAMS COMPANY, - PUBLISHERS AND PROPRIETORS.
232-238 WILLIAM STREET, NEW YORK.

JULY, 1898.

The Building Situation.

Extended correspondence during the past month regarding the volume of building in the large cities of the country has elicited the fact that conditions are more nearly normal than is generally believed among the builders themselves. While none of the large cities report unusual activity in building, there is a fair amount of work actually under way nearly everywhere. Excessive competition seems to be one of the features of the situation which has given contractors a tendency to complain, and this, together with the fact that some projected work has been withheld or postponed on account of the war, has caused a feeling of depression which does not seem warranted from the work on hand. It appears to be a safe statement that the average of work done this year will be about the same as that of 1897, but it will fall below the amount confidently expected before the season opened and before war was declared. As indicating the building situation in the Greater New York it may be interesting to refer to some of the figures contained in the report of the Department of Buildings, made public a few days ago. The report covers the operations during the three months ending March 31 of the present year, and shows 946 buildings to have been projected in the boroughs of Manhattan and Bronx, at an estimated cost of $21,495,430. In Brooklyn there were 911 buildings projected, estimated to cost $3,791,058; in Richmond there were 36 buildings, estimated to cost $82,398, and in Queens 16 structures, to cost $45,600, making a total for the Greater New York of 1909 buildings, involving an estimated expenditure of $25,414,486. In the boroughs of Manhattan and Bronx 586 buildings were commenced and 624 completed during the period named. In the classification of the plans and specifications for new buildings filed and acted upon by the department, 305 were for dwelling houses, 377 were for flat houses, 171 were for tenement houses, 56 were for stores, 15 for office buildings, 52 for manufactories and workshops, 7 for hotels and boarding houses, 4 for school houses, 6 for churches, 13 for public buildings, places of amusement, &c., 28 for stables and 675 for frame structures.

Co-operative Homes.

Every now and then some one comes to the front with a scheme for lessening the cares of the housewife by dispensing, for example, with the individual kitchen, and making one centrally located serve for a number of families. Ever since Bellamy's "Looking Backward" was seriously considered attempts at co-operative housekeeping have been made, but in no instance, so far as we are aware, have the results been altogether satisfactory. Public attention is again being directed to the subject by the efforts of a Canadian lady who has been seeking the co-operation of that Government to make her plan an exhibit at the Paris Exposition in 1900. Her scheme, which in a general way is similar to others which have been advocated, is to erect around the outside of a tract of land 44 houses, all connected so as to form a square of buildings. Each house is to have either two or three stories, as the case may be, and none to be more than two rooms deep, so as to afford ample light and an abundance of fresh air. In the central court is to be erected a large two-story structure in which will be located the kitchen, laundry, the dynamo, cold storage plant, an improved heating apparatus for supplying electric light and steam heat for the 44 homes. On the second floor of this building is to be a kindergarten, a library and a large hall. All of the houses are to be connected with the central building by speaking tubes and telephones and an electric conduit for carrying the hampers to and from the kitchen. By such an arrangement, it is advocated, the housewife is spared the trouble of preparing meals and the servant question is happily solved. The space inclosed by the block of houses, and that on either side of the central building, is intended to be laid out in attractive lawns, with tennis courts, croquet, &c. It is the intention that the affairs of the model community shall be managed by a board of directors elected by the home owners.

Architecture at Columbia University.

An excellent idea of the work of the architectural department of Columbia University may be gathered from the exhibit of the students' drawings which is made each year at commencement. The completion of the new college buildings on Morningside Heights afforded exceptional facilities this year for the display of the drawings, which were arranged by classes in rooms assigned this department in Havemeyer Hall. The work indicated a variety of study and close attention to details, the showing of the different classes being highly creditable to both instructor and pupil. In the first year the eye and mind of the student are cultivated and the idea of form developed, there being used for this purpose architectural details drawn free-hand by the students. Attention is given to the Ionic orders, the capital, casting of the shadow, &c., the whole idea being to make the work cumulative and progressive from the very beginning. Historical drawing is a feature of the course of the first-year men, and in the way of measured work the porch of Havemeyer Hall was taken and worked out in plan, elevation and perspective. In the second year the study of details is continued, with combination into designs, the third year showing the same work carried further, and devoted more largely to design, while in the fourth year problems in design of a more elaborate character are considered. Among the drawings of the various classes were porches, two-story buildings, a clock tower, an armory, a small library, a museum, a city house worked out in perspective and rendered in colors, together with pen and ink work drawings from photographs, color work, sketch problems, &c. The subjects of the thesis drawings included the Executive Mansion at Washington, a public bath, a savings bank, a cathedral, a city driving club, a large country house, a synagogue, a State library, a music hall and a country club. The constructive problem of the year was a masonry dam. These were all of an interesting character and strongly emphasized the results of the system of study pursued in this department of the university.

American Institute of Architects.

The thirty-second annual convention of the American Institute of Architects will be held in Washington, D. C., the first three days of November of the present year. Particular interest attaches to this meeting, as it will doubtless witness the formal opening of the first permanent home of the institute, the old Octagon House, in that city, having been secured for this purpose. For several years past the institute has had a home in New York City, but has been considering the question of permanent headquarters, and this home of the architects in the National Capital is therefore likely to be found of great advantage not only to the members themselves but to the fraternity at large. The programme of the coming convention includes many interesting features, among which, it may be stated, B. E. Fernow, Chief of the Division of Forestry, will treat of the Government timber tests. Professor Merrill of the National Museum will discuss building stones, Dr. Cyrus Adler of the Smithsonian Institution will present a paper on the Jewish people in architectural history, and Professor Sabine of Harvard College will deal with the subject of acoustics.

The Omaha Exposition.

The exposition which was opened in Omaha, Neb., on June 1 is larger than either the Tennessee Centennial Exposition or the Cotton States Exposition, or even the Centennial, but it is easier to compare it with the World's Fair at Chicago. Its buildings represent in architecture and in arrangement the best features of the Columbian Exposition, and in our double supplemental plate which accompanies this issue we show some of the leading structures. It far exceeds our greatest exposition in the common sense use which has been made of the available money in the construction anu especially in the arrangement of the buildings.

We can summarize the characteristics which will live as distinguishing features of the Trans-Mississippi and International Exposition as: 1, The beauty of the buildings and their ingenious arrangement so as to require the least possible time and exertion on the part of the visitor ; and, 2, the great economic efficiency in the expenditure of money in the construction and administration.

The principal buildings are for manufactures, agriculture, mining, machinery and electricity, liberal arts, fine arts, horticulture, transportation, together with the magnificent building erected by the United States Government. The buildings are all on the average about 350 long by 150 feet deep, with the exception of horticulture and transportation. They are arranged around a long lake which reproduces the best effects of the Grand Court of Honor at Chicago. In this way nearly all the ground around this Court of Honor is occupied by the principal buildings.

At the west end stands the Government Building, towering to 178 feet at the top of the figure on the dome. It is by far the most beautiful structure that the Government has yet contributed to exposition architecture.

Looking from the Government Building toward the east, one finds the Fine Arts Building on the right and the building devoted to agriculture on the left. A happy thought, which is really but the natural growth of crude suggestion at other expositions, is that of connecting the Government Building with its neighbors by long covered colonnades, so that the visitor can pass from one building to the other with almost no exposure to the summer sun.

Between the Government Building and the next along the Court of Honor to the east is the Administration Arch—the unique structure which can best be described by the central photograph in the supplemental plate, and in which the exposition offices will be placed.

Beyond this comes the Manufactures Building, which was originally designed for the mining exhibit with the thought that the two largest buildings would be devoted to the mineral and agricultural resources of the West. Next to the manufactures is the Machinery Hall.

The buildings on the south side of the Court of Honor, in addition to the Fine Arts, are Liberal Arts, Mining and the Auditorium. At the east end of the court and opposite the Government Building is a large viaduct arching Sherman avenue.

Rising from the viaduct are two tall buildings to be devoted to restaurants, and no happier thought has been given to an exposition than that of providing a place of rest and refreshment where the eye can see, spread out beneath, the entire exposition as well as it could be seen from an Eiffel Tower.

The Machinery Building, like all others, suggests in its architecture the purpose for which it is intended, not only by the decorative features of highly conventionalized converters, cog wheels and statuesque triumphs of mechanic art over natural forces, but by tablets bearing the names of the pioneers in machinery and electricity, even down to Holley and other pioneers of our present age.

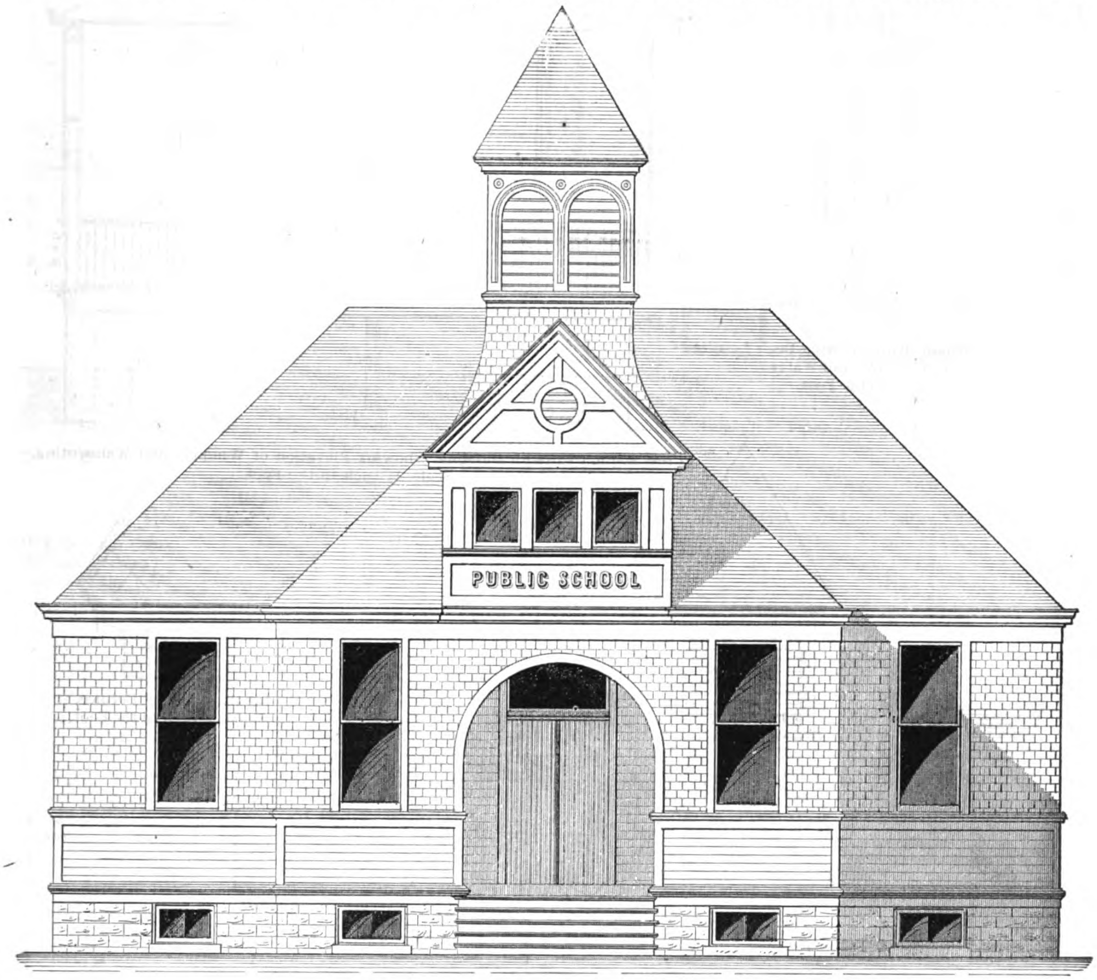
The last of the exhibit buildings at the east end of the Grand Court of Honor is, perhaps, in every respect the most satisfactory piece of work in the exposition architecture. This is the building designed for manufactures, but now devoted to the mineral resources of the West. It is a Greek-Ionic structure, 300 feet long by 130 deep, with a gallery, giving in all a floor space of 60,000 square feet. The main entrance is a large rotunda 80 feet high by 42 feet in diameter, surmounted by a step-like dome, over which a banner bears the name of the building. Its decoration is extremely pure and simple. In addition to the tall fluted Ionic columns supporting the rotunda, its only ornamentation consists of four torch bearers at each end of the building, and the same figure is repeated upon the crown of the rotunda. Light in the building is abundant, being supplied by 220 windows in addition to a large skylight made of a new material, which is simply muslin coated with a preparation of linseed oil varnish. While not transparent, it is translucent, so as to add very materially to the lighting of the building.

Residents and business men of New York are beginning to complain bitterly of the smoke nuisance, which is making itself felt in the city. A local scarcity of small sized anthracite coal and the higher prices now ruling for the larger sizes have induced large numbers of steam consumers to make use of soft coal. This produces volumes of thick, black smoke, which is allowed to escape from the large chimneys of manufacturing and other buildings, in contravention of the sanitary code of the city Health Department, which directs the prevention of all such smoke. Failure to enforce this regulation is charged to the city authorities, who are to be requested to take steps to stop the nuisance.

A deplorable piece of official vandalism has been discovered on the big Washington Bridge over the Harlem River, in the Borough of Manhattan. A city engineer has just found that in painting the steel part of the structure last year the handsome bronze balustrades and the lamp-posts and elaborate ornamental work in that metal, which cost the city many thousands of dollars, were also covered all over with a heavy coating of paint. As the paint cannot be scraped off without ruining the fine work in the bronzes they will have to remain as they are, with their artistic merits entirely obliterated, a lasting monument to the gross ignorance or incompetency of some city official.

A TWO-ROOM FRAME SCHOOL HOUSE.

A TWO-ROOM school building, suitable for erection in suburban towns and country villages, is illustrated in the engravings here presented. The structure is of frame, one story in hight, and finished in a neat and attractive style. The design is that of A. K. Miller, architect, of Turtle Creek, Pa., who states that the foundation is of rubble stone work, neatly pointed above grade. The frame is of hemlock, the sheeting above the window sills being single surfaced hemlock laid tight, over which are dimension shingles, as shown in the elevations. The cornice, sill casings, water tables, and all exterior lumber are of dry white pine. The sills, which are 6 x 12 inches, are halved together at the corners; the girders are 6 x 12 inches, and the corner posts 6 x 8 inches. The joists and studding, which are spaced 16 inches from centers, are gained into the sills. The studding around window and door openings is doubled. The ceiling joists have three lines of 2 x 6 inch studding, spiked down on top to hold them in place. The floor is composed of strips of yellow pine, not over 3½ inches wide, and well nailed at each bearing. The walls, except under the blackboards, are wainscoted up to the windows with white pine beaded flooring. Under the blackboards the wainscoting is 2 feet high. The cloakrooms have two rows of hooks for coats and hats, there being no less than 50 for each row.



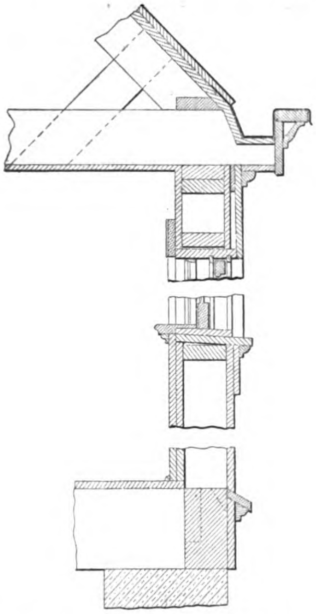
Front Elevation.—Scale, ⅛ Inch to the Foot.

A Two-Room Frame School House.—A. K. Miller, Architect, Turtle Creek, Pa.

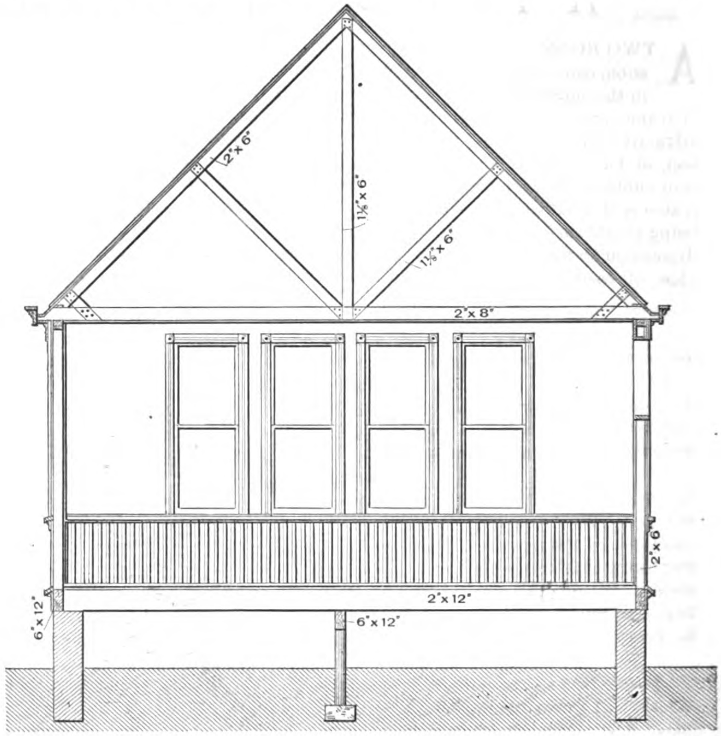
The interior and exterior wood work is painted with two coats of pure lead and oil. The roof is covered with No. 1 sea green slate. The building may be heated with stoves or hot air furnace, as may be decided is most convenient. As designed, it is arranged for heating with hot air, the registers and wall pipes being the only items relating to heating which are considered in the estimate of the cost of the building, which is placed at about $1500. Some of the more important items of the architect's estimate are rubble stone work, $177; slate for roofing, $156; plastering, $150; blackboards, $80; gutter tin and conductors, $52.20; 16,260 feet of hemlock, $211.38; pine siding, $22.50; dimension shingles, $45; 1680 feet of yellow pine flooring, $47; window frame, sash and glass complete, $60; casement and windows complete, $12; basement stairs, $10; Venetian windows for belfry, $16; wainscoting, $37.20, and carpenter's work, $160.

Process of Preserving Timber.

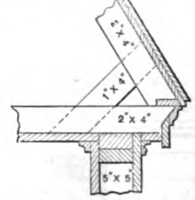
Not long since an interesting demonstration of the process of preserving timber as developed by Colonel Haskin, an American engineer, was given in England with very satisfactory results. The process consists in subjecting raw, unseasoned wood in long cylindrical chambers to the action of compressed circulating air heated to a temperature considerably over the boiling point of water. After being thus heated for a number of hours the wood is allowed to cool in air under the same state of compression. It is claimed that after this treatment the wood is strengthened, hardened, improved in appearance, is more impervious to water and, above all, is rendered far less subject to decay.



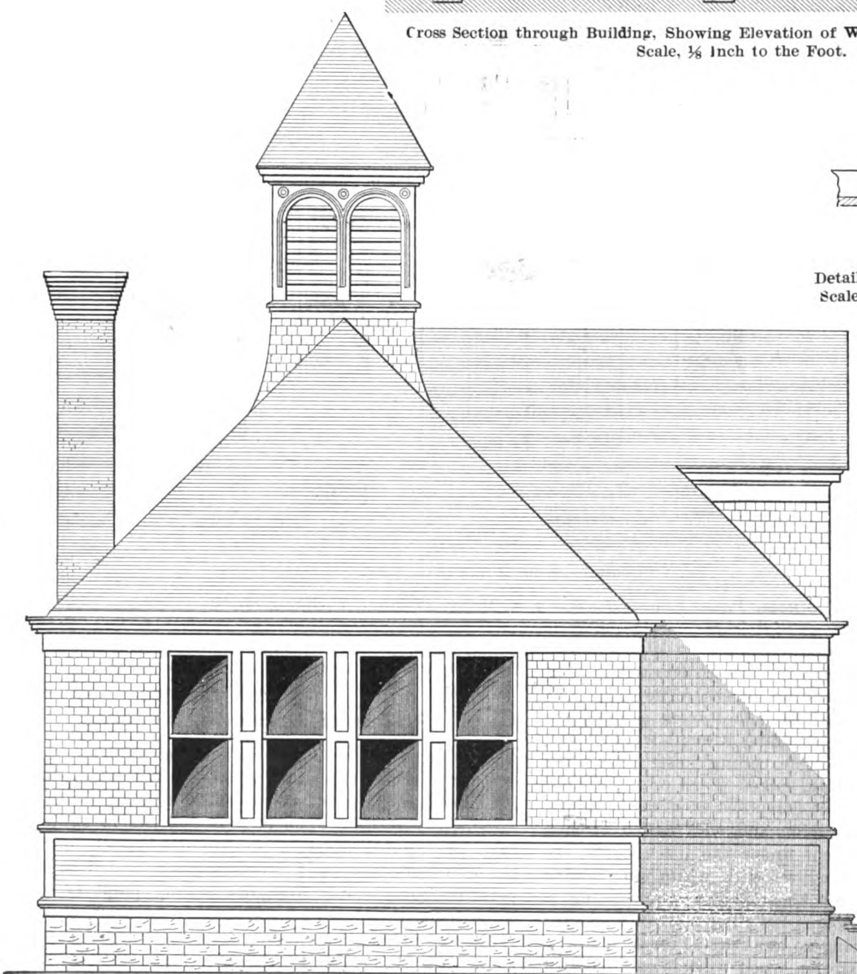
Section through Main Wall, Showing Details of Cornice, Windows and Water Table.—Scale, ½ Inch to the Foot.



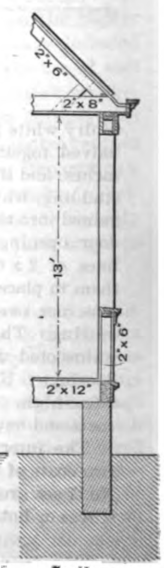
Cross Section through Building, Showing Elevation of Windows and Wainscoting.—Scale, ⅛ Inch to the Foot.



Detail of Belfry Cornice. - Scale, ⅛ Inch to the Foot.



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



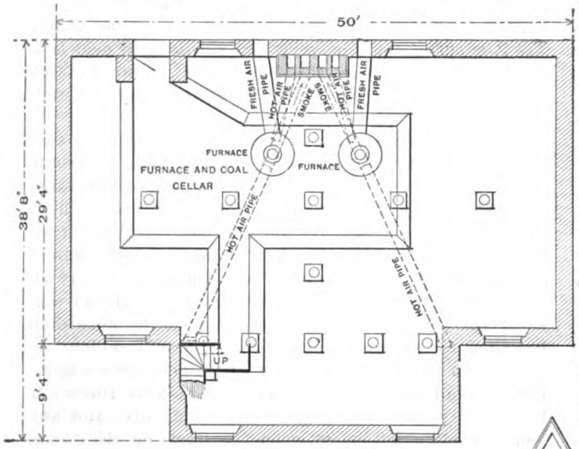
Section.

Elevations and Details of a Two-Room Frame School House.

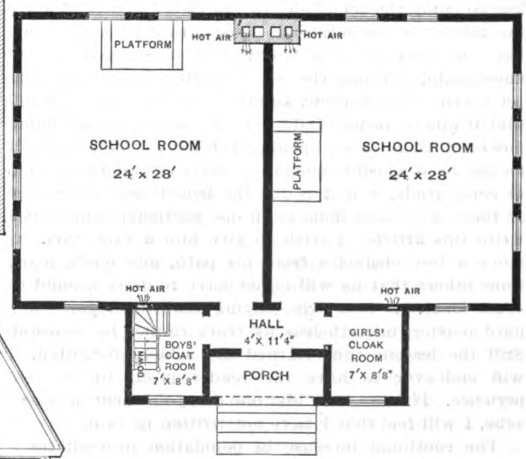
History of the Stone Arch.

Professor Malverd A. Howe recently read a paper on the above subject before the Engineers' Club, in St. Louis, Mo., and from the data presented the following conclusions may be drawn· The Romans first used the arch in the construction of bridges in the second century B.C. Until about the thirteenth century the arch in bridges was of the circular form, and almost without exception it was semicircular. The pointed arch was first employed in bridges about the thirteenth century. In the fourteenth century segmental and elliptical arches were introduced. At the present time the segmental arch is almost universally employed for long spans.

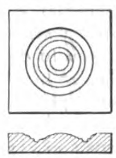
THE owner of a brick building contracted with another party to tear it down. When this work was completed the owner took possession of the brick, which had been placed in the street so as to obstruct the gutter. The court held that as he had taken possession of the brick while in the gutter, he and not the contractor who had placed them there was liable for damages arising by such obstruction.



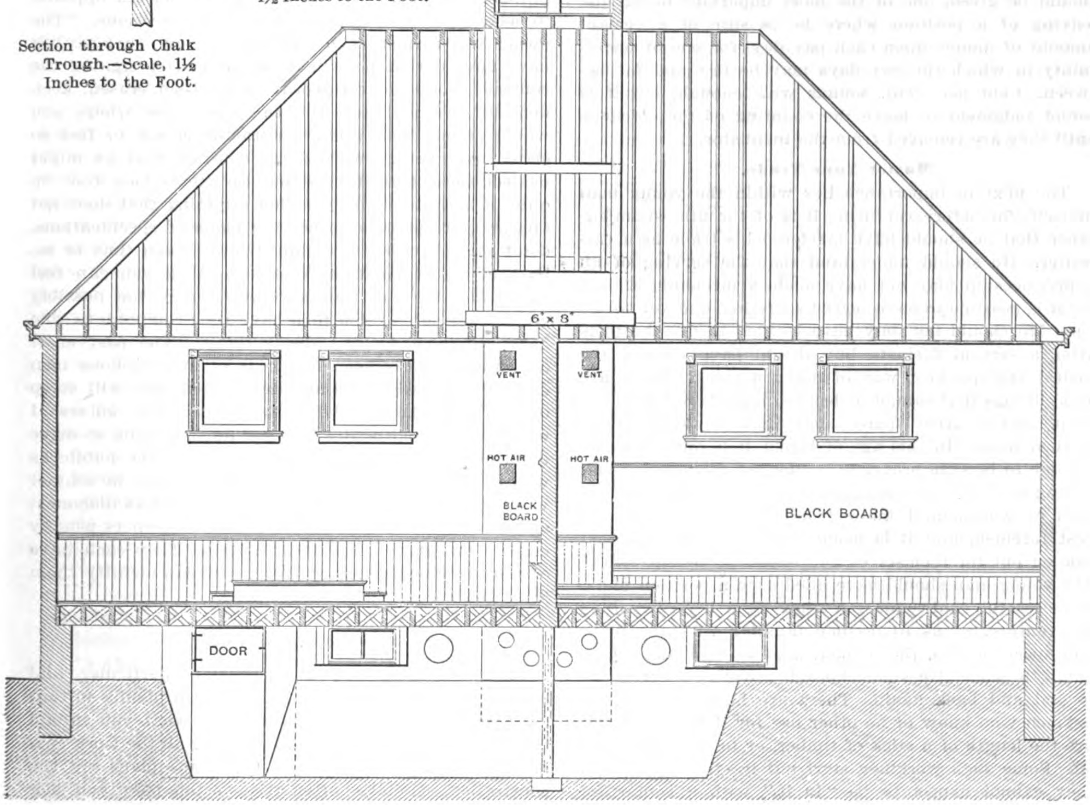
Basement Plan.—Scale, 1-16 Inch to the Foot.



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


Detail of Corner Block.—Scale 1½ Inches to the Foot.


Section through Chalk Trough.—Scale, 1½ Inches to the Foot.



Longitudinal Section through School Rooms.—Scale, ⅛ Inch to the Foot.

Floor Plans and Sectional Elevation of a Two-Room Frame School House.

WORDS FOR THE YOUNG BUILDER.

BY L. J. AIMAR.

IN olden times, when this country was young, a man could start out with nothing more than a determination to do his best, coupled with a fair knowledge of his business, apply himself to his work, and in due course of time retire, with sufficient means to enable him to enjoy the remainder of his useful life. But since the advent of corporations, trusts, combines and such like, the chances of a young man to succeed in any undertaking through the use of skillful hands and honest service, but without capital, have become so small that it almost means failure at the start. To my mind, however, there is an opening yet for a young man, if he has been sensible enough to serve an apprenticeship at some trade, and it is for the benefit and assistance of those who have done so in one particular line that I write this article. I wish to give him a fair start, remove a few obstacles from his path, and chalk mark some others that he will either have to drive around or climb over. It is a trite saying that experience is a hard master, nevertheless its truth cannot be gainsaid. Still the lessons thus learned are seldom forgotten. I will endeavor to have the reader profit by my experience. If I can save him one diappointment or heartache, I will feel that I have not written in vain.

The continual increase in population necessitates a proportional increase in the number of habitations, and herein lies the opportunity for the young man of brains and push. But before starting "on your own hook," as the saying is, there are many things to which thought should be given, one of the most important being the leaving of a position where he is sure of a certain amount of money upon each pay day for one of uncertainty in which the pay days may be few and far between. Cent per cent. sounds well enough, but it is sound judgment to leave the counting of the chickens until they are removed from the incubator.

Master Your Trade.

The next in importance lies within the young man himself, for before venturing it is of the utmost importance that he should have mastered his trade as a carpenter. He should understand that the serving of an apprenticeship may not have made a mechanic of him for it is possible to have served a lifetime and yet not be one. He should not only have learned to use the tools after a certain fashion, but should have learned the easiest and quickest way of doing a thing. There are many things that cannot be learned anywhere but in the shop, and a great many more that would never be learned there. In this age of books it is quite possible for one to become proficient in the use of tools without having served more than a year or two in the shop. This kind of workmen, I know from experience, make the best foremen, and it is usually the best foremen that can set out for themselves and expect to be successful. The young man should have filled such a position under a successful contractor for some time before making his venture, so as to become familiar with the plans and specifications, the management of men and laying out of the work. He should know the steel square from end to end and back again. There are hundreds of journeymen who know of no other use for it than to measure the length of a stick of timber, or to scribe and end off. Some such workmen start out for themselves, but they cannot expect to be "in it" with a competitor who goes at his work in a scientific manner. While the former is laboriously lifting and turning his timber in his endeavor to make a joint, the latter has done his work with much less labor, and he knows positively that when brought together everything will fit, for the reason that two and two when added can never make either more or less than four. Our grandfathers might be excused if they knew no other method than fitting each piece to its member and daubing both with black paint as a means of identification. Books were scarce in those days. We have no such excuse now, as a very small sum will purchase all the books necessary. Yet it is surprising how very few journeymen ever look into a book relative to their calling. It is not for this class that I write, as I know this would never reach their eyes.

Now having started it is necessary, young man, that you take pride in your work. Don't look to profits alone. If you do, you will soon become one of that large class styled "jerry builders." This class has to hunt up new patrons eternally, the first job being about all that any one wants from their hands. Never attempt to do less than you contracted for. Endeavor to live up to the letter of your specifications, and, I might as well say right here, neither is it necessary to do more than is called for in your contract, as you will seldom receive even thanks for so doing. It is best before figuring to read the specifications over several times. If they are typewritten, as they commonly are, and any words are written in between the lines, or elsewhere, take particular note of them, every word. You might appreciate the importance of this if ever you find a set of doctored specifications facing you after signing a contract, binding you to do things that never appeared in the specifications at first, and which may mean financial disaster. But if you have made your notes as cautioned, you can more readily see if such is the case. If the owner is to furnish any part of the materials, as is often the case, and this has been an after consideration, probably you may find written in the margin opposite to where the item appears in the specifications, "The owner will furnish such and such." Now, suppose you have figured that he will do so, and after signing the contract you find the words have been erased, accidentally, we will say—you can easily see where you would stand. The young contractor is apt to feel so elated over being awarded the contract that he might neglect these little things, but the items may foot up quite a large sum. If you find anything that does not appear quite plain in either the plans or specifications, don't say, I guess the architect must mean thus or so, but get an explanation from him; then you can feel sure. This may not only save you money, but possibly get you the job, as you then have your competitors who have not done so at a disadvantage. The past eight or ten years have seen hundreds of unscrupulous men enter the profession as architects—men who will stoop to anything whereby they may obtain a few dollars. I wonder the "legitimates" do not do something to drive them out of existence, for the benefit of the public as well as for their own. You may be brought in contact with such, as well as owners who are just as dishonest and who lay for the unwary. Dishonest owners usually employ the above class of architects. They each have certain little ear marks by which you can identify them after you become more experienced.

Scope of Proposal.

In the wording of your proposal be particular, and have it cover the entire ground. Word it plainly so that the owner can understand distinctly what you intend doing for his money. You intend doing all the work covered by the specifications, of which the plans are the illustration. Mistakes often arise on this point and contentions follow. I think the following form will serve as a good example :

I hereby propose to furnish all the materials and labor for the erection and completion of the building for Mr. .... at (name of place), in strict accordance with the plans and specifications drawn and furnished by Mr. ...., architect, for the sum of ...... thousand and.........dollars ($00.000.$\frac{00}{100}$) (write the full amount and follow by figures), the owner to furnish the following items (here name items) as per notes in specifications (give the number of line and page where said note occurs). If it is desired that I furnish said items the cost will be .... dollars ($......), making the total sum .... dollars ($.....). If the changes mentioned on page .... line .... are made before signing the contract, the following sums are to be deducted (or added, as the case may require), making the cost of entire work as per specifications as illustrated by the plans ...... dollars ($......).

The owner now understands what you have figured upon, and you have tried to make it plain to him what you consider it worth to build a house as required by the plans and specifications of the architect. The plans and specifications represent the architect's interpretation of the owner's desires. It is possible that before you finish the building, if you secure the job, the owner's ideas are quite different from the architect's. After you have finished a piece of work, he may say :

"I don't want that done that way ; I won't have it so."

"Well," you say, "that is just as the plans show it, or as the specifications describe it."

This is your first trouble of the kind. You feel bad over it ; you decide to take it down and make it right. Don't do it if it will cost you anything. If it is done as called for it is right. To do it as he desires will not be as described, therefore wrong. If the owner is just he will not expect you to read what was in his mind, probably before you even heard of him. If he is dishonest, he may have been laying for you until you came to this point, and if he finds you soft this will be the first of many advantages he will take of you. An unjust owner is very sure to employ an architect after his own heart. If he has, your vexations will be doubled, but unless they make good to you the cost of changes take no notice of them ; stick to your plans and specifications ; complete your work, and all the courts in the land will uphold you. Bear this in mind all the way through.

Cost vs. Estimate.

It often happens that after an architect is instructed to furnish plans for a building to cost so much money, the owner finds, when estimates are made, that all bids exceed the sum he thought of investing. The building, he finds, will cost much more than the architect's estimate. How is this ? He thinks the architect should know pretty nearly the worth of the building, and so he should if he is competent. An architect ought, at any rate, to be able to figure out every foot of timber required to build a cottage, and he should know very nearly the cost of all other items. When it comes to the construction of the modern iron and steel monsters it may be different, yet the designers of that class of structures can give the cost of them more nearly correct than do the designers of the smaller buildings. The reason for this is quite plain to my mind. The builder of the larger structures puts them up as investments ; he figures to a dollar what his income from the rent of the buildings must be, and the cost must be just so much to make his calculations foot up right. The designer appreciates this fact.

With the smaller structures the case is usually different. Generally it runs about like this : An owner, or a prospective one, calls upon an architect and, after introducing himself, says :

"I own a lot in such a suburb, and I think of building a cottage. I want you to understand, though, that I am not a millionaire. I will invest just so many dollars," naming the sum. "I would like so many bedrooms—good large ones—nice high ceilings. The dining room, parlor and kitchen I want about so, and, above all things, good plumbing and drainage."

After he leaves the architect gets to work and designs a building according to the outlines required to obtain the amount of rooms. He has not given the question of cost half the consideration he ought. The plans are completed. They are just what was desired, as far as accommodations are concerned. The elevations are pleasing. Possibly a perspective sketch is produced showing the building located on a ten-acre tract surrounded by impossible drives. The flower beds, if the sketch is colored, will contain conceptions of the architect's brain which are in their originality, to say the least, unique.

"Oh, Fred !" the wife will say when it is shown to her, "is this our cottage ?" and almost has hysteria when she finds she may keep the sketch. So far all is well.

Reducing the Cost.

Next, proposals are invited and received. Upon being opened they are all out of reason, thinks the owner. Where lies the trouble ? he wants to know. There are many so-called architects in the business who will easily make him believe that the contractors are figuring on too large a scale—too much profit. He trusts the architect, whom he thinks must know the value of the work. If he was competent he would, but he was not. To help the looks of things on his part he is ready to get in some of his fine work. "I have several friends who will furnish you a decent figure—men not so well known, perhaps, as the first, but yet just as trustworthy." He then gets to work on his specifications, makes a few interlineations, notes and changes. Nothing further is said to the owner. The doctored specifications with the plans are sent to one or two of his softest victims with perhaps a few instructions. They figure the work, not according to the original specifications, but in accordance with the notes and changes. Of course, the result is a lower figure ; or, perhaps, these men figured on the job at first, in which case the architect may go so far as to say : "The owner prefers this particular contractor to build the house, but as the case now stands he is so many dollars too high." He spins this yarn to each, and if he has sized his men up right he will be able to tell the owner how near right he was at first. Where the bids are sealed and opened in the presence of the tenders, of course, this method could not be employed. This is supposedly the usual custom, but it is far from being universal.

I have been pretty rough on the architect, and will let up on him for the present, as the one I had in mind may have been the exception that proves the rule. There are some who may think that I have been drawing it rather strong, but I have only related what I know to be facts—my own experience, or that of personal acquaintances.

(To be continued.)

Freezing Test for Bricks.

One of the most important features in structural materials of all kinds is their permanence under the influence of atmospheric influences. Of all these perhaps the one that exercises the greatest mechanical effect is frost, which tends to disintegrate bricks and stone by the expansion in the act of freezing of the water inclosed in the pores, with a consequent separation of particles or flakes when thawing ensues. Probably very few of our readers, says the *British Brickbuilder*, have ever thought of testing the permanency of their goods under such conditions ; the winter time provides a seasonable opportunity and there is no reason why every manufacturer should not, if we have frost enough, be able to ascertain to what extent his goods will stand frost. This can be determined by a very simple test—namely, by direct freezing. Let typical samples of the goods be chosen during frosty weather, and saturated with water, and then alternately frozen and thawed a dozen times or more. Now, if the samples to be tested are weighed dry, and the loss of weight by exfoliation determined also on the dry samples, the thing is accomplished. It would be possible to create a standard of permanency by counting a given percentage of loss as unity (this would have to be chosen arbitrarily) and then referring other percentages of loss to it. Thus might be created a scale of permanency, and when about to enter into a contract this might be referred to just in the same way as the resistance to crushing strain is now quoted.

THE ART OF WOOD TURNING.—I.

BY FRED. T. HODGSON.

IN looking over my file of *Carpentry and Building*, which dates back to January, 1879, I was impressed by the number of inquiries for information regarding the art of wood turning, and in hunting over all the book catalogues at my command, which by the way are numerous, I was somewhat surprised to find the literature on the subject very little indeed, when the importance of the topic is considered. Why so little should have been written on an art which enters so largely into all the constructive and decorative practices of this country is something to be wondered at, especially when there are so many facile pens waiting for opportunities to wear themselves out on any subject that might in the opinion of the owners be interesting or instructive. That the subject of wood turning would be both interesting and instructive is proven beyond a doubt by the many inquiries made in these columns by the correspondents during the last 19 years, and in order to do a little toward satisfying the requirements of the many correspondents who have asked for information on this subject I have reluctantly consented to prepare a series of papers and present to the best of my ability all the knowledge I possess personally, and such other as I may be permitted to glean from the works on turning at my command. This will necessitate my drawing largely from Bergeron, Peter Nicholson, Jacques Besson, Ree's Encyclopedia, *Nouveau Manuel Complet Tourneur*, Encyclopedia Britannica, Watson, Hasluck, Lukin, *Scientific American*, *English Mechanic* and other American, English, French and German works.

History of the Lathe.

The history of the turning lathe has been told so often and by so many able writers that it would be presumption on my part to attempt one, even if such were necessary, which it is not. The first illustration of anything in the shape of a turning lathe was published in a German work in 1568, the picture showing a man at work turning a sphere—a difficult job, I imagine, with the means at command. The lathe shown is of the most primitive kind, and the manner in which the operator is holding the cutting tool is not such as would commend itself to American turners. The illustration, somewhat modernized, is shown herewith in Fig. 1, but in the original picture there are lying on the floor and on the work bench a number of turned articles, such as tops, vases, balusters, spindles, and an object that might pass for an everyday rolling pin. The turner stands with his back against a rail, a custom that obtains to this day in some parts of Austria and Hungary, where the finest of children's toys are made—equal in many respects to the famous wooden wares of Tunbridge Wells. The manner by which this lathe is driven is not very clear, but from all indications it is probably driven by a pole, as there appears to be one with one of its ends inserted in the wall in the rear of the lathe. The manner in which the work was made to rotate by the use of the pole was by means of a cord wound around the work twice or more and having one end attached to an elastic pole, and the other formed like a stirrup into which the foot of the workman was inserted. When the foot was forced downward the work would be rotated in the direction of the cutting tool and the end of the pole would be bent toward the work. When the foot reached the floor the work would cease to rotate and the cutting tool would be drawn back while the foot would be raised and the spring in the pole would draw the stirrup up, causing the work in the lathe to rotate in a reverse direction. When the pole recovered its straight form the operation would be repeated and continued until the job was completed. By this method the work in the lathe rotated alternately, first in one way and then in the other, and the operator was compelled to withdraw the cutting tool at every change of motion—something that must have severely taxed his patience and skill.

The Bow Lathe.

Another method of operating the early lathe was by the aid of a bow. This instrument generally had several strings to it, which were fastened to a sort of roller or pulley at their middle point. This roller had a cord attached to it which was wound several times around the material to be turned and run down to a treadle under the lathe as shown in Fig. 2, which was taken from Bergeron's work published in Paris 100 or more years ago. But it does not, however, show the bow, although the end of the string connecting with the bow is visible. The bow was an improvement on the pole, as it equalized the force and was not so hard on the operator. The power was more uniform, enabling him to work with greater accuracy on the most delicate jobs. The bow was so constructed that it could be attached to the frame of the lathe, to the ceiling, or to the side wall, according as might be most convenient. Travelers tell us that this kind of lathe is still in use in many parts of India and China, where the itinerant mechanics carry their tools, including one of these lathes, with them, and do a job of work wherever their services may be required. It is stated that their skill in turning with the aid of this rude machine is something marvelous.

The modern lathe for wood turning as made and equipped by our great manufacturers of wood working machinery is a marvel of mechanism, and to perform good and intricate work by its aid is a matter that is within the reach of every American workman who cares to devote a small portion of his time to mastering the few rules necessary to a thorough understanding of the theory of wood turning, which I hope to make plain before completing these papers.

Home Made Lathe.

Although first-class wood lathes are now made by a number of concerns, notably the Seneca Falls Mfg. Company and W. F. & John Barnes Company, and sold at astonishingly low prices, yet it is not within the means of every workman who might wish to own a lathe to purchase one, and as any good mechanic ought to be able to build the frame of a wooden lathe, and do such other work as can be done with wood as a material, it may not be amiss to briefly show how he can construct for himself a very good lathe which will answer for ordinary wood turning, and at an expense of a very few dollars over and above his own labor. While I do not advise those who can afford to buy a lathe to make one for themselves, I would strongly advise the ambitious carpenter whose purse is hemmed in by well defined limitations to make his own machine whenever his spare time will permit, and if he will follow the rules I am about to lay down he will have no difficulty whatver in making a lathe that will enable him to execute such work as spindles for grills, balusters for stairs, newels, and the thousand and one things that may be required about the house for decorative and useful purposes.

The making of a wooden lathe similar to the one shown in Fig. 3 ought not to present any difficulties to a young carpenter who is in possession of an ordinary kit of tools, some judgment and a few dollars to purchase iron and lumber. The bearers marked B should be made of sound maple, white oak, or other stiff hardwood. Their dimensions are 2 x 5 inches when finished, and they are cut 5 feet long. They should be dressed by hand or by a Daniels planer, in order to take them out of wind, and they should be true and square on every face. The two uprights are 3 x 6½, one of which is to form a part of the head block, being 3 feet 6 inches long, and the other 2 feet 10 inches long, this being the hight of the lathe from the floor to the top of bearers. This would make, according to Fig. 3, the center line of working point 3 feet 4 inches from the flooring, a very good hight if the turner sits at his work. If a lathe is required when the operator intends to stand while using the tool, the uprights may be left as much longer as may be desired to give the bearers the necessary hight. The length given here need not be adhered to if some other length is more desirable. The uprights or legs, which are to be of hardwood, should be taken out of wind the same as the bearers and dressed square and true all around. The one intended for the head D should be worked off to a thickness of 2 inches as shown at D'. In order to make the matter clearer there are shown in Figs. 4 and 5 the uprights or legs with all dimensions figured and worked out. The gains for the to make his tenons, and cut all his shoulders with a fine bask or tenon saw. The mortise should be worked out clear and smooth and of the exact size, not too small, yet small enough so that the tenons will have to be driven home with a heavy mallet. Workmen should keep these diagrams well in sight, as I shall be compelled to refer to them often before we get through completing our lathe, as I purpose to give full directions for the completion of the machine before entering into a course of instruction in the art of turning. In order to make the diagrams easy of admeasurement I give a graphic scale with each sketch so that actual measurements may be taken from the drawings themselves if such a mode is preferred by the workman. The drawings presented are made to a scale of 1/8 to 1 inch, or 1½ inches to the foot, but as the editor may object to large drawings the graphic scale will meet any of the conditions he may choose to apply.

There will be required for the foundation or frame of the lathe four pieces of stuff made from hardwood, as follows: Two pieces 3 x 4 inches, 32 inches long, and which may be called the feet, and into which the uprights or standards are framed; also two pieces 3 x 3 inches and 5 feet long. These long pieces are to be tongued into the feet, as will be shown and described later. These must be dressed true and out of wind and framed snugly. The mortises must be cut truly square with the base of each foot and the tenons carefully fitted. The tenons may bear tightly against the end wood but not sideways, as in the latter case the feet would be liable to split. There will also be a mortise required for the cross bars, which will be halved at the ends to suit the mortises.

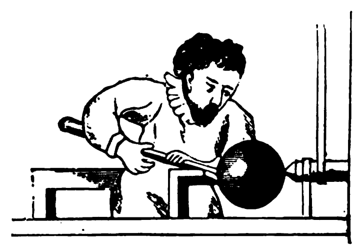


Fig. 1.—An Old Time Turner.

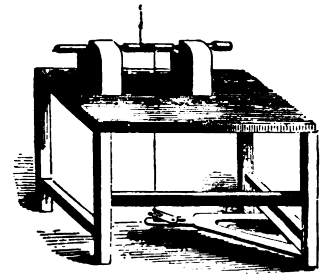


Fig. 2.—A Bow Lathe.

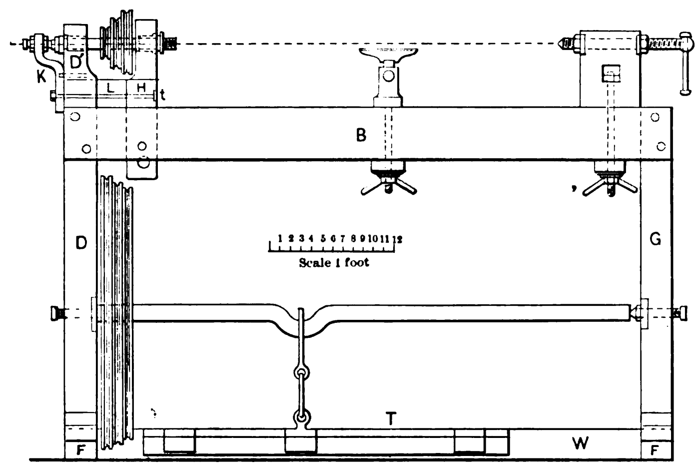
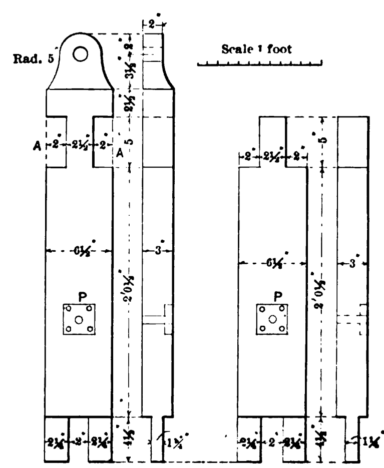


Fig. 3.—Elevation of a Home Made 6-Inch Lathe.



Figs. 4 and 5.—Details of Lathe Shown in Previous Figure.

The Art of Wood Turning.—Making a Lathe.—Scale, ¾ Inch to the Foot.

bearers are shown, also tenons at bottom where they are to enter mortises in the floor frame, which will appear later on.

Fig. 4 represents the left hand upright and shows the crank bearing at P, a front and edge view of the upright being given. A front and edge view of the right hand upright is given in Fig. 5, and the bearing for the crank is also shown at P. The gains with shoulders and tenons below are also indicated, together with figures indicating sizes of tenons, relish and shoulders. By following these instructions closely and performing the work as it proceeds, each piece may be wrought separately and may be fully completed and laid aside until all the other parts are finished and ready to be put together.

It is hardly necessary for me to say that all the wood used in the construction of this machine must be thoroughly seasoned, sound and free from defects of all sorts, for any change in shape in any of the parts may affect the machine to such an extent as to render it almost incapable of turning out good work. I would advise the young workman to use a fine toothed rip saw

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Northwich is the most dissipated looking town in England by reason of the remarkable crookedness of its streets and houses. It is the center of the Cheshire salt industry and is built over immense subterranean lakes of brine, which lie at a depth of 200 or 300 feet below the earth's surface. Hundreds of thousands of gallons of brine are pumped from these reservoirs every week by the salt works which surround the town. The consequence of the steady draining of their contents is a gradual subsidence of the upper crust of the earth, which has pulled askew the ground and the buildings on it, so that there is hardly a straight house or street in the place.

PREVENTING DAMPNESS IN BUILDINGS.

ONE of the annoyances to which the builder and house owner are often subjected in connection with a dwelling is the appearance of dampness within the structure, and they are often at a loss just how to proceed in order to remedy the trouble. The importance of keeping out the dampness from a building, especially one which is intended for dwelling purposes, cannot be gainsaid, owing to its bearing upon the general health of the occupants of the structure. The principles involved are very simple, but either from neglect or ignorance the necessary precautions are frequently omitted. It is believed, therefore, that a *résumé* of the principal causes of dampness and their consequences, taken in the order of the erection of a building, may be of service to many, as there would be less likelihood of their being overlooked at the time, with the consequent result of increasing the cost of remedying the defect. In an article contributed to one of the English building papers a correspondent refers to the prevention and cure of dampness in buildings, and takes up the remedies to apply to buildings already in existence in which dampness in its various forms has made an appearance, while pointing out those which have been found under varying conditions effective in practice.

Dampness may briefly be said to find its way into buildings through one of the following sources:

1. The soil upon which the building is erected.
2. The floors adjoining the level of the ground.
3. The external walls inclosing the building, together with their foundations; and
4. The roof.

Commencing with the erection of a new building, the first consideration will be the nature of the soil upon which it is to be put up, this often being not a matter of choice. The English writer suggests that if possible it should be of a gravelly nature, avoiding a stiff, retentive clay. The disintegrating influences of frost and dry weather upon a clay soil are well known to all practical men. Dry weather causes it to crack and form fissures, which become filled with rain, and if extended below the foundations of a structure and frosty weather supervening, the expansion of the clay when a thaw occurs will cause the foundations and walls to settle and crack. No foundation in clay, says the English writer, should be at a less depth in that country than 3 feet, in order to keep out of reach of frost.

Where possible the site upon which the building stands should be well drained below the level of the lowest floor before the building itself is commenced, the object of this being to get rid of the subsoil water. This is a simple precaution, but is too often neglected in dealing with country and suburban sites, where it can be most easily applied and is most wanted. It is obvious that if the subsoil water can be thus disposed of less cost will be incurred in the necessary precautions to keep it from finding its way into the building through the foundations and basement walls. Unless the walls of the building are upon a rocky or firm gravelly foundation concrete foundation will be necessary. If the nature of the soil is damp these should be of Portland cement. In other cases lime concrete will serve the purpose. Care must be taken, however, that the dimensions of the concrete bed are properly proportioned to the weight of the structure to be carried, otherwise cracks and settlements will ensue, thus causing dampness from the subsoil to find its way upward into the walls.

The soil having been properly drained and good foundations secured, the next thing to consider is the precautions necessary to prevent the dampness from the soil inclosed within the area of the external walls of the building finding its way upward through the floors. Whatever the nature of the soil the whole of the area mentioned must be covered with an impervious layer of Portland cement concrete at least 6 inches in thickness. Lime is often substituted for the cement in the concrete, but is not nearly so efficacious and is in many cases worthless. In many cases the dampness of the subsoil necessitates the upper surface of the layer of concrete cement being flooded with a layer of asphalt as a necessary precaution against dampness striking through it. This will prevent any dampness finding its way upward through the floor of a building.

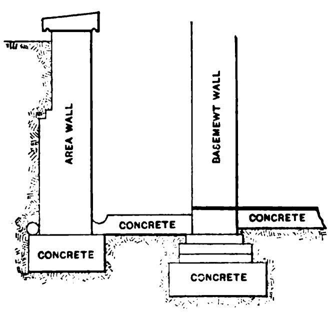

Fig. 1.—An Open Area.

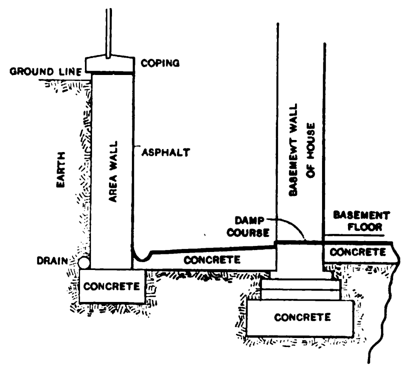

Fig. 2.—Another Treatment of an Open Area.

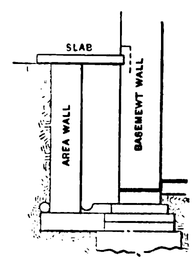

Fig. 3.—A Dry Area.

Preventing Dampness in Buildings.

Walls of the Building.

Very much depends upon the materials of which the wall itself is constructed, as porous stone, badly burned bricks, mortar composed of road scrapings and other rubbishy material of which the jerry builder is fond are a fruitful source of dampness. It is of importance that the bricks be hard, sound and well burned, and that they be laid and thoroughly flushed up in every joint with mortar composed of good lime and clean sharp sand, mixed in the proper proportions. Great care must be taken to see that the sand is perfectly free from clay, silt or lime, a very small proportion of which, and especially clay, will cause the mortar to molder away in winter and thus admit the dampness. Sea sand should not be used in the preparation of mortar, or its presence will soon be felt in the incurable dampness of the walls. The thorough flushing up of each joint of a course of brick work with mortar is a point which should not be overlooked by the careful builder. The manner in which the average bricklayer lays a course of brick in a solid wall is a sufficient reason why thin brick walls are nearly always damp. A slight dab of mortar on the outer joints of a brick is considered by him as a sufficient equivalent for a proper flushing, with the result that the interior wall consists of a series of small cavities without any of the advantages of a properly constructed cavity wall, and rain strikes through it at once.

Solid walls, even when thoroughly well built and flushed up with good mortar, will not in very exposed

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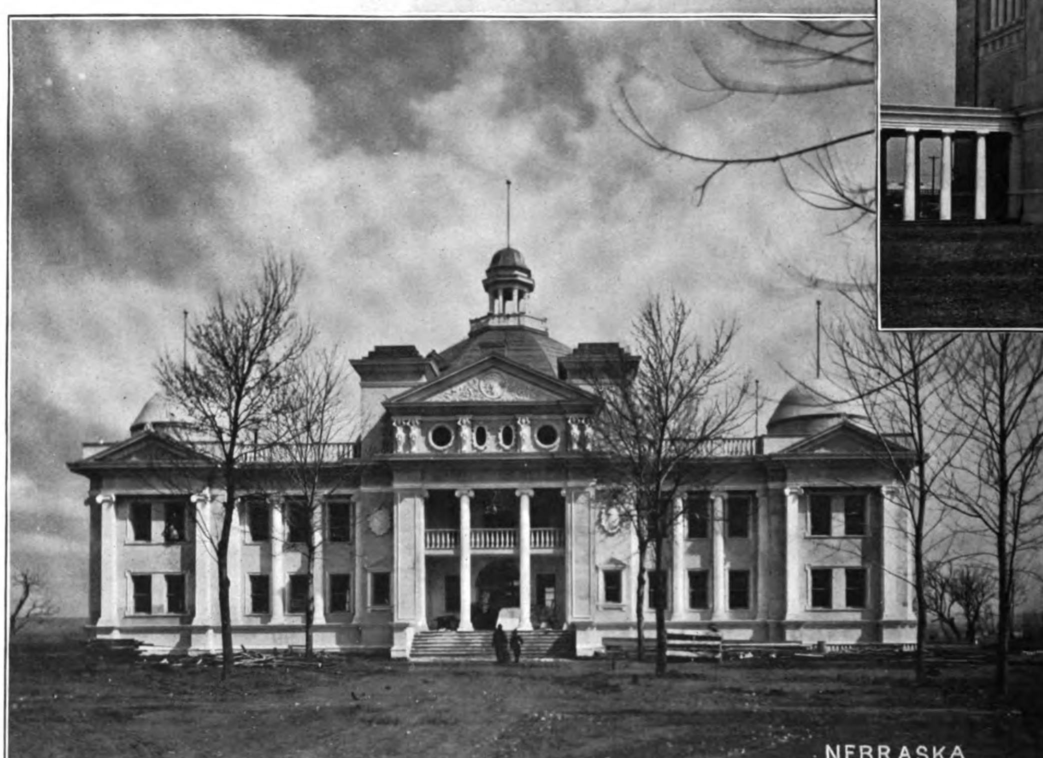

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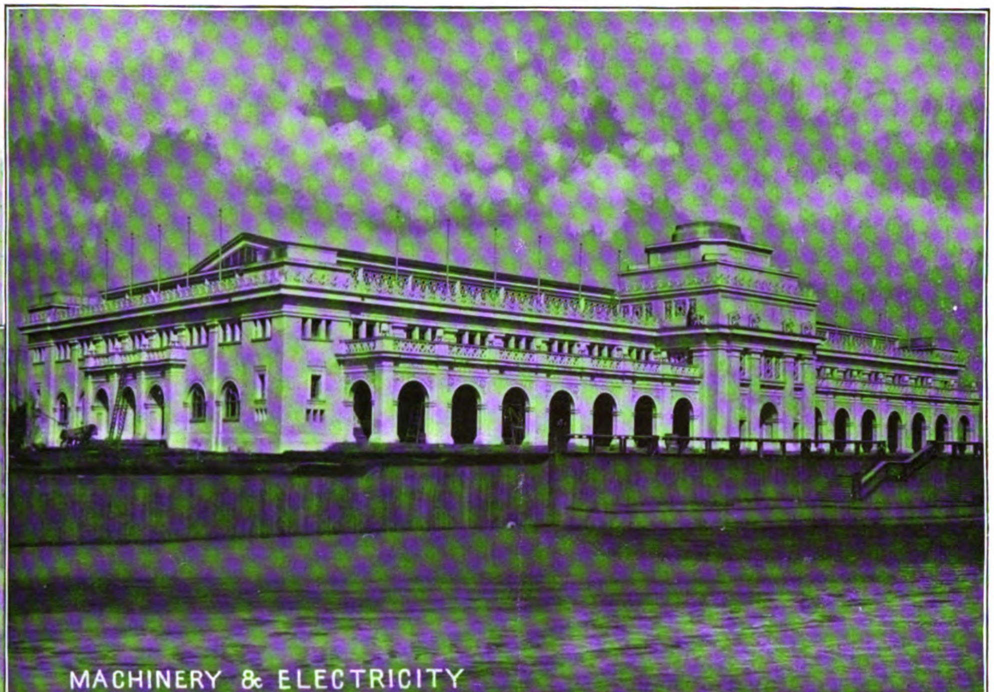
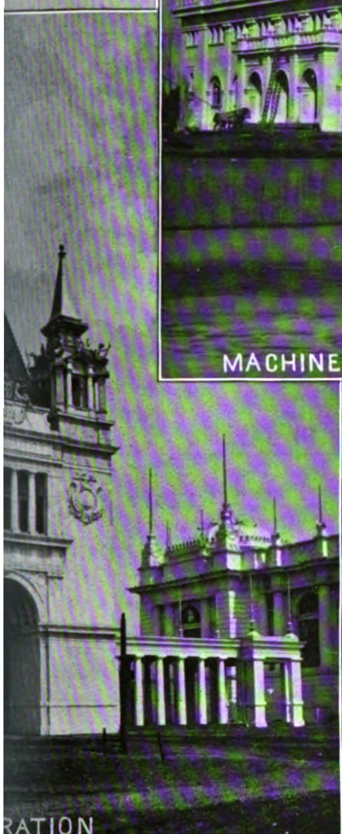


MACHINERY & ELECTRICITY



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TIONAL EXPOSITION AT OMAHA, NEB.

situations keep out the dampness, especially in driving rains, and a 9 or 14 inch wall in a southwest aspect is often little more than a sieve for water. In such situations it would be preferable to adopt one or the other of the following constructions: Hollow walls, solid walls with Hygeian Rock filling, solid walls built with cement, slate or tile hanging to walls, and rendering the external walls in Portland cement, the course adopted being governed by the cost.

If the building has a basement special precautions will be necessary to prevent the increment of moisture from the surrounding soil to the external walls. One method of effecting this, where cost is not a consideration, consists in the construction of an open area surrounding the cellar part of the building, this plan having much to recommend it when space will admit. If the surrounding soil is moderately dry the area walls may be built of concrete, rubble stone or brick, and rendered on the inside in Portland cement or lined with white glazed bricks or tiles. The floor of the area should be of Portland cement concrete, at least 6 inches thick, on rough stone or brick foundation, with a channel formed in it to carry the surface water into traps at intervals, connected with a drain. The floor should slope from the wall of the house. At the rear of the area wall a drain pipe should be laid to carry off the subsoil water, all as indicated in Fig. 1 of the accompanying illustrations, which represents an open area as described above. By this arrangement the main walls of the building will not suffer from the subsoil dampness or water. In damp or marshy situations cellars are always surrounded with a saturated soil, and in such cases the area walls previously mentioned should be well and solidly built with non-porous materials, such as blue bricks, and lined on the inside with asphalt ½ inch thick, care being taken that the joints of the brick work are raked out as the work of carrying up the walls proceeds, in order that the asphalt may key well into the substructure. The floor of the area in this case should also have a layer of asphalt on top of the concrete, and if this layer is continued as a damp course through the walls and basement floors a water tight tank will be formed by the walls and floors of the building, which, if the work is executed with the best materials and workmanship, will keep any water or damp from the subsoil at bay. Fig. 2 shows an open area constructed as here described.

Where space is limited and cost has to be considered a dry area may be substituted for the open one. Fig. 3 shows such an area, in which the damp earth is prevented from coming in contact with the main walls of the building. The remarks as to construction of walls and floors of open areas are applicable to the dry area. It is a common but faulty practice to build these walls roughly and with inferior materials, thus neutralizing the very object of their use, which is to keep the external walls of the building dry.

In the construction of a dry area ventilation is of the utmost importance, and this is effected by the introduction of air gratings at intervals, fixed in the main walls of the building, as shown in the sketch, as horizontal gratings would admit the rain and render the walls damp. The covering of the area may be formed with York stone flags or cement concrete slabs, laid with a slight slope from main wall, and they should be drained in a similar manner to that described for the open area. Where for various reasons a continuous area, open or dry, round the basement walls is inadmissible, great care must be taken that the damp does not come through the main walls upon which the earth impinges. These walls, if solid, should be built of the best hard non-porous bricks procurable, laid in cement and rendered on the outside with Portland cement 1 inch thick, and have a damp course of the same material. This will prove sufficient if the soil outside is of a moderately dry character. If, however, the soil is wet or marshy it will be necessary to substitute for the Portland cement rendering a lining of Seyssel asphalt, with a damp course of the same, as shown in Fig. 4.

Instead of the solid external walls before described hollow walls may be substituted. Fig. 5 shows a basement wall one and a half bricks thick, having a 2-inch cavity between the two thicknesses, which are connected with galvanized iron ties or bonding bricks. The cavity will require ventilation by means of air bricks at intervals or it will retain the damp which strikes through the outer facing. It is of great importance that the cavity should be carefully executed instead of the rough manner in which it is often done, and that all mortar droppings should be carefully removed from the bottom of the cavity and the ties as the work progresses, or damp will otherwise strike through the wall at the points where this precaution is neglected, and show in patches on the inside. The bottom of the cavity must in all cases be continued below the level of the floor, as shown, and should have a 2-inch pipe drain to carry off any water that may find its way through. In the construction of these walls special attention must be given to the mode of finishing the jambs of door and window openings, which are the most vulnerable points in this system of walling. Fig. 6 is a plan of part of a window jamb in a hollow wall, with 4½-inch outer and 9-inch inner lining, and a 2-inch cavity or air space. The position of the tie is shown, and it will be seen that water is excluded from penetrating the inner lining at this point.

Where hollow walls are objected to, and cost will not permit of a thick solid wall to resist the weather, the cheapest and perhaps the best precaution against damp consists in the use of White's Hygeian Rock, which is a perfect protection against driving rain, and possesses the further advantage of adding greatly to the strength of a wall, permitting the use of a thinner wall—*i. e.*, a 9 for a 14-inch or a 14 for an 18-inch wall. Its application will be seen from Fig. 7, which shows a 9-inch wall in which this composition is used. A ½-inch cavity is left between the inner and outer thicknesses of wall, which are built in mortar or cement in the usual manner. This cavity as the work progresses is run in with the material rendered liquid by heat, forming, as it were, an impervious vertical damp course throughout the wall, through which it is impossible for damp to find an entrance. The material can also be used as a damp course as shown in Fig. 7 of the sketches.

(*To be continued.*)

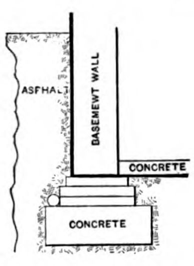


Fig. 4.—Treatment of Main Wall where "Open" or "Dry" Area is Not Possible.

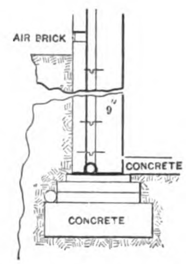


Fig. 5.—Basement Wall Made Hollow Instead of Solid.

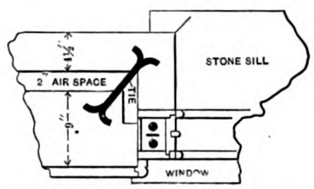


Fig. 6.—Plan of Part of Window Jamb in Hollow Wall.

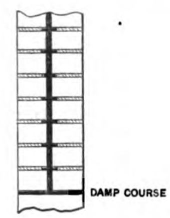


Fig. 7.—Showing Vertical and Horizontal Damp Courses in a Wall.

Preventing Dampness in Buildings.

Holding Power of Wire and Cut Nails.

A GREAT deal has been published relative to the merits of wire and cut nails, showing as a result that opinions differ widely touching certain features of these useful articles. We have in the past presented numerous letters from correspondents expressing their views on the durability of these two kinds of nails, and we now give some data relative to the holding power of nails of this description. Professor Soule of the University of California recently read before the Technical Society of the Pacific Coast a paper on this particular subject, the data being obtained from tests with wire and cuts nails driven in Douglas spruce, otherwise known as Oregon pine, and in redwood. The points which it was particularly desired to clear up by the tests were the relative merits of cut and of wire nails; the merits of different surfaces on the nails; the best shape of nails; also of points; the relative holding power in the woods mentioned; the best relation between the length of nail and the thickness of board nailed by it, and the effect of time upon the holding power of nails in the cases of the kinds of timber mentioned.

Results of Tests.

The conclusions formed from the consideration of the results of the tests are as follows:

1. Cut nails, for the same area, hold better than wire nails.

2. The holding strength increases with the length of the nail, but not according to any simple law.

3. The pointing of the wire nail adds about 100 per cent. to its efficiency. If slightly more pointed than they are made at present, the holding power would be increased.

4. Pointing the cut nail adds 33 per cent. to its efficiency, but it increases the tendency to split the wood. To avoid splitting, the taper side only of the cut nail might be wedged. If wedged on all four sides it holds best.

5. Cut nails driven with wedge across the grain are only about 80 per cent. as strong as those driven with the wedge parallel to the grain. This fact does not accord with practice in driving, probably on account of the greater tendency to split the wood.

6. A nail is three times as strong when driven into the side of a beam—that is, across the grain—as it is driven into the end of it—that is, parallel to the grain.

7. The holding power of nails increases with time in the case of redwood. It is asserted by some that the tannic acid rusts the nail and thus increases its holding power. It is probable that this effect would be extended over a few months only, after which the further rusting of the nail would weaken it. The effect of time in the case of cement nails does not seem to be great, and is only slightly greater in the case of wire nails, but is very considerable for cut nails.

8. The tests show that all these nails lose holding power with time when driven into Douglas spruce. This probably may be accounted for by the small lateral adhesion of the fibers in that wood and their gradual yielding to the wedge action of the nail. In other words, they pinch the nail less with time, but it seems unlikely that this diminution would continue indefinitely.

9. In redwood a cut nail holds slightly better than the wire nail.

10. In Douglas spruce the cement nails are 1.3 times stronger than the wire nails.

11. A cement nail is slightly stronger than a wire nail when driven into redwood, but the difference in strength is small.

12. Under shearing stress cut nails are 1.4 times stronger than wire nails. There seems to be no difference in the resistance of the nails to shear in using blocks of Douglas spruce or of redwood.

13. When nailing cleats to a block the same area of nail in the wood will hold about the same stress, whether a few large nails are used or more small ones. The superiority, if any, is in favor of the larger nail.

14. The cut nail holds 1.33 better in Douglas spruce than in redwood; the wire nail about the same in each, with a slight superiority in favor of redwood.

15. The holding power of a nail is not directly proportional to its surface in contact with the wood. In determining the relative holding powers, the stress per unit area has been employed, but as far as possible nails have been taken as nearly alike as practicable, so as to eliminate the error introduced by this method.

16. In drawing a nail, the pull seems to reach a maximum shortly after the nail starts.

17. In the case of a wire nail, the applied stress increases gradually; of a cut nail, by jerks and starts. The decrease of holding in wire nails after reaching the maximum is gradual, while in cut nails it falls off suddenly. Hence a cut nail is not as efficient in holding together pieces of timber subject to vibration as is the wire nail, for the former is more easily loosened, and, being partly withdrawn, loses much of its strength. This results from the fact that the major portion of the resistance comes from the wedge sides of the nail.

18. Cut nails are more likely to split Douglas spruce, and wire nails to split redwood.

19. In tearing a cleat from a block to which it is nailed, a maximum resistance is obtained for a cleat the thickness of which is two-fifths of the length of the nail used. This agrees closely with the practice of using a nail about two and one-half times the thickness of the thinner piece nailed.

20. A slight roughness on the surface of a nail is of advantage.

21. The cut nail is more efficient when driven into Douglas spruce, but the wire nail is more so in redwood. This fact bears out the theory as to the manner in which a wire nail holds. The lateral pressure of the redwood fibers is greater than that of the fibers of Douglas spruce, on account of the closeness of the grain of the redwood, it having 36 annular rings to the inch as against 14 for the spruce; and this holds true notwithstanding that the redwood is softer than the spruce.

The general conclusion from the tests was that for most uses and under most conditions the cut nail is superior to the wire nail.

Building to the Street Line.

An interesting case relating to building restrictions on city streets has recently been decided by the Supreme Judicial Court of Massachusetts. In 1795 the town of Boston voted to sell a large quantity of land opposite the Common, "upon express condition that all buildings to be erected on the lands sold by virtue of this vote shall be regular and uniform, and of brick or stone, and covered with slate or tile or some material that will resist fire." The property sold pursuant to this resolution embraced what is now Tremont street between Mason and Park. In the course of fifteen years that portion of the street was occupied by a continuous line of buildings, straight and regular, but four feet back from the street. The defendant has now put up a new building extending to the street line, and the plaintiff insisted that this was a violation of his rights as an adjoining owner, because both parties were bound by the restriction above quoted not to build out beyond the original building line. The court held that it would be straining language to say that a requirement of regularity and uniformity in building bound the land owners to an arbitrary building line for all time. Furthermore, Judge Oliver Wendell Holmes expressed the opinion that in any event the restriction was enforceable only in behalf of the municipal authorities, saying that at the time the land was sold no one dreamed that the words quoted gave rights to anybody except the town of Boston. He concluded that the plaintiff as an adjoining owner could not enforce the condition so as to prevent his neighbor from building out to the street line, and the complaint was declared to have been properly dismissed.

CORRESPONDENCE.

Position of Leather Belt on Pulleys.

From GEORGE ABREY, *Memphis, Tenn.*—Speaking from considerable experience with regard to the above matter, I would say to "C. E. G." that undoubtedly it is best to run the hair side of the belt in contact with the face of the pulley, as the life and utility are perceptibly increased thereby. It is also very essential to adjust the laps in such a way that the point of the top half is last in making the circuit. Especially in fast speed belts is this advantageous where a large and small pulley are engaged.

Design for a Greenhouse.

From J. W., *Hopkinsville, Ky.*—I am a reader of *Carpentry and Building* and consider that it is a strictly up to date journal. I am in need of information and come to the Correspondence department for it. I would like to see in the next number a plan of a greenhouse 12 x 16 feet, showing heating arrangement, &c. I want to raise vegetables in it and hope some of my brother chips will promptly respond.

Note.—We shall be very glad to publish drawings showing greenhouse construction, and trust that those of our readers who have done work of this kind will let us hear from them. Our correspondent may derive suggestions, perhaps, from some of the articles on greenhouse heating and construction which have appeared in previous issues of the paper. In June, 1892, and December, 1895, will be found two articles from correspondents showing how a greenhouse should be constructed, and in the issue for December, 1897, is an article in which the subject of heating greenhouses is discussed.

Wood Turning Chisels and Gouges.

From J. F. W., *Danville, Pa.*—Will some of the many readers of the paper furnish designs of wood turning chisels and gouges for the turning of tongue pulleys and wooden land rollers about 10 to 24 inches in diameter? I would also like designs of augers to bore endwise of the stick. I do quite a lot of this kind of work, but have not the right kind of tools. If some of the readers can give me instructions with regard to these points it would be a great favor.

Construction of a Carriage Shed.

From JOHN L. SHAWVER, *Bellefontaine, Ohio.*—In response to the inquiry of "J. A. R.," Germantown, Pa., I submit sketches of a cheap yet substantial church carriage shed, which I trust may prove of interest to him as well as to others. This shed employs the principle of the plank frame barns that are growing rapidly in favor and will save a good percentage of the timber as well as much of the labor of framing. Four good men will frame and erect a shed 160 feet long in a day, if the timber is conveniently near and racked in assorted lots. Sheds of this kind should shelter 20 double teams and carriages, and are usually made 8 feet high and 18 feet wide, the length being according to circumstances.

Referring to Fig. 1, the posts marked A are made of two 2 x 6 plank, the front post being 12 feet high and the rear one 8 feet. The beams are 2 x 8 in size and 18 feet long. The braces C are 2 x 6 and also 18 feet long. The brace comes between the two pieces of the posts and is beveled to fit snug beneath the beam B to support the projection. The braces D are made of two 2 x 4 pieces. A short sill at E is made of 2 x 8 plank. The plates F are made of two 2 x 6, like an inverted hog trough, and are 8 feet long. The braces G are of 2 x 6, and the braces I are 2 x 6 and 10 feet long. The rafters are made of 2 x 5 stuff. In Fig. 2 is shown a side view of the framing.

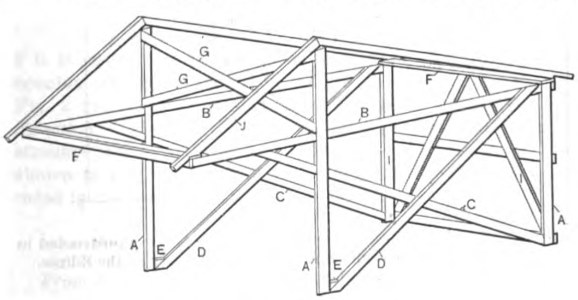


Fig. 1.—Details of the Framing.

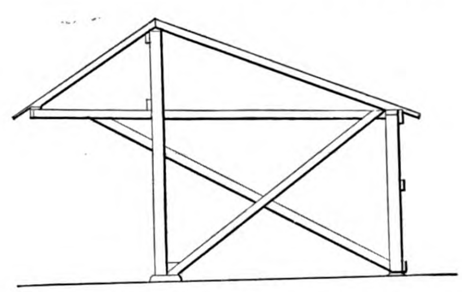
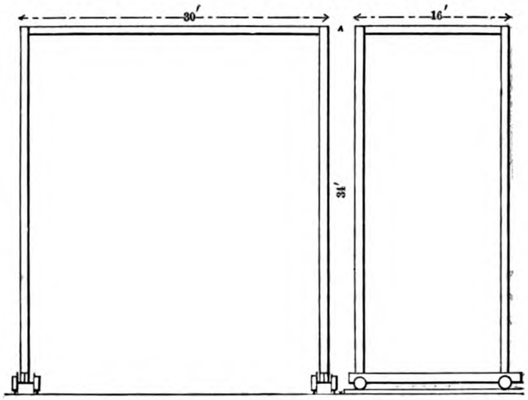


Fig. 2.—Side View of Carriage Shed.

Construction of a Carriage Shed.



Suggestion of Traveling Scaffold as Required by "Young Chip."

Details of a Moving Scaffold

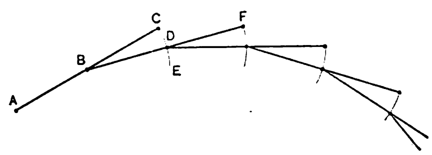
From YOUNG CHIP, *Montreal, Canada.*—Will some of the many kind readers of *Carpentry and Building* who are learned in such matters give me a design with details of a moving scaffold to run on wheels? It is wanted for use in ceiling a large hall 40 feet high, 30 feet wide and about 200 feet long. I want to make the scaffold high enough so that I can work from it the full width of the hall and about 16 feet broad. The wheels to be used are railroad car wheels, to run on rails, but with a narrow gauge, say about 2 feet or 18 inches. I should like the timber to be as light as possible consistent with strength, so as to be easily taken down and packed away. For instance, I would rather have two pieces 4 x 9 inches bolted together than one piece 8 x 9. I send a rough outline sketch of what I want, and if some one will kindly fill in the struts and braces, giving dimensions, I shall be under obligations to him. The first part of the sketch shows a side elevation of the movable scaffold and the other part is an end elevation.

In Want of a Chimney Top.

From C. W., *North Tarrytown, N. Y.*—I would be glad to have the readers of the paper inform me of some chimney top adapted to the requirements which I describe. In our city there are a good many cement chimneys in use, and they crack and chip from the heat and weather. They are about 10 inches square, inside measurement. I would like to know of some metal or tile top that would take the place of these cement devices and be likely to give better satisfaction; also be more ornamental in appearance.

Laying Out a Segment of a Circle Without Using Radius.

From O. L. W., *Dallas, Texas*.—The above proposition, submitted by William T. Davies in *Carpentry and Building* for March, has been correctly answered by several correspondents, but each has introduced a very tedious mathematical operation. Referring to the sketch



Sketch Accompanying Letter of "O. L. W."

which I send, first lay down a chord, as A B, of any convenient length—we will say 5 feet. After this has been done produce it 5 feet further to C. Now, with B as a center and B C as a radius, describe a short arc, as C E. Next divide the square of the chord by the radius, 250 feet, which would be $5^2 = 25$ and $\frac{25}{250} = \frac{1}{10}$ foot, or $1\frac{1}{5}$ inches. Lay this distance off on the arc C E, as at D. Draw B D, producing it 5 feet further to F. Now, with D as a center, repeat the former operation and continue as far as desired. The points A, B, D, &c., will be on the curve, which may be traced by the method described in *Carpentry and Building* for June, 1897.

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

From A. P., *Saginaw, Mich*.—In the April issue is a communication from "L. S. H.," Fredonia, N. Y., showing his method of determining the shape of a hole in an inclined roof to fit a perpendicular cylinder or pipe, and intended as an improvement on the method suggested by Julien A. Hall in the January number. Both correspondents assume that the hole must be a perfect ellipse, which is correct. "J. A. H." obtains this ellipse, even if it takes great care and two men and a boy to accomplish it, while "L. S. H." in my opinion can never obtain a perfect ellipse by the method suggested by him in Fig. 2 of his sketches. I submit the inclosed diagrams to show my reason for my way of thinking. In Fig. 1 A B C D is a rectangle constructed on the assumed semi-axes of the ellipse, and in Fig. 2 I have described a quadrant of the figure in accordance with the well-known property belonging to the ellipse—namely, the sum of the focal distances of any point in the curve is equal to the tranverse axis. Now, let "L. S. H." divide D C and C B each into the same number of equal parts and join them, as suggested by him, and he will discover without further discussion the difference between a perfect ellipse and the figure his method produces.

Referring to Fig. 2 of my sketches, draw E F and E G, making an angle equal to the inclination or pitch of the roof. Make E F equal to the radius of the pipe and draw F G perpendicular to it, intersecting the roof line E G at G. Now from G draw G H perpendicular to E G and make it equal to E F; then E G and G H will be the semi-transverse and semi-conjugate axes respectively of the required elliptical hole, the curve of which may be found in various ways. The following is a very simple method, and will be readily understood by any one: From G as center, and G H as radius, describe the arc H I. Divide G I into any number of equal parts, and from the points 1, 2, 3, &c., draw lines perpendicular to E G, intersecting the arc H I in the points 0, 0, 0, &c. Also divide G E into the same number of equal parts, and from the points 1′, 2′, 3′, &c., draw the dotted lines indefinitely and parallel to the others. From the points 0, 0, 0, &c., on the arc H I, draw lines parallel to E G, intersecting their corresponding dotted lines in the points 0′, 0′, 0′, &c. Through the points thus found the curve can be easily drawn with the aid of a flexible strip. As many points as may be desired may be found by this method.

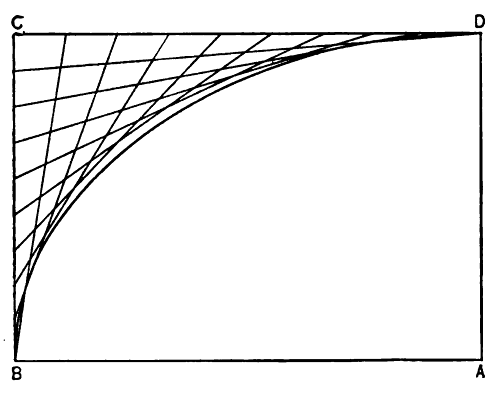


Fig. 1.—Rectangle Constructed on the Assumed Semi-Axes of the Ellipse.

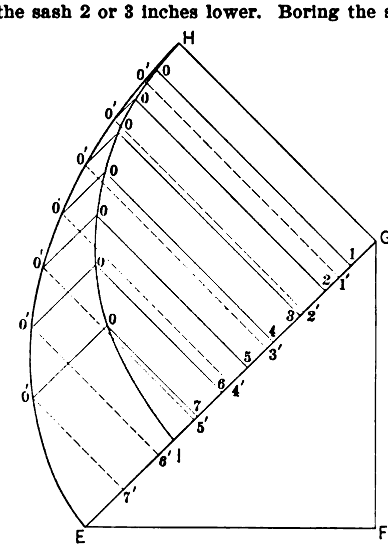


Fig. 2.—Diagram of Quadrant of the Figure Constructed in Accordance with a Well-Known Property of the Ellipse.

Cutting an Opening in a Roof to Fit a Round Pipe.—Diagrams Accompanying Letter of "A. P."

Rule for Boring Sash.

From J. D. McD., *South Sudbury, Mass*.—With regard to a rule for boring sash, about which a correspondent recently inquired, I would say that I place the center of the pulleys 6 inches down from the top of the frame and bore the sash 2 or 3 inches lower. Boring the sash any lower than this would cause an unnecessary waste of cord. I have hung some very wide, low windows, which were quite heavy, necessitating the use of long weights which struck bottom before the sash was up to its full hight. In such cases the pulleys should be placed as high as possible in the frame and the sash bored a few inches lower.

Design for a Derrick.

From C. O. M., *South Amana, Iowa*.—I am sometimes obliged to do heavy lifting and would like to build a derrick. I have no pattern, however, to go by, and I would like to have some of my brother chips furnish the editor, for publication, drawings of a derrick which would be suitable for the purpose.

Note.—It is possible that our correspondent may derive some suggestions from the illustrations of the apparatus described by Mr. Smiley in his series of articles on "Barn Framing in Western Pennsylvania" as being used in raising the frames of the barns in question. The matter was referred to in the issue of the paper for September, 1897. We trust, however, that those who have the time and inclination will send forward drawings of such apparatus as will answer the purpose specified by the correspondent making the above inquiry.

Method of Placing Sheeting Boards.

From L. E. P., *Aiken, S. C.*—I send herewith sketches representing the sheeting boards about window openings on the side of a house, and I would like to ascertain through the Correspondence department what is the best method of placing the boards. There has been quite a little argument over the question here, and I would be pleased to have some of my brother carpenters express an opinion upon it. As will be seen from the sketches the sheeting is nailed on diagonally, but in Fig. 1 it is cut in the center above and below the window opening, giving the boards a double direction, while in Fig. 2 the sheeting extends continuously in a diagonal direction. I want to know which is regarded the stronger way. I claim that it is best not to cut it as shown in Fig. 1, but that it should be put on as indicated in the second sketch.

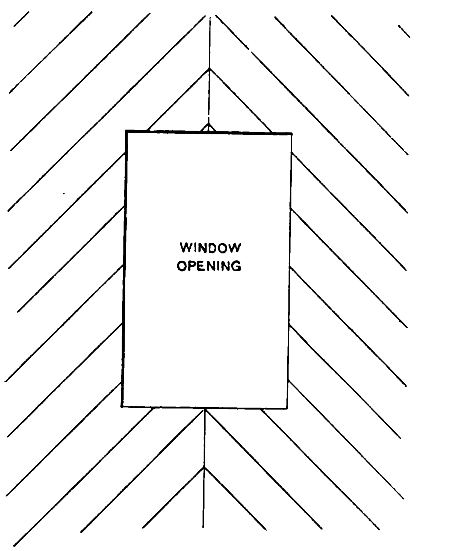


Fig. 1.—Sheeting Boards Placed so as to "Joint" on a Center Line Above and Below the Window Opening.

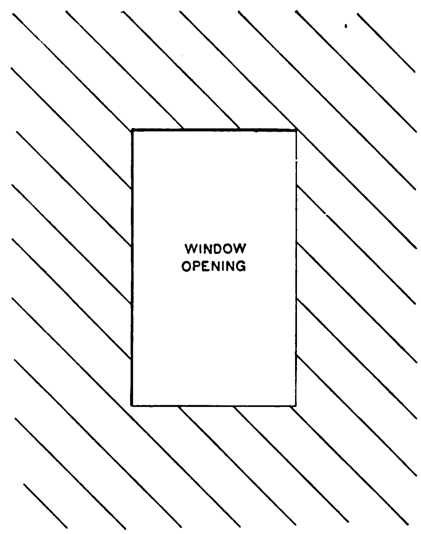


Fig. 2.—Another Method of Laying the Sheeting Boards.

Method of Placing Sheeting Boards.

Glass Surface for Schoolrooms.

From J. H. K., *St. Louis, Mo.*—The question raised by your correspondent, "R. H. D.," Lancaster, Pa., in the June number is one of great importance and deserves the attention of all interested in the construction of school houses. A schoolroom should have plenty of light and yet the light must not be too glaring. Too bright a light is almost as harmful as too dull a light. The windows should be so proportioned and placed as to light every part of the room as nearly uniform as possible. The number of square feet of window surface required to light a room depends upon the exposure of the windows to direct sunlight and upon the width of the room. The windows most exposed to the direct light of the sun furnish more light than those not so exposed, and the places far from the windows receive less light than those near by. Herman Cohn made a great many experiments to determine the proper amount of light to be furnished to schools, and as a result of his experiments and our general experience with schools we know that the area of the window surface for the admission of light to schoolrooms should never be less than one twelfth of the floor surface, and should be as nearly one-fifth or one-quarter as possible. The widths of the rooms should not be much greater than twice their hights, and the greater part of the light should be admitted so as to fall upon the left side of the pupils when seated.

"R. H. D." says that the room which he has under consideration is 16 x 21 feet and has a hight of 12 feet, but that he can get light from one side only. The floor area is 336 square feet, one-quarter of which is 84 square feet, so that if the windows are made 8½ feet high, as suggested, the sum of their widths must be 84 divided by 8½, or about 10 feet. If the windows are on the side that is 21 feet long there will be left on that side 21 — 10, or 11 feet of length of wall. The best arrangement would probably be to put in two windows, square or segment capped, each about 5 or 5½ between frames. In order to prevent the sash from being unduly large, there should be four sash to each window—that is, there should be two double windows. If the windows have a southern exposure, and therefore are exposed to the direct light of the sun, it will be necessary to provide some means of preventing a glare. Either shades or ribbed glass may be used. The objection to shades is that they shut out a great deal of light and the objection to ribbed glass is that it prevents the pupils from looking out of the windows. A good compromise is ribbed glass for the upper sash (I am assuming that the windows are to be double hung) and shades for the lower sash.

Note.—We are very much indebted to this correspondent for the very interesting remarks which he presents upon the above subject, and we trust that he will favor the readers of this department with other communications, which we have no doubt he can discuss in an equally instructive manner.

Construction of Veneered Doors.

From J. D. McD., *South Sudbury, Mass.*—Replying to the recent question asked by a correspondent concerning the construction of veneered doors, I would remark that while I think the tendency to warp might be diminished by making the harder veneer very thin, I do not believe it would entirely cure the evil. To construct a door which would have no tendency to warp, I should veneer both sides with the cheaper wood, say

3-16 inch thick, and then lay a thin veneer of the desired wood over the other on one side, say 1-16 inch thick. The thick veneer on each side would shrink or swell alike and keep the door straight. I offer the above as a suggestion to manufacturers of veneered doors, feeling confident that it would be an improvement.

Design for Model Sheep Shed.

From J. Y., *Lena, Ill.*—I would very much like to have some of the readers of the paper furnish floor plans and elevations for publication of a model sheep shed arranged for convenience in feeding, the building to be 24 x 100 feet in size. I have no doubt that some of the many readers of the paper have had experience in this class of work and that they will be willing to comply with my request.

Omitting the Front Wall Trap.

From PLUMBER.—I would like a little information as to the advisability of omitting the front wall trap in a job of plumbing. Would it be practicable in a country job of plumbing to omit the trap on the main drain pipe just inside of the cellar wall when the drain pipe discharges into a cesspool which cannot be readily ventilated other than through the drain pipe system?

Note.—The primary object of the front wall trap is to be a barrier against the dangers which arise from the foul air and gases that may be generated in a sewer system or in a cesspool. Throughout the United States the use of the front wall trap, as the trap on the main drain inside of the house is called, is very general, but there are cases where it is omitted. The plumbing regulations of Orange, N. J., do not permit the use of a front wall trap, owing to the fact that the sewers are of the Waring system and of comparatively small bore. Where the house drainage system connects with a cesspool we would consider that the front wall trap was desirable, even if it was necessary to run a special ventilating pipe from the drain pipe between the trap and the cesspool up to some point above the roof and several feet higher than any neighboring window.

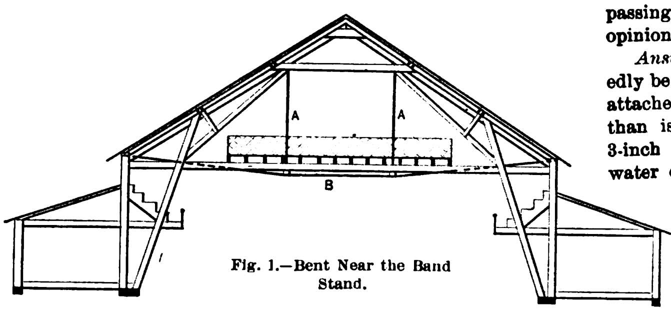


Fig. 1.—Bent Near the Band Stand.

The Plank Frame Applied to a Skating Rink.

From N. B., *Sussex, N. B.*—We want to erect an auditorium, 50 x 200, with 16-foot posts and 12-foot sheds at each side for offices, waiting rooms, saloon, &c. We want galleries all around and a large band stand at one end, suspended from the roof. The building is to be used for a skating rink in winter and for public meetings during the summer. Will the plank frame system described in *Carpentry and Building* be suitable for the frame?

Answer.—The above inquiry was submitted to Mr. Shawver, who contributed the recent articles on plank frame construction, and in reply he says:

The plank frame is admirably adapted to such a building as that described, and can be quite cheaply constructed. In Fig. 1 of the sketches is shown one of the bents near the end on which the band stand is located, indicating the manner in which it is suspended from the roof by the rods A A, together with truss rod B. The galleries appear at either side, above which and beneath the eaves are the windows. If lighted by dormer windows, or if artificial light is employed, the shed roofs may be of the same pitch and a continuation of the roof of the main building, in which case the galleries may extend back beneath the roof of the sheds, and they need not extend out further than the purlin posts. The sketch, Fig. 2, shows an interior bent without the band stand. The end bents will be constructed in a manner similar to that shown in the January number of *Carpentry and Building*. A 200-foot building should have 17 bents placed 12½ feet apart.

Defective House Drainage Work.

From V. S., *San Francisco, Cal.*—I would like information in reference to some house drainage work which has been brought to my attention. In one case there is a 3-inch stack of iron soil pipe with three hopper closets connected with it. In another job there is a 2 inch stack with a space of 20 feet between the ground and the highest fixture, leaving a distance of about 10 feet between the two fixtures. If it is necessary to vent the traps of the fixtures on the 2-inch stack why should the vents be omitted from the closets on the 3-inch stack, as is done, though there are closets on three different floors? I am of the opinion that the 3-inch traps will siphon as well as the 2 inch if not vented correctly. A column of water passing from the upper fixture down the stack will, in my opinion, surely siphon the water out of the lower one.

Answer.—The traps in both instances should undoubtedly be vented to prevent siphonage. If water closets are attached to the stacks in each case the pipes are smaller than is considered good practice. In some instances 3-inch soil stacks have been used in connection with water closets, but the general opinion of those who have given attention to the subject is that 4-inch pipe is as small as should be used in connection with water closets. Vent pipes from the fixtures, however, need not be so large, though the size of the vent stack must be in proportion to the number of fixtures connected with it.

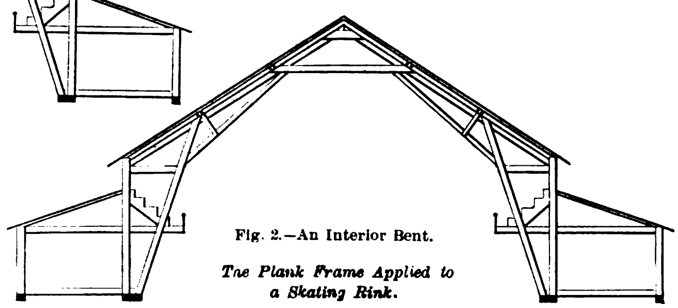


Fig. 2.—An Interior Bent.

The Plank Frame Applied to a Skating Rink.

Black Lines and Figures on an Ivory Rule.

From F. O. R., *San Francisco, Cal.*—I would like to know how, if possible, the black lines and figures on an ivory rule can be restored, provided the grooves are not wholly worn off?

Note.—Investigation among the manufacturers of goods of this sort fails to reveal any specific method which can be described for doing the work mentioned by our corespondent. It is probable, however, that if he would return the rule to the manufacturers the black lines and figures could be restored at a nominal charge to him. This correspondent, like some others to whom we have in the past called attention, falls into the error of failing to give his name and address, so that we are unable to correspond with him direct and mention in detail particulars regarding his trouble which might be of value. We take this occasion to remind all our correspondents that it is better to sign their letters with full name and address, not as an indication that they are to be published, but for the purpose of enabling the editor to correspond with them in case the necessity should arise.

WHAT BUILDERS ARE DOING.

THE activity in the building business reported as existing in the residence parts of Baltimore, Md., particularly in the Annex, does not seem to extend to other localities. Secretary Miller of the Builders' Exchange writes that building generally is dull, such work as is under way being confined principally to dwellings, alterations, additions, &c. No large contracts are under construction, and no public buildings are being erected except the new court house, which is expected to be under roof this season. This building, when completed, will be one of the handsomest public buildings in the country.

At the annual meeting of the Builders' Exchange, held June 7, the following officers and directors were elected to serve during the year ending May 31, 1899:

President, P. M. Womble, Jr.
First vice president, J. J. Walsh.
Second vice-president, August Wehr.
Third vice-president, John H. Short.
Secretary, E. D. Miller.
Treasurer, B. F. Bennett.

DIRECTORS.

E. D. Crook	E D Preston.
Joseph T. Lawton.	Henry A Seim.
Joseph H Hellen.	Hugh Sisson.
E M. Noel.	Norman James
Theodore F. Krug	James Maginnis.
C H. Classen.	William Carthe.

Isaac S. Filbert, the retiring president, said in his address:

This exchange is now ten years old. Let us look back and see what has been accomplished in that time.

Commencing as we did at 19 West Saratoga street with a membership of 39, we, through the individual members of the exchange, now occupy our present home, costing in round numbers about $100,000, and with a membership of about 105.

During this time we have, in connection with the architects, prepared a code of building laws for Baltimore city, which has been adopted and is now in force, and if strictly adhered to will be of great advantage.

The change of the grade of Lexington street, from Charles to Calvert street, was accomplished through the efforts of this exchange

The exchange, as a corporation, stands equal to any association in influence and importance in our city.

Boston, Mass.

The condition of affairs in the building trades of Boston remains unchanged from that reported last month, no new work of marked importance having come into the market since the last issue of *Carpentry and Building* The construction of a new dry dock at the Charlestown Navy Yard, recently authorized by Congress, will be begun as soon as practicable. It is estimated to cost, approximately, $2,000,000, and the present indications are that it will be built of concrete, although a strong effort is being made in favor of granite

The Master Builders' Association is being again brought into favorable prominence as one of the progressive organizations of the city through its connection with the Bureau of Commerce and Industry, of which the secretary of the association is also secretary The bureau, which is of recent creation, is composed of influential business houses in all lines of trade, and its objects are the protection and advancement of the general business welfare of Boston and New England

The Massachusetts Charitable Mechanics' Association has offered a prize of $500 for the best design of a home for mechanics Upon 4 acres of land in the suburbs of a large city it is required to provide for the housing of 50 artisan households in an attractive, agreeable, sanitary and independent manner, in such a way that the property shall be recognizable as a single property, and shall provide, at rentals within the reach of the artisan class, a fair return for the invested capital The designs will be exhibited at the Twentieth Triennial Exhibition of the association.

Chicago, Ill.

Early in June the Carpenters' District Council began a campaign for the universal adoption throughout the city of a Saturday half holiday. The employers have been notified, and up to the present time no opposition has been reported. The workmen say that under no circumstances, however important, will the half holiday be given up.

The Building Trades Club, whose former rooms were destroyed by fire some time since, has been re established in a new home in the Chamber of Commerce Building. The first meeting in the new quarters was held on June 4, and on the 7th the *café* was ready for service. The rooms are convenient and centrally located, and the members generally are pleased that the club is once more settled in a home of its own. The name of the club has been changed to "The Builders' Club of Chicago," as the organization was constantly being confused with the Building Trades Council

Chicago builders feel that the season's work will fall below the average of the last few years unless a change for the better is soon manifested Considerable dissatisfaction has been manifested over the requirement, by the new building ordinances, of the consent of all property owners in a residence block to permit the erection of a building to be used for any other purpose than that of a dwelling A number of buildings are delayed as a result of this provision, and it is probable that an effort will be made to amend the ordinance by only requiring the consent of the majority of the property owners

Cleveland, Ohio.

The Cleveland *Press* of recent date makes the following statement in regard to building during May: "The building inspector's report for May shows a big increase in the cost of building improvements in Cleveland as compared with May a year ago. The total number of new buildings was 273, at an estimated cost of $484,625. In May, 1897, there were 308 building permits, but the cost of buildings was but $284,042. There were nine stone and brick buildings in May and 11 in May, 1897. So far this year is away ahead of last year at the same period in the total amount of money invested in new buildings. Deputy Building Inspector Ellen estimates that this year's increase is more than $400,000 It had been feared, too, that the war would lessen the building enterprises.

Lowell, Mass.

The general condition of building in Lowell is reported as being dull by Secretary Conant of the Builders' Exchange. There is less work being done at present than at any time for many years past, the estimated amount being about one-third of the amount under way at this season of 1897. Such work as is being done is confined almost entirely to the residence parts of the city. Very little activity is apparent in the business and manufacturing districts. Good feeling exists between employers and workmen.

The exchange arranged for its annual meeting at Mountain Rock on June 23, and elaborate preparations have been made for a most enjoyable time. The occasion promises to be a delightful one, including games—baseball, football, cards, &c.—refreshments, music and speechmaking The committee having the matter in charge consists of Chas. P. Conant, Wm. H. Fuller and Phil. P. Conners

Milwaukee, Wis.

During the month of June a case was tried in the courts in Milwaukee, before Judge Sutherland, to determine the legality of an agreement between the Schlitz Brewing Company and the Building Trades Council that union men only should be employed on all work undertaken by the Schlitz Company The case was tried on the plea of Contractor Erdman Schulz for an injunction restraining the Schlitz Brewing Company from interfering with the erection of a certain building for the company so long as Schulz employs competent and skillful workmen as called for in the contract under which the work was let.

The contract for the erection of the building in question was executed March 18, 1898, and work was commenced On May 7 a walking delegate, claiming to represent the Carpenters' District Council, called upon Mr. Schulz and demanded that he sign the union agreement. Under the terms of the agreement he was to pay his workmen at least 25 cents an hour and eight hours was to constitute a day's labor. None but union workmen were to be employed, and in the event of a disagreement or trouble of any kind the controversy was to be submitted to a board of arbitrators, whose decision should govern Mr. Schulz refused to sign He was living up to the terms of the demand, paying his men 25 cents, working but eight hours and employing none but union workmen, members of the council represented by the walking delegate. He would not sign the agreement, however, and his men were called out and quit work. Mr. Schulz then, according to the complaint, called upon the council and asked that a force of union men be sent him, but the council refused to comply with the request until the agreement was signed. After advertising for a force of union workmen unsuccessfully, Mr. Schulz secured a force of competent and skilled non-union men, and work was resumed. The agreement between the brewers and the Trades Council was set up, and then it was asserted that on May 16 the Schlitz Brewing Company learned that non-union workmen were being employed upon the building. The brewing company, according to the complaint, forbade him to employ any except union labor, and threatened to forcibly eject all of the non-union workmen and to forcibly prevent any non-union men from continuing work. This was being done, Mr. Schulz alleges, in pursuance of the agreement between the brewing company and the Trades Council, and all the trouble is alleged to be due to the simple fact that he refused to sign the agreement, although agreeing to abide by the terms demanded.

Judge Sutherland granted Schulz the permanent injunction asked for, restraining the brewing company from interfering with the fulfillment of the contract. The judge decided that the endeavor of the brewing company to force Schulz to employ union workmen was contrary to public policy, in restraint of trade, and that the agreement of the brewing company with the Building Trades Council that only union men be employed on its building work was unlawful.

The decision created great interest among the brewers, plumbing and carpenter contractors, as well as among the union men. This comparatively recent agreement with the brewing companies has been one of the strongest levers that the union labor men of the city have been able in years to bring to bear upon those who refused to sign their agreements. The brewing companies have annually expended thousands of dollars in repair or new construction work, and many of the contractors have depended largely upon them for employment. It is believed that the ruling of the judge is a relief to the brewing companies as well as to the contractors, for the brewing companies do not expect that the men will demand hereafter what the courts have held to be unreasonable.

Minneapolis, Minn.

Minneapolis carpenters are complaining that an erroneous report is being circulated that there is a scarcity of wood workers in the city. It is stated that only a moderate amount of building is being done and that there are plenty of carpenters on hand to take care of it all and more besides.

New York City.

During the last few days of May and early June a general strike was called by the Board of Walking Delegates to enforce the demand of the Hoisting Engineers' Union against the Pelham Hod Elevating Company for an increase in wages from $4 to $5 per day. The matter was finally settled by the employers agreeing to pay the increase for five years on the condition that the hoisting engineers, as a union, withdraw from the Board of Delegates. The condition was accepted and the union was withdrawn from the board.

The break between the Board of Walking Delegates and the Building Trades Council over the question of sympathetic strikes continues to widen. The council is reported as gaining in strength, its members being convinced that the sympathetic strike is a two-edged sword that cuts the workmen deeper than it does the employers. Among the unions that have resigned from the board are the Hand and Ornamental Operative Plasterers' Union, Amalgamated Painters and Decorators' Union, Steam Fitters' Union, Brotherhood of Carpenters, Elevator Constructors' Union, Housesmiths' and Bridgemen's Union, and Slate and Metal Roofers' Union. Some had been suspended; others had resigned. They have a combined membership, it is estimated, of about 25,000. One of the most potent reasons for the action of the workmen is the experience of the Bricklayers' Union, an organization of about 11,000 members, which is under an agreement with the employers' association, and which has not been on a strike for ten years. The opinion of an ex-delegate in relation to the bricklayers' experience is quoted as follows:

"Arbitration" has been the principle on which the big organization has thrived. It has found that 99 out of 100 disputes could be satisfactorily settled by arbitration without the necessity of ordering an expensive and probably unsuccessful strike. As for sympathetic strikes, the stumbling block of the Board of Walking Delegates, the Bricklayers' Union smiles at such childishness.

The strike of the cut stone workers, which was inaugurated some time about the middle of March, came to an end the last week in May, being a victory for the New York Stone Trade Association. The result of this strike is the abolishment of walking delegates, the establishment of a Board of Arbitration and the renouncement of sympathetic strikes.

The annual agreement between the Mason Builders' Association and the masons' laborers belonging to the Laborers' Union Protective Society was renewed June 17 and will remain in force until May 1, 1899. The wages are to be 30 cents an hour and the working day to consist of eight hours. The agreement provides that no strike can be ordered until the questions in dispute have been considered by a joint arbitration board composed of employers and employees.

Edmund R Vaughan, secretary of the Mechanics and Traders' Exchange, makes the following statement regarding the condition of building in the city: "From talks with some of our builders the general opinion prevails that the amount of work on hand is about one-third of what it was last year. The general character of work lies in public buildings, private houses, two or three factories. This work is largely in the nature of improvements. Building for investment has been very small on account of the dullness of business in general. If all of the large public buildings that have been figured upon had gone on without doubt it would have been a fairly busy year, but the war scare and dull times were the cause of many contemplated buildings being withdrawn for the present. I should say about 75 per cent of the work going on would come under the head of business buildings, public buildings and schools, the remaining 25 per cent being divided among private houses, stables and alteration work."

Paterson, N. J.

The recently organized Master Carpenters' Association has filed its certificate of incorporation. The officers are: Adrian G. Van Houten, president; Leonard Sanford, first vice-president; Henry Schwarz, second vice-president; Andrew Dickinson, financial secretary; Leonard Breen, treasurer.

Philadelphia, Pa.

Secretary William Harkness of the Philadelphia Master Builders' Exchange sends the following statement by the Bureau of Building Inspection of the amount of building undertaken up to June 1 as compared with the first five months of 1897:

"Up to June 1 of the current year there were issued 3057 permits, embracing 5159 operations, the estimated value of which was $9,285,770. In comparison with the same period of 1897 there was a decrease of 338 permits, 1457 operations and $3,292,630 in estimated value. During this period of the present year permits were issued for 2248 dwellings at an estimated cost of $5,327,150, a decrease over the same period of last year of 1210 dwellings and $2,006,665 in the estimated cost. By comparing this year's statement with that of last year it will be noticed that the great falling off is in the amount of new work, and not so much in the matter of improvements to existing buildings. By summing up the items, 'alterations and additions,' 'miscellaneous,' 'heaters' and 'fire escapes'—under which heads are comprised all manner of improvements—this year's total shows falling off of only 223 operations and of $53,655 in estimated cost."

The quarterly meeting and reunion of the Master Builders' Exchange was held at the exchange recently, with Charles H. Reeves, the president, in the chair. The feature of the meeting was an address by R. O. Moon, in which he spoke of the exchange as an organization of substantial, unpretentious citizens of Philadelphia, who occupy modest quarters in an unpretentious building. To the majority of Philadelphians the existence of this organization is unknown, yet a review of its work done in the past ten years is simply astonishing. Organized in 1887, a little more than a decade ago, it and its allied interests have in that time erected over 60,000 new houses in this city alone, at an outlay of nearly $300,000,000. He also referred to the prominent part the exchange took in all measures tending to the benefit and advantage of the city, State and nation, and in concluding spoke of the necessity of closer alliance and of attention to the trade schools.

Pittsburgh, Pa.

June 14 was reported as a boom day in the office of the Bureau of Building Inspection of Pittsburgh, the permits for building issued on that day representing an investment of $55,000. The new buildings were all dwellings, one of which was to cost $27,000, the others ranging from $5200 to $9000.

Portland, Oregon.

Work on the new Federal Building at Portland will be begun at once, the contract having been recently awarded to the Bentley Construction Company of Milwaukee, Wis. The Bentley Company, of which Thos. R. Bentley, the president of the National Association of Builders, is the senior member, have executed their bond of $350,000, and it is expected that ground will be broken by the time this issue is printed. The contract calls for the erection of the building and inclosing the same, but does not include the interior finish, plumbing or heating of the building. The sub and superstructure, under the terms of the contract, are to be fully completed in 16 months, and the contractors expect to have the same fully completed within that time.

Racine, Wis.

During the latter part of May the building trades of Racine were considerably upset by a strike of hodcarriers and masons' tenders for an increase in wages and the employment of none but union workmen. Early in the year the carpenters, masons and painters demanded an increase in wages and the matter was adjusted before the building season opened. Contractors were enabled to undertake work under the new wage scale without inconvenience, and the feeling against the hodcarriers was strong among both employers and the other unions growing out of the disturbance that followed their demand and strike. The other unions refused to comply with the order of the Trade and Labor Council to strike in sympathy and work was brought to a standstill. The employers offered to pay the men 17½ cents per hour, their demand being for 20 cents, and the matter was finally compromised by the payment of the increase asked, but without an agreement by the contractors to employ only union men.

San Francisco, Cal.

Building in San Francisco is reported as being dull, with little present indication that any immediate increase in activity is likely to occur. During the first week in June only eleven contracts of any importance were recorded, the total estimated cost of the same being $149,509. Among these contracts the following are the most important: Third street, south of Stevenson a brick, stone and iron structure, to cost $30 190; Market street, near Sacramento, a four-story brick store building, to cost $36,827; a two-story brick factory building, to cost $49,474, at the corner of Townsend and Seventh streets; on Market street, near Golden Gate avenue, a two-story brick building, to cost $13,140. The other contracts were for dwellings in various parts of the city. Everything seemed to be quiet among the trades unions and no labor troubles were anticipated.

Syracuse, N. Y.

The Syracuse *Standard* of recent date says, in relation to a strike among the carpenters: "As the result of the arrangement of a new scale of hours and wages arranged by the carpenters' unions and disagreed to after a trial by the bosses the carpenters of the city are on strike. Nearly 75 per cent. of the carpenters of the city, representing those connected with the unions, have quit work, though a general strike is said not to have been ordered by the unions. The schedule objected to provided that the boss carpenters were to pay each union man at the rate of 25 cents an hour and eight hours was fixed as a day's labor. This new schedule was to take effect May 1. Prior to May 1 the carpenters had been receiving wages ranging from 20 to 25 cents an hour and ten hours constituted a day's labor.

"Subsequently the bosses were notified of the new schedule, and as they had always been on amicable and friendly terms with the unions they decided to give it a trial. The reason they give for objecting to it is that it gives a 'wood butcher' the same wages as it does a fine workman. The bosses have made this proposition to the unions: Minimum wages 20 cents an hour and nine hours to constitute a day's labor."

Worcester, Mass.

The building business in Worcester is reported as being quiet as compared with past years, but that considerable work is being done in the residential parts of the city.

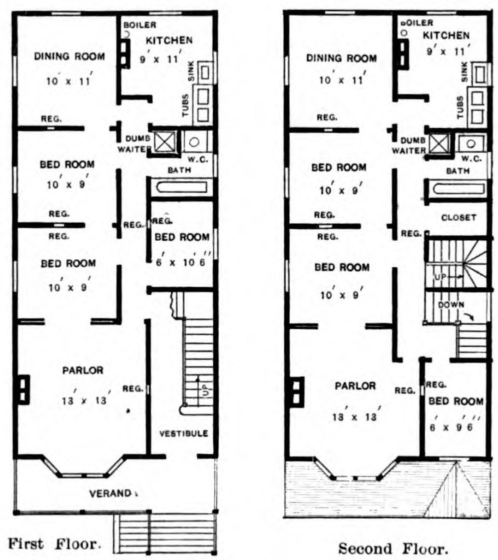
The Builders' Exchange is considering the presentation of a gift to the Art Museum of the city. A model of the Parthenon is the choice of the majority of the members. The committee having the matter in charge consists of Charles A Vaughan, President John H. Pickford, O. S. Kendall and Messrs. Fiske and Steinberg. The exchange is also at work seeking to establish a more thorough enforcement of the lien law of the State.

A WRITER in one of our exchanges, citing the fact that the average width of a shingle is 4 inches, calculates when shingles are laid 4 inches to the weather each shingle averages 16 inches, and that 900 are required for a square of roofing. If laid 4½ inches to the weather 800 to the square are needed; if laid 5 inches, 720 to the square; if laid 5½ inches, 655 to the square; and if laid 6 inches, 600 to the square, this being for plain gable roofs. In hip and valley roofs, where the shingles are more or less cut to meet the conditions, add 5 per cent. to the foregoing figures. A carpenter will carry up and lay in the roof from 1500 to 2000 shingles in a day of ten hours, or one and a half to two squares of plain gable roofing, so that the art of shingling at the present rate of wages may be put down at $1 per square, exclusive of cost of material, scaffolding and nails. To lay down roof boards and carry to roof is worth about 25 cents per square, and to cut and place rafters is worth about the same—*i. e.*, 25 cents per square. This would make the total cost for labor $1.50 per square. This, of course, is calculated for buildings up to two and a half stories high. Buildings more than that will cost, for roofing, 5 per cent. more per square for each additional story.

A Two-Family House on Staten Island, N. Y.

IN the accompanying illustrations we reproduce the drawings of a two-family house recently erected at New Brighton, Staten Island, N. Y., the design of which is of such a character as to render it of possible interest to a number of our readers. It is adapted to the requirements of families of moderate means, and is well suited for duplication in localities where the owner might desire to occupy the first floor and rent out the second floor, thus giving him a home practically rent free. An inspection of the plans shows that on the first floor there are parlor, dining room, kitchen, three sleeping rooms and bathroom, while on the second floor the arrangement is the same except that the position of one of the bedrooms is changed. The dimensions of the structure are 20 x 44 feet The foundation walls are 16 inches, with 8 inch

Front Elevation.—Scale, ⅛ Inch to the Foot.



First Floor.

Second Floor.

Scale, 1-16 Inch to the Foot

A Two-Family House on Staten Island, N. Y.—William Macdonald, Architect.

brick walls above grade. The walls are cemented on the outside up to the grade line and the cellar has a concrete floor. In the locality in which the house is located the architect states that King's patent plaster is very generally used, two coats, with lath laid to suit.

The timber used in the frame of the house is spruce, the sills being 4 x 4 inches; corner and intermediate posts, 6 x 4 inches; studding, 4 x 2 inches, placed 16 inches on centers; rafters, 4 x 2 inches, placed 22 inches on centers; and the floor beams 10 x 2 inches, also placed 16 inches on centers. The exterior of the frame is covered with 1-inch rough hemlock boarding, laid diagonally, on which is placed thick building paper, this in turn being covered with 6-inch Novelty siding. The roofs are covered with cedar shingles. The house is painted two coats of best white lead, in two colors, to suit the owner.

The floors are 1¼-inch tongued and grooved pine. The doors are of the four-panel variety, 1½ inches thick, with moldings on both sides. The windows are cased 1¼ inches thick and hung double. The bathroom has front washout closet and Steel Clad bathtub. The house is piped for gas and is intended to be heated by means of a Howard furnace, made by the Howard Furnace Company of Syracuse, N. Y. In the kitchen there is a Boynton range, with vertical hot water boiler.

The house was recently erected for Timothy Santry, in accordance with plans prepared by William Macdonald, architect, of Stapleton, Staten Island, N. Y., the contractor being Robert Lyons.

The Dome of the Philadelphia City Hall.

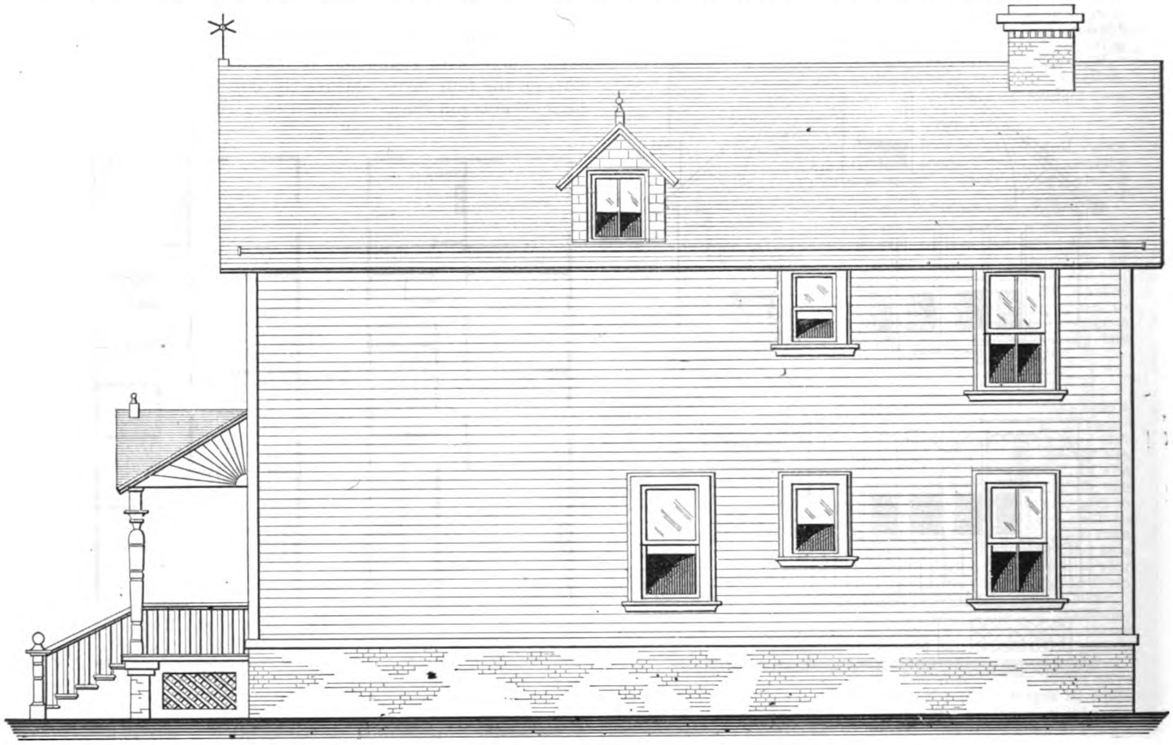
The construction of the metal dome of the City Hall in Philadelphia, Pa., was an interesting piece of work, and although the dome was completed some time ago it may not be out of place, even at this late date, to present a few additional particulars as to how the work was done, contributed by the superintendent in charge. This was Francis Schumann, who in an instructive paper, appearing in a late number of "The Proceedings of the Engineers' Club of Philadelphia," gives an account of the construction employed. The two upper stages, he says, have isolated columns in pairs. From the upper stage with segmental pediments, over the clock dials on the four faces, springs the cupola, an elongated dome of octagon shape, crowned by a colossal statue of Penn. The hight of the tower from the ground is 337 feet 4½ inches. It is of brick, faced with marble, about 70 feet square externally and about 45 feet internally. The tower is enriched by several stages, cornices, balconies and other ornamental details. Upon this tower of masonry the metal dome rises a further hight of 210 feet 9 inches, making a total to top of statue of 548 feet 1⅞ inches, an altitude which exceeds most of the great historic examples of this country or England. A few details are given that may be of interest. The total estimated weight of tower, extending 15 feet below the ground to top of concrete foundations is 62,768 tons; the concrete is 8½ feet thick and covers an area of 7150 square feet, and weighs 4000 tons. For a hight of 90 feet the tower is attached to the north wing of building, and is bonded to it. The upper clock story, which rises 60 feet into the dome, has a clock dial on each face 23 feet in diameter, and to the center of dials it is 361 feet 3 inches above the ground level. The dome has a slight curve and is enriched by angle ribs, cornices, dormers and festoons. About 145 feet above the masonry of tower the floor of balcony is reached, the highest part accessible by means of stairs and elevators, and from it the top of the Penn statue is 65 feet 10 inches. By means of ladders through the "tree stump," which forms a central support to the statue, the visitor may enter into the body of the figure itself, and may also put his head through the crown of Penn's hat. The four pediments of the tower below are surmounted by bronze eagles, and allegorical bronze groups represent the four epochs in the early history of Pennsylvania. The shell of dome is electroplated cast iron, the louvered panels being of sheet steel.

Describing the structural part of dome, which is of wrought iron and steel, the form is an octagonal prism to the hight of clock story, the remainder an octagonal pyramid ending with the steel apex cap supporting the stone. The octagon is formed of meridional columns or chords at the corners, and these are supported on four box girders, placed diagonally across the masonry tower, bedded in cast iron plates about one-third of the length of girder. This brings the weight of dome through the columns to the clear ends of the girders, which act as cantilevers, thence to the solid portions of masonry, thus clearing the window openings. These girders are bolted to the masonry by two 3-inch diameter anchor rods to each girder. The rods extend down 70 feet to anchor plates imbedded in wall. The columns are braced together by horizontal struts dividing the dome into ten tiers of bays, each panel intersected by diagonal tie rods, these made to resist both tension and compression on the upper tiers. The apex cap of steel is an octagonal tube of steel plates and angles, upon which the statue is bolted. The author describes the several floors which divide the dome. There are four floors perforated for stair and elevator. Considerable skill has been shown in the iron framing supporting the 24-foot statues at the corners. The segmental pediments, bronze group parts and the details are illustrated by several drawings of sections of the framing, reproduced by photographic means and by views of the progress of work. The colossal figure of Penn and diagrams of strains are shown also on several sheets, and the dimensions and weight of the frame work are given.

Certain Rights of the Contractor.

In discussing some of the rights to which the building contractor is entitled, a writer in the *Brickbuilder* has this to say:

The average building contractor is so accustomed to look out for himself, and, we must admit, is so perfectly able to do so, that we do not always bear in mind some of the rights which are undoubtedly his, but which are very often not insisted upon; and the scramble for work, especially in these dull times, is so pronounced that we imagine an architect can easily fail to appreciate how much it means for a contractor to be spending his time week after week figuring new work, none of which may come his way. There have been at different times a few spasmodic attempts to so alter the present system for making tenders for work that there would be an opportunity for some compensation to be awarded to unsuccessful bidders. At one time it was proposed that each of the contractors who were invited to figure should add a certain percentage to his bid, the one to whom the contract is awarded to divide the percentage among the unsuccessful contestants One of the strongest of the trade associations in this city has, if we are rightly informed, carried such a scheme into practical effect for a number of years with eminently satisfactory results. But as this particular association limits its work to a technical portion of building operations, and includes in its ranks practically all who follow this line in the city, it is easier to regulate such a practice than it would be in the case of the general contractors, who often have to compete with every one, and on all sorts of terms and conditions. It would really be fair that when a contractor is called upon to spend several days in carefully estimating the cost of a structure, the owner, who thereby gets the benefit of selection from several bidders, should be willing to pay a small compensation for the opportunity, though just how this can be brought about is a question



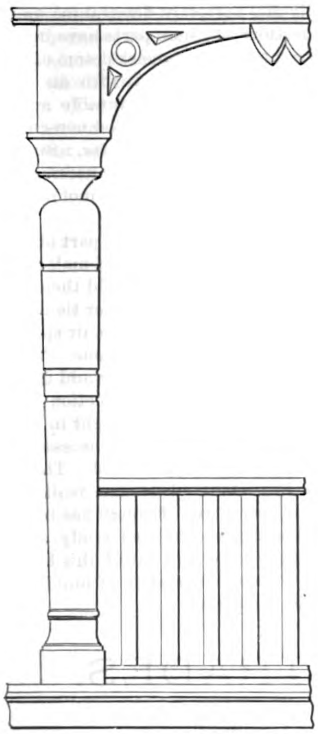
Side (Right) Elevation.—Scale, 1/8 Inch to the Foot.

A Two-Family House on Staten Island, N. Y.

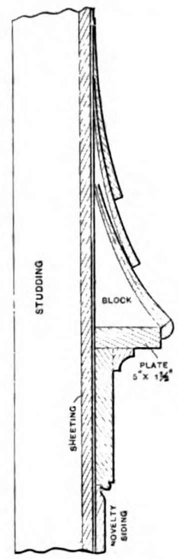
which is not easily solved. There are a few considerations, however, that would certainly lighten the task of the unsuccessful bidder without laying any serious burden upon either architects or owners.

It ought to be an inflexible rule with an architect that no contractor should ever be allowed to change his bid after it has once been submitted in writing. If the builder is to feel that the owner, by applying moral suasion, can expect him to cut off 5, 10 or 15 per cent., he will, if he is human, add that amount to his bid in the first place, and take his chances on being the lowest, and it is believed that by adhering strictly to a rule of this sort the architect would get lower bids in the first place, and would take a higher rank in the opinion of the competitors.

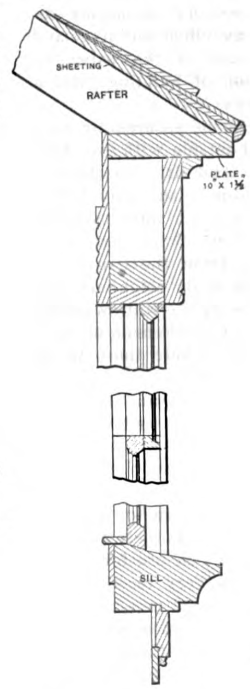
Another slight act of courtesy can make relations much more pleasant. Ordinarily when a builder submits a tender for work he thereupon goes his way and may not know for weeks, or even months, who is to do the work. Just as soon as any decision is reached, each one of the bidders ought to be notified that the contract has been awarded to so and so under certain conditions, and appreciation expressed of the services of the bidder in figuring. This is not money compensation for estimating, but it is a matter of courtesy between the architect and the builder, which one owes to the other. The architect cannot build a building without a builder, though the builder might put up a structure without an architect, but anything which brings the two more closely together is of unquestionable advantage. The line between architect and builder is at best a faint one, and the amenities of civilization can well be studied as a branch of architecture.



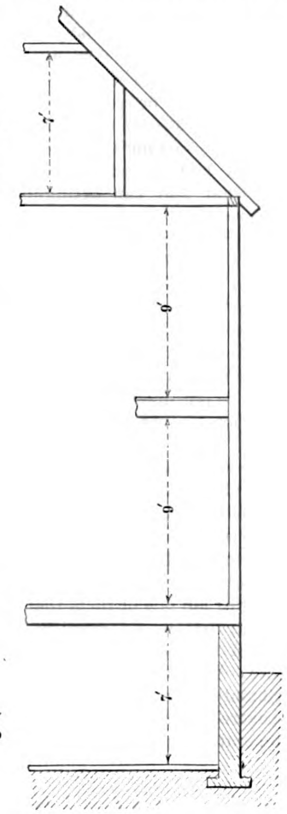
Detail of Porch Column and Balustrade. —Scale, ½ Inch to the Foot.



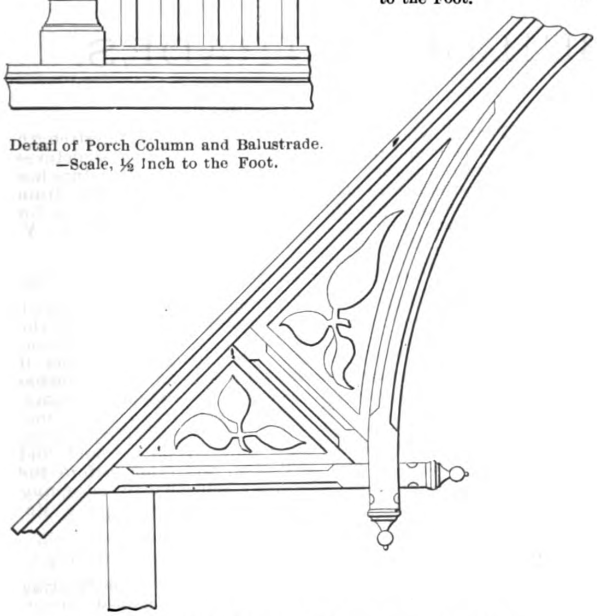
Detail of Main Cornice.—Scale, 1 Inch to the Foot.



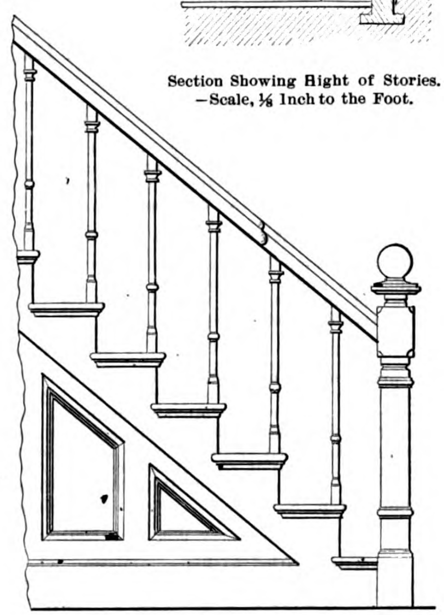
Vertical Section through Bay Window.—Scale, 1 Inch to the Foot.



Section Showing Hight of Stories. —Scale, ⅛ Inch to the Foot.



Detail of Front Gable Finish.—Scale, ½ Inch to the Foot.



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

Miscellaneous Constructive Details of Two-Family House on Staten Island, N. Y.

SLOW COMBUSTION OF BUILDINGS.

IN a paper read before the Western Society of Engineers Gen. William Sooy Smith presented some very interesting information relative to the fire proof construction of buildings and what was necessary to prevent the corrosion of the iron and steel which is so largely employed in the modern sky scraping office buildings and business structures. In the course of the paper he touched upon the slow combustion of buildings, which he stated could be secured as follows:

Slow combustion of buildings can be secured by carefully whitewashing the inside and outside with fire proof material laid on with a brush. And fire departments claim that they can extinguish almost any fire if it is only prevented from spreading too much until they can bring their engines into play. It is of the utmost advantage to protect each building from the danger of ignition in the case of the burning of its neighbors, and this can be at least measurably done by the whitewashing suggested and by putting fire proof shutters on all windows and openings of every kind. Where there is an open court in a building some sort of fire proof covering should be put upon all parts of such court, and the same protection should be given to stairways and elevator shafts.

The essential characteristics of a fire proofing material for buildings are: 1, It must itself be incombustible; 2, it must be as nearly as possible a non-conductor of heat; 3, it must be strong and durable. While there are very many so-called fire proofing materials in use for which these qualities are claimed, up to a very recent period there was not one of them that was a good non-conductor of heat, that would stand heating to redness and being plunged into cold water while red hot without flying to pieces. Within a few months, after years of careful experimenting and testing the material, "asbestic" was discovered, which possesses all the requisites above enumerated, as proven by severe tests on a large scale at Montreal, New York, Washington and Chicago The requirements of a building are that it shall be strong enough to carry all its loads and resist wind pressure and all other strains to which it may be subjected as a whole or in any of its parts, that it shall be as nearly as possible fire and weather proof, and that it shall be durable and not unreasonably costly. Supposing that steel is used for the frame work of the structure as being preferable to any other material for the frames of large buildings, and that proper shapes and sizes of all parts of such frames have been carefully and correctly determined and the disposition and connections of these parts have been properly made, it only remains to cover the skeleton of a building inside and outside, roof included, with an integument that shall be fire proof, strong and durable and, if possible, light, tough and elastic and a good non-conductor of heat and impervious to air and water. Such covering can be made of fire proof plaster of any necessary or desirable thickness, and suitable cornices and moldings can be worked out of the same material.

As soon as the skeleton is erected every part of it should be covered with a thick coat of fire proof material laid on with a brush. The metal lathing should then be put on, strengthened where necessary by angle or tie iron covering all parts of the frame and leaving an air space between the lathing and every part of the frame. The great weight of tile, brick and stone now used would thus be dispensed with and the much lighter construction described substituted. A very great saving of weight in the frame itself would be made and the cost of the necessary foundations of the buildings be greatly reduced. There would be so many other important advantages realized that we need not describe them here. Enough has been said to invite the careful and unprejudiced study and criticism of engineers and architects, and out of this kind of investigation there may come a new system of building that may be the ideal one of the future.

LAW IN THE BUILDING TRADES.

WHEN PERSONAL JUDGMENT AGAINST OWNER WILL NOT FOLLOW.

Though a subcontractor may be entitled to a lien, he is not entitled to a personal judgment against the owner for the amount due him from the contractor.—Frost *vs.* Falgetter, Nebraska, 73 N. W. Rep., 12.

WHEN ARCHITECT IS NOT A PUBLIC OFFICER.

An architect employed by commissioners for the construction of a public building, to supervise its construction, is not incumbent of an office.—State *vs.* Broome, New Jersey, 38 Atlantic Rep., 841.

OWNER'S RIGHTS AGAINST SURETY OF CONTRACTOR.

A provision in a building contract that if the contractor refuse or neglect to supply sufficient materials or workmen the owner may provide them and deduct the expense from the amount of the contract, does not deprive the owner of the right of recourse to the contractor's surety for any excess of reasonable cost over the contract price.—Welch *vs.* Hubschmidt B. & W. Co., New Jersey, 38 Atlantic Rep., 825.

OWNER'S LIABILITY FOR COMMISSIONS.

A broker is entitled to his commission when he has procured a purchaser satisfactory to the owner of the property, ready and able to make the purchase on the prescribed terms, though a written agreement to buy is not executed and the sale falls, through imperfections in the title.—Brackenridge *vs.* Claridge, Texas, 42 S. W. Rep., 1005.

MEASURE OF DAMAGES ON DISCHARGE OF CONTRACTOR.

In an action by a building contractor to recover for being discharged before the completion of his contract, the measure of damages is the difference between the contract price and the amount which it would have cost to perform the contract.—Feaster *vs.* Richland Cotton Mills, South Carolina, 28 S. E. Rep., 301.

EXPERT TESTIMONY.

Persons who have made special study of the strength of materials and the proper mode of building structures to sustain weights may testify whether a structure has been built sufficiently strong to withstand the strain which would be put upon it in using it for the purpose for which it was intended.—Fox *vs.* Buffalo Park, 47 N. Y. Supp. Rep., 321.

INJUNCTION LIES AGAINST PROJECTIONS BEYOND LOT LINE.

A party constructed a building with a cornice which projected 18 inches over the adjoining lot; some of the window sills also projected slightly over the line. He was under no mistake as to the line, except as to whether it ran to the center or to one side of a monument 4 inches wide. When he was putting in the foundation the adjoining owner told him he thought the wall was over the line. The adjoining owner brought suit for a mandatory injunction against maintaining such building on his land, and notice of the suit was served on the other before the house was completed. The court held that the adjoining owner was entitled to the injunction.—Harrington *vs.* McCarthy, Mass., 48 N. E. Rep., 278.

CONTRACTOR LIABLE THOUGH MISTAKEN AS TO LOCATION.

One who offers to do part of the work of constructing a building on a certain street for a price named cannot, after acceptance of his offer, show that he was mistaken as to the particular lot on such street on which the building was to be located.—McCormack *vs.* Lynch, 69 Mo. App. Ct. Rep., 524.

LIABILITY ON REFUSAL TO COMPLETE CONTRACT.

A builder who has failed to completely perform his contract in every detail cannot recover the contract price less deductions for the necessary expense of finishing the work where an intention to substantially perform is negatived by his refusal to complete it when called on.—Kohl *vs.* Fleming, New York, 47 N. Y. Supp. Rep., 1092.

WATER SUPPLY FOR COUNTRY DWELLING.

BY OLIVER TWIST.

MANY and varied are the methods of water supply, and aside from the drainage of a building there is probably no field of study in connection with the plumbing business that will afford the young plumber, the student, more interest than a good and proper arrangement of the water service. In many places outside the sphere of plumbing regulations there comes with the onward march of progress a demand from people of moderate means for sanitary conveniences to give comfort to the home, to make a dwelling more easy to rent, and for the sake of the general health and welfare of the community. The customer has said that provided he can get his bathroom fitted for so much he will do so; if not he cannot afford to pay more. Local competition is keen, economy the order of the day, and to do work so as to combine sanitation (for all parties interested) and soundness or durability is a perplexing problem.

One of the chief points of the water service is the range boiler. Who will undertake to tell the number of ways and means by which such an apparently simple affair may be connected up? We find them doing their duty upstairs and down, and even in the cellar occasionally. Horizontal and vertical, single and double, two or more stoves to one boiler, and *vice versa*, any way and every way, right and wrong—their name is legion. We do not always find an application of forethought, of logical conclusions drawn from scientific reasoning or from past experience of good results. A man may connect the hot water pipe with the cold water tube inside of boiler unintentionally, knowing well the proper arrangement. A mistake pure and simple. A large number of faulty arrangements are made, however, one is forced to admit, from a lack of knowledge.

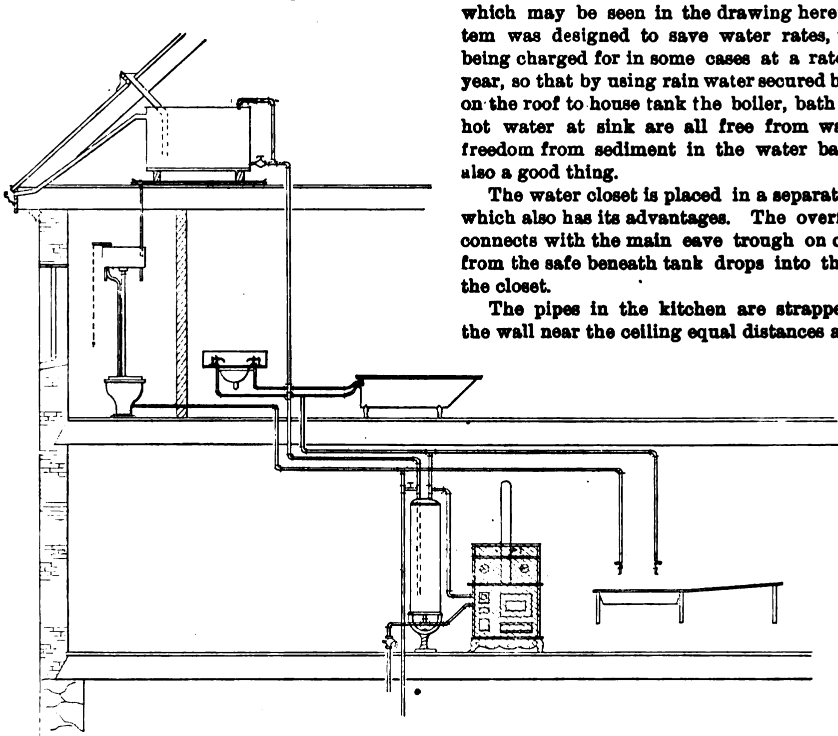
How important, then, even if we think we know it all, that we should always be willing to learn, and if so to be equally willing to assist others. Help to spread information by subscribing to a good journal published in the interests of your profession and make your companions acquainted with it; feel an interest in it; send in your letter; ask your question, and we shall never be heard to complain of the dullness of our paper.

The sketch shown herewith is not complete in some respects. It will be noticed that a circulating pipe from the last fixture back to the boiler has been omitted. Being a comparatively small house the fixtures are not far from the boiler. It was desirable to keep down expenses and was unnecessary. Sometimes it is possible to have too much of a good thing.

The house tank, you will observe, does not show a valve to shut off for repairs or the air pipe extended up over the tank to admit air so that pipes may drain dry, and which will also act as a relief for the boiler, all of which may be seen in the drawing herewith. This system was designed to save water rates, the town water being charged for in some cases at a rate per fixture per year, so that by using rain water secured by a false trough on the roof to house tank the boiler, bath and basin and hot water at sink are all free from water rates. The freedom from sediment in the water back and boiler is also a good thing.

The water closet is placed in a separate compartment, which also has its advantages. The overflow from tank connects with the main eave trough on cornice. A pipe from the safe beneath tank drops into the flush tank of the closet.

The pipes in the kitchen are strapped to a board on the wall near the ceiling equal distances apart and neatly painted. All are easily accessible and do not look unsightly. In case of repairs no time is lost in removing carpet and flooring to get at pipes concealed between joists, &c. The water closet is supplied directly from the street, also a faucet at the sink. A valve between the street supply and the top of the boiler provides a method of filling the tank from the street should it run dry in an exceptionally dry season. The whole system is very simple and, of course, open to criticism, but it seems to fill the bill.



Water Supply for Country Dwelling.—Section Showing Arrangement of the Fixtures.

Figuring Heating Surface of a Greenhouse.

In the new catalogue of steam and hot water boilers made by Abendroth Bros., New York, is the following information for determining the amount of surface required in greenhouse heating:

In figuring a greenhouse, we have to deal entirely with exposed surface, cubic contents rarely, if ever, being taken into account; therefore, the entire amount of glass exposure and its equivalent should be determined, and in doing this the ends and side walls should be figured just as surely as the overhead and end glass. The sides and end walls, if of wood, sheathed and papered good and tight, should be figured in the following proportions, viz.: Five square feet of wall to 1 square foot of glass.

After obtaining the number of square feet of glass and equivalent, the next point is the proper amount of heating surface necessary, and this is dependent upon the temperature required in the greenhouse. The following proportions of glass to heating surface will be found fairly accurate.

	St.	H. W.
To a temperature of 40 degrees, divide number of square feet of glass by	9	6
To a temperature of 45 degrees, divide number of square feet of glass by	8	5
To a temperature of 50 degrees, divide number of square feet of glass by	7	4
To a temperature of 55 degrees, divide number of square feet of glass by	6½	3¾
To a temperature of 60 degrees, divide number of square feet of glass by	6	3½
To a temperature of 65 degrees, divide number of square feet of glass by	5½	3¼
To a temperature of 70 degrees, divide number of square feet of glass by	5	3

The above is based on an outside temperature of zero.

New Publications.

STEEL IN CONSTRUCTION. By Pencoyd Iron Works. 4½ x 6½ inches, 350 pages. Tenth Edition. A. & P. Roberts Company, Philadelphia, Pa.

During the two years that have elapsed since the ninth edition of this book was issued the contents have been thoroughly revised and much new matter added. The text and tables have been very carefully prepared, under the supervision of James Christie, engineer of the works. Each subject or subdivision may be considered as composed of two parts—one, the commercial side, which describes the varied products of the company, and the other the engineering side, which treats of the practical application of the products. The first tables present dimensions and weights of beams, Z-bars, angles, tees, bars, rounds and squares. Then follows a brief description of the chemical and physical characteristics of open hearth basic steel, which, as used in structures, usually varies in tensile strength from 55,000 to 70,000 pounds per square inch of section, and from 0.10 to 0.25 per cent. of carbon. The tables for Pencoyd beams cover the limits for the safe load, deflection, beams with fixed ends, continuous beams, horizontal shearing of beams, spacing and deflection of beams, and rule for the weight of floor beams. Under "Spacing and Deflection of Beams" it is stated to be good practice to limit the deflection to $\frac{1}{30}$ inch per foot of span, or the total deflection not to exceed $\frac{1}{360}$ part of the span. For I-beams subjected to the loads given in the tables this deflection occurs when the depth of the beam is about $\frac{1}{24}$ of the span, or, approximately, twice the depth of the beam in inches gives the span in feet having a deflection of $\frac{1}{360}$. The following rule gives a close approximation to the actual weight of floor beams:

$$\frac{\text{Load per square foot in pounds} \times \text{square of span in feet}}{1000 \times \text{depth of beams in inches}} =$$

pounds of beams per square foot of floor.

The approximate formulæ for rolled beams are intended for convenient application in cases where strict accuracy is not required. While the rules for rectangular and circular sections are correct, those for the flanged sections are approximate, and limited in their application to the standard shapes given in the tables. They give results which have been proved by experiment to be sufficiently accurate for practical purposes. Directions are presented for beams bearing irregular loads, beams subjected to compound stresses, for ascertaining the strength and weight of riveted plate girders. While single webbed girders are the most economical in material and most accessible for painting and inspection, the double or box girder is the best where great width and stiffness are required. If the length of the girder exceeds 20 times the width of the flange the girder should either be given some lateral support or else the section of the top flange should be increased. It is usual to allow flange strains of 15,000 pounds per square inch of net section for steel girders for buildings, and the safe loads in the tables are calculated on this assumption. Following this is a discussion of fire proof floors and Z-bar and corrugated flooring. In the consideration of struts of various sections the least radius of gyration of the cross section around an axis through the center of gravity is assumed as the effective radius of the strut.

It is stated that the experiments on columns of round and square section are not very complete, especially as denoting the comparative values for the various end conditions. The tables are derived partly from experiments on actual columns, extended and completed by comparison with experiments on rolled struts, from which the tables of strut resistances are derived.

An exhaustive discussion is presented of the moments of inertia of standard sections, including I-beams, channels, deck beams, angles, tees, and inertia of compound shapes. Tables are also presented giving the various fundamental properties of railroad sections, by the aid of which the strength or stiffness of each can be readily determined. The calculations are made for all sections of I-beams and channels, and for the least and greatest thickness of other shapes, and intermediate thicknesses of these can be approximated by interpolation.

Bending moments, deflections, &c., are given for beams of uniform section. The stresses in some usual forms of frames and structures are presented in cranes, truss girders and roofs.

Iron roofs having a slope of 2 to 1 and trusses about 15 feet apart will approximate in weight as follows per square foot of building area:

Weight of frame and material, including truss and purlins, but not covering:

Truss of 75 to 100 feet span, 8 to 10 pounds per square foot.

Truss of 50 to 75 feet span, 7 to 8 pounds per square foot.

Truss under 50 feet span, 5 to 7 pounds per square foot.

The covering for this would be per square foot as follows:

	Pounds.
Tin on 1-inch boards	4.5
Corrugated sheets, No 20 galvanized	2.8
Corrugated sheets, No. 20 on 1-inch boards	5.7
Slate $^3/_{16}$ inch thick on 1¼-inch boards	11
Slate ⅛ inch thick on 1-inch boards	7.5
Felt and gravel	9 to 11

If plastered below rafters add 10 pounds.

The snow load will vary with the latitude from 10 pounds per square foot of building area for Baltimore and Cincinnati to 30 pounds for Northern New England. In roofs with inclinations of 45 degrees or over the snow load can be neglected, and on slate roofs with a slope of 2 horizontal to 1 vertical the snow will not lodge to any extent.

Many specimens are presented of standard framing of beams, channels and of connections of floor beams to columns. Tables are also given of the shearing and bearing value of rivets in pounds.

In the appendix are many tables in frequent use by engineers, which have been carefully compiled and corrected to conform to the latest knowledge on the respective subjects. All the materials described in this portion of the work offer a wide range of resistance and stress in any direction, and the tables for strength indicate averages of reliable data. Some of the subjects here treated are physical properties of timber, greatest safe load uniformly distributed for rectangular wood beams 1 inch thick, and total safe load in net tons for square pillars of different hights and sections in white and yellow pine. Tables of the physical properties of metals and alloys, of materials, of masonry, &c., are also presented.

Under the following captions are formulæ and tables of value and arranged for ready reference: Foundations, piles, crane chains, wrought iron tubes, weight of rolled sheets, steel plate, sectional areas and weights of flat bars and round and square bars. One table gives the circumferences, circular areas, squares, cubes, square roots and cube roots, logarithms and reciprocals of numbers from 1 to 1000. Another table gives natural trigonometrical functions, followed by electrical formulæ, including standards of measurement, &c.

The work is handsomely printed on good quality paper, gilt edge, and bound in flexible leather covers.

The Builders' Exchange

Directory and Official Announcements of the National Association of Builders.

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National Organization.

For a number of years the methods by which builders have secured their business have been undergoing a perceptible change. The successful contractor no longer confines himself to a single city and no longer depends upon any special locality for his work. Where, in the past, it was the exception for bids to be received from contractors outside of the city in which an important building was to be erected, another plan is now the rule, and to-day New York contractors are bidding for work in Chicago, men in the latter city are bidding for work in New York, and so on all over the country.

As a result of this condition of affairs many inconveniences and hardships are unnecessarily caused, and competition is conducted upon a basis which cuts down profits and has a tendency to the general demoralization of long standing local conditions. For instance, the contractor from outside who bids for work in any given city introduces many elements which did not exist prior to his coming. The outsider is not bound by any of the conditions to which the local builders are subjected, and is free to adopt such methods as he sees fit for securing sub-bids, materials, workmen, &c. As a case in point, a contractor from a prominent Western city recently bid for work in a prominent New England city, using sub-bids of the Eastern sub-contractors. Being successful in obtaining the job, the Western contractor proceeded immediately to secure lower sub-bids by using those originally obtained as a basis for the reduction. He even went so far as to approach original sub-bidders with a proposition that they reduce their bids to a price lower even than the new bids that were obtained after he had been awarded the job. Upon being informed that such practice was not considered legitimate or honorable in the Eastern city the Western contractor was both surprised and indignant, maintaining that such was the regular course in his own city.

The protection for the Eastern contractors lay in the existence of a strong Builders' Exchange, and in most cases the outsider could not find sub-bidders suitable to the architects except in the exchange, and therefore in each of these cases he was compelled to abide by the original bid through the use of which he had secured his contract.

One of the surest preventives of the growth of any evil effects from the continued extension of the custom of bidding for work in different cities is the establishment of uniform methods all over the country. Uniformity offers no hardship to any one; on the contrary, it offers protection to all concerned.

The National Association of Builders presents the means whereby builders throughout the entire country may meet together at least annually for the purpose of learning from each other the conditions under which business is transacted in the different cities. Out of the information thus obtained universal practice may be fostered, and the building business, as a whole, protected and advanced by the resultant elimination of some of the most objectionable of its competitive features. Local organization is not sufficient protection, under the changing conditions governing building today; more thorough national organization is clearly a growing necessity, and builders everywhere are urged to give the subject their most careful consideration.

Employer and Workman.

During the past month the building trades of New York City have been disturbed by a condition of affairs which appears on the surface to proceed from a difference between two organizations of workmen, the Board of Walking Delegates and the Building Trades Council. The immediate cause of the breach between the two is a difference of opinion as to the advisability of the sympathetic strike as a desirable means of securing concessions from employers.

The principles upon which the two bodies are based are virtually the same, they both being central bodies representing various unions, the board being, as its name indicates, composed of the walking delegates of certain unions and the council consisting of representatives not necessarily walking delegates or certain other unions. A number of the unions now represented in the council were formerly and may still be represented in the board.

These organizations represent the experience of years of effort on the part of the workmen to provide some machine which would be sufficiently powerful to insure the enforcement of such demands upon employers for wages, hours of labor, &c., as seemed best to a majority of their number. The efficiency of these bodies acting in unison is practically unlimited ; so great, in fact, that its use is likely to "kill the goose that lays the golden egg." Employment being the "goose" for the workmen, they must be employed in order to obtain the "golden eggs," and the more conservative of the unions feel that the sympathetic strike is not only dangerous in the unnecessary antagonisms created, but that its operation restricts the number of working days in a year to a point which reduces the total earnings too low for the proper maintenance of life.

Cause of Disturbance.

This, then, seems to be the cause of the disturbance in New York, that one body of workmen believes that no union should call out its members except for some grievance affecting its own interests, and the other believes that all unions should be ordered out for a grievance which affects but one. While there is no question regarding the immediate cause of the condition referred to, the initial cause lies in the fact that the workmen have arrived at their present strength as organizations without efficient or adequate assistance from the interests against which they have come to stand in united opposition. The present power of organized labor has been developed through contact with individuals. Unions of workmen have, in a very large majority of cases, measured their strength against, not unions of employers, but individual employers, and it is from this unequal battle that such a condition of affairs as now exists in New York City has been evolved. No account is taken of the employer; those members of the unions who are delegated to transact the business, simply determine what wages they believe fair to be paid or what hours shall constitute a day's labor, and a strike is declared against every employer who declines to concede the same.

Position of Workmen.

Nothing could be more logical than the position taken by the workmen; their experience is sufficient warrant for their action, and it would be more than astonishing if, under the let-alone policy of the employers, they had arrived at any other position.

The real cause for the disturbance mentioned lies, not with the workmen, but with the employers. If employers had done their duty by themselves and by each other with one-half the fidelity and personal sacrifice displayed by the workmen, such a condition of affairs as exists to-day in nearly or quite every large city in the country would be impossible. If employers had been as clear headed as the workmen have been in adopting, maintaining and perfecting organization as a business policy during the past ten years, for example, incalculable money, time, suffering (on the part of the workmen at least) and inconvenience would have been saved. And the experience of such bodies of employers as have adopted organization, proper organization, as a business policy has proved beyond any question that it is good, that it is practical, that it is profitable.

The time has gone by, particularly in the large cities, when it was possible for employers to proceed in all ways toward their workmen as they saw fit. To-day the workmen are in a position to demand any treatment they may believe to be fair, and to enforce that demand with sufficient power to greatly endanger the business welfare of any individual employer who may oppose them. Leaving the moral aspect of the situation entirely out of the question, such a state of affairs does actually exist, and it continues to exist solely because employers still fail to avail themselves of the power for good that lies in organization and in united workmen, whose very union is a source of protection and profit if it be but rightly understood and rightly used.

The fact that unions of workmen exist is sufficient proof, if any were needed, that there are two sides to the relations between employer and workmen, for it shows that it was necessary for the workmen to combine in order that their side might be heard and felt. Employers, failing to recognize the inevitable end of years of neglect in stubbornly refusing to place themselves in such a position as would insure joint consideration of the two sides of the question, have brought upon themselves the conditions against which they complain.

Joint Action.

The example has been set by groups of employers and workmen in many cities which proves the feasibility of joint action between the two, and demonstrates that the relation can be sustained in perfect harmony and with entire freedom from the delays and harassments to business which are continually manifesting themselves where no such provision for joint action exists. There are economic reasons without end as to why disturbances between employers and workmen should be avoided, but the practical reason is sufficient that the employer—the organized employer—is insured against strikes and other obstructions to the progress and profit of his business, and that workmen are insured the payment of fixed wages, regular hours and other working conditions fixed by joint action under equal representation.

Employers cannot expect immunity from labor troubles until they are willing to act in a body, to organize, and to organize for the express purpose (so far as the labor question is concerned) of setting up joint action with the workmen. No attempt on the part of employers to "wipe out" labor organizations can hope to be permanently successful. It must be admitted at the outset that there are two sides to the question, and that the question can never be adjusted until each side is present in equal force to present its claims and defend its rights.

The actual experience of organizations of employers and unions of workmen that have established joint boards of arbitration has been frequently referred to in these columns, and the secretary of the National Association of Builders is ready to furnish to all who may desire them copies of a plan for forming such joint boards and rules for their maintenance.

The new settlement of Beira, in Portuguese South Africa, is a city of zinc. All the houses, public buildings, hotels, barracks and warehouses are built of it. There is no getting away from the metal. If a man gets sick he is carried on a corrugated zinc stretcher to a zinc hospital, and should he die a zinc coffin receives his remains. Thousands of tons of sheet zinc have been consumed in Beira since its "boom" began six or eight months ago. The appearance of the town is said to be "very disagreeable," and the discomfort of living in zinc houses under a tropical sun must be indescribable. The reason for the extraordinary partiality for zinc in this particular place is not readily apparent.

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CARPENTRY AND BUILDING

WITH WHICH IS INCORPORATED
THE BUILDERS' EXCHANGE.

DAVID WILLIAMS COMPANY, - PUBLISHERS AND PROPRIETORS
232-238 WILLIAM STREET, NEW YORK.

AUGUST, 1898.

Medals for Manual Training Schools.

Manufacturers are taking great interest in the progress of mechanical education. Evidence to this effect is continually coming to light in the proceedings of the various manufacturers' associations. The students of the manual training schools are making their impress in numerous lines, and employers cannot help expressing their gratification at the manner in which the standard of every craft is being raised by the superior intelligence which has been thus infused into the mass. While the benefits of the training schools are shared both by the students and by those who become their employers, it is believed that the latter should display in a more practical way than hitherto the deep interest felt by them in the success of this system of improving our mechanical trades. The students are, of course, working to secure the best possible results for their personal advancement in the occupation which they intend to follow. An additional incentive would, however, be given them for closer application in the attainment of expertness if the plan should become general of manufacturers' associations yearly setting aside sums of money for the purchase of medals to be given the students distinguishing themselves in the particular branch coming under the province of these associations. This is not so much a matter for national organizations as it is for local associations. The manufacturers or employers in the vicinity of a polytechnic college or manual training school naurally have a deeper interest in the success of that particular institution than if they were 1000 miles away from it. A master builders' association, for instance, in a city or town would be a proper body to bestow a yearly medal on the student of the local training school who would distinguish himself by his mastery of the science of carpentry; a local plumbers' association would be most interested in bestowing a medal upon a student in the local training school who would make the best showing in plumbing, and the same thing would be true in other lines. Individuals have made themselves prominent by endowing technical educational institutions and by establishing funds for the purchase of medals in rewarding proficiency, but associations have not thus far shown in any similar manner their interest in the students. It would certainly stimulate the work done by these institutions to have them thus officially recognized.

Prospects of an Eight-Hour Law.

The opposition to the extraordinary propositions contained in the eight-hour bill, pending for several weeks in the Senate Committee on Labor, resulted just prior to adjournment in most unusual action on the part of the committee, the result of which will be to make it extremely difficult, if not impossible, for the advocates of the measure to pass it in the Senate. Subsequent to the extended hearings on the measure the bill was taken up for discussion at several meetings of the committee, but so wide a diversity of opinion was speedily developed that it soon became apparent that no agreement could be reached. The bill was favored by several members of the committee, but in no case without certain amendments to meet the requirements of the Government in emergencies. A preliminary step was therefore taken by authorizing the chairman to incorporate in the measure amendments to the three principal sections. This is an extraordinary course for the committee to take and one which is only resorted to when the futility of further discussion is fully demonstrated. The form of the committee's report will at once advise the Senate of the inability of a majority of those who have investigated the subject to agree upon a recommendation, and it therefore seems probable that the advocates of the bill will find it very hard to bring the measure before the Senate during the coming short session, when the discussion of many matters of great national importance is crowded into less than 60 days of legislative work.

Profitable Philanthropy.

About a year ago D. O. Mills, the well-known capitalist, built and opened up a model poor man's hotel in Bleecker street, this city, at a cost of a little over $1,000,000. The enterprise, which was undertaken by Mr. Mills primarily as an attempt to solve the question of better housing for the respectable class of small salaried workingmen, has turned out a profitable speculation from a business standpoint. The huge and costly "Mills Hotel No. 1," popularly known as "the Waldorf of Bleecker street," has been a most gratifying success from the very start. From the time of its opening the 1554 bedrooms have been occupied nightly and hundreds of lodgers have been turned away for lack of accommodation. The restaurant attached to the hotel has fed some 3000 persons each day, with meals averaging 10 cents in cost, and the ten stores in the basement of the building have yielded a steady rental. Although the actual figures have not been published, it is estimated that the rents received for the rooms have averaged $2100 a week, or $109,200 a year, while the restaurant has yielded an average weekly profit of about $500, or $26,000 for the year. Adding $3120 for the rental of the stores, the total income of the hotel on the most conservative estimate for the year is shown to have been about $138,320. The estimated expenses are: Taxes on $500,000 assessment, $10,700; repairs, $500; incidentals, $500; gas and electric lighting, $7000; 150 employees, at an average of $9 a week, $72,000; water tax, $1500. Total, $92,200, leaving a net profit of $46,120 on an outlay of $1,000,000, or a safe 4½ per cent. investment, at the lowest computation. This is a very satisfactory showing and should do much to encourage the establishment of similar institutions in New York and other cities. London already has a number of such poor man's hotels, started several years ago by a company of philanthropic capitalists under the management of Lord Rowton, each one of which has proved a pronounced financial success. The benefits conferred upon the masses by the provision of clean, comfortable and hygienic dwelling places at a cheap cost is incalculable. Mr. Mills has lately completed a lodging house for families on the same plan in the rear of his hotel, in which he charges $8.50 a month for a suite of three rooms and offices, and the building promises to be always full. He is also building a "Mills Hotel No. 2," about half the size of No. 1, on the east side of this city.

New Building of the International Correspondence Schools.

The new building of the International Correspondence Schools, at Scranton, Pa., is now receiving its finishing touches. It is described as a singularly handsome structure, unique in the originality of its construction down to the last detail. The purpose of the architect was to carry out in the building the finest thought in Greek art. The structure is not overloaded with ornamentation, but is rich in its simplicity. There are no columns to obstruct the view or hinder the freedom of ranging the desks on the several floors, but strong arches transmit the weight of the building to the heavy semi-granite walls. The wainscot throughout is of quartered oak in various kinds of finish, and Sienna marble is used in the handsome entrance. Massiveness is the impression created by any view of the building, from the base to the handsome red tiled roof. The several stories are high and well lighted, and the building possesses a perfect system of heating, ventilation and plumbing. The exposed pipes are all nickel plated. The toilet rooms have marble floors and oak doors with nickel hardware. All the work on the building has been done under the superintendence and after the plans of the architectural, plumbing and other departments of the Correspondence Schools.

A Hanging Building.

An ingenious piece of architectural work is described in a late issue of the Birmingham *Mail.* It appears that the Great Western Railway tunnel comes within 18 inches of the street surface. The shallowness of this tunnel has frequently been a source of trouble, for when the cable tram conduits were laid in Colmore Row a special form had to be devised to meet the difficulty. Again a large and imposing frontage in Carr's Lane is nothing but a huge sham of timber and plaster, especially devised to present an imposing—very imposing—front without stability and without weight. The difficulty has been that the whole of the steel frontage is over the tunnel, and at an awkward angle, varying from 4 to 25 feet, but not a particle of weight would the company allow to rest upon the tunnel, and cross girders could not be used on account of the shallow depth.

What the landowner wanted to do was to erect a three-story building, with very little indeed to rest it upon, and it was evident that the 25 feet of building over the tunnel would have to be suspended—held out at arm's length, as it were. In other words, as the proposed building was 45 feet deep, and from this had to be deducted 25 feet of tunnel, it left but 19 feet of solid foundation to carry an erection 45 feet wide and three stories high. To overcome the difficulty the architect who had the work in hand devised an ingenious system of huge cantilevers, six in number, running to 9 feet deep and estimated to carry weights varying from 100 to 400 tons, and the building will soon be completed. The A cantilever supports the greatest weight, estimated at 400 tons and calculated to support a strain of 875 tons. We may, perhaps, render the matter more intelligible by taking as typical the cantilever known to the architect as A1, which projects over the tunnel 25 feet and supports—or will support—its due share (375 tons) of the building, while only 19 feet of it under the building will rest upon a solid foundation. To add to the safety, from this hangs a huge mass of concrete, some 16 feet across by 15 feet high, and weighing some 160 tons, suspended by steel bars 22 feet long. The whole matter resembles the weighing of a leg of mutton on the butcher's steelyard—the cantilever acts as the steelyard—the warehouses and shops are supported at the long end, and the gigantic weight of concrete dangles from the short one, acting in some matter as a counterpoise, while the cantilever rests upon a bed of concrete. It has been suggested that a vigorous sneeze in a front portion of the premises, or the simultaneous entrance into the premises of two or three portly customers, might "tip the whole thing up." But the drawings of a building constructed on such novel lines have, naturally, been examined with the utmost care both by Mr. Englis, the engineer of the Great Western Railway and the City Surveyor, and one or two minor objections have been successfully met, so that the building is now in course of progress. When the girders are covered it will present no unusual features to the eye and will have little to distinguish it from its fellows. All the same, it will be a monument of architectural ingenuity.

Fire Losses in 1897.

According to the tables presented by the *Financial Chronicle,* the fire losses for 1897 reached enormous proportions, but nevertheless they were considerably less than for some of the previous years. Whether the reduced losses are the results of blind luck or of more efficient fire proofing, time alone can tell. The aggregate fire loss was $2,454,592,481, which is $2,382,845 less than in 1896. The insurance loss for the year was $1,438,902,448, or $7,181,655 lower than the loss for the previous year. This showing is smaller than for any year since 1890. A noticeable feature is that for the first time the yearly loss of New York was exceeded by that of another State, Pennsylvania leading with a fire loss of $13,706,315, and an insurance of $8,674,980.

The number of fires reported during the year was 55,779, of which but two caused a loss of over $1,000,000. One was at Knoxville, Tenn., in April, where the figures footed up to $1,019,725, and the other was at Pittsburgh, Pa., in May, when the loss was $1,905,515. The loss to the State of Pennsylvania on the buildings at Harrisburg aggregated $700,000. The greatest monthly loss occurred in January, when the property loss was $11,594,495, and the insurance loss was $7,187,515.

In 1897 there were burned 33,033 dwellings and tenements, 11,811 barns, stables and granaries; 1753 general merchandise stores, 913 retail liquor stores and saloons and 735 churches.

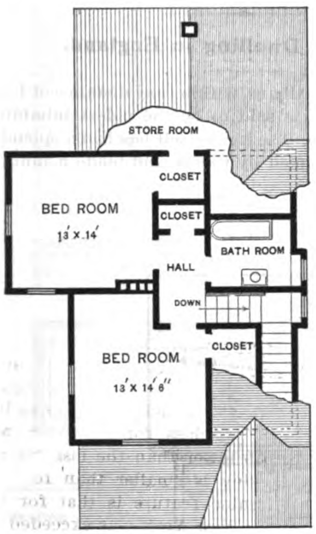
Materials Employed in Constructing a Modern Office Building.

An idea of the amount of material required in the construction of a modern office building may be gathered from the following figures furnished by the superintendent in charge of the construction of a 16-story skyscraper in Philadelphia, Pa.:

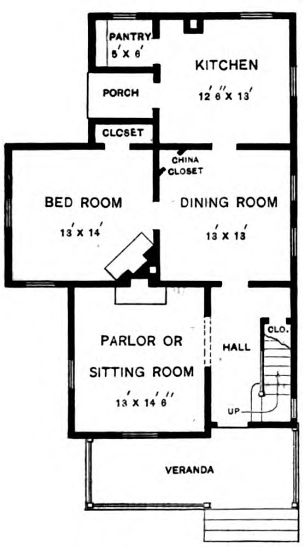
About 8000 cubic yards of excavation, 4000 yards of concrete and stone masonry, 4,871,500 pounds of steel, 300,000 pounds of ornamental iron, 36,000 pounds of ornamental bronze, 10,000 cubic feet of granite, weighing 900 tons; 260,000 square feet of fire proofing, weighing about 3600 tons; 1360 tons of patent mortar used in plastering to cover 42,000 square yards of plastering; about the same amount of cement mortar used in brick and stone masonry; 40,000 square feet of Pavonizza, Numidian and Italian marble, 15,000 pounds of nails, 10,000 cubic feet of terra cotta, weighing about 290 tons; 325,000 face brick, 1,500,000 common brick, 24,000 square feet of glass, weighing about 73,660 pounds; about 80 miles of electric piping to incase the electric wiring throughout the building, and about 10 miles of plumbing and steam fitters' piping. There were on an average 200 men working on this structure from the start until the finish.

A LOW COST SOUTHERN COTTAGE.

We have no doubt that many of our readers will be interested in the design which forms the basis of our half-tone supplemental plate this month, representing as it does a low cost cottage adapted for erection upon a suburban site in almost any section of the country. While the cost has been kept at a low figure, it will be seen from an examination of the half-tone engraving that the design of the exterior possesses many features of architectural merit, giving to the house a much more expensive appearance than the amount actually involved would seem to suggest. It is a six-room structure, one story and a half in hight, and embodies in its arrangement of rooms a feature very common with the moderate cost dwellings to be found in the West and South, as well as in some other sections of the country—a sleeping room on the first floor. There is also on the main floor a good sized front room which may be used either as a parlor or sitting room, and beyond this, as one leaves the hall, is a dining room, the kitchen being immediately in the rear. On the second floor are two sleeping rooms and a bathroom, the location of the stairs being such as to reduce the amount of space required for the hall to a minimum.



Second Floor.

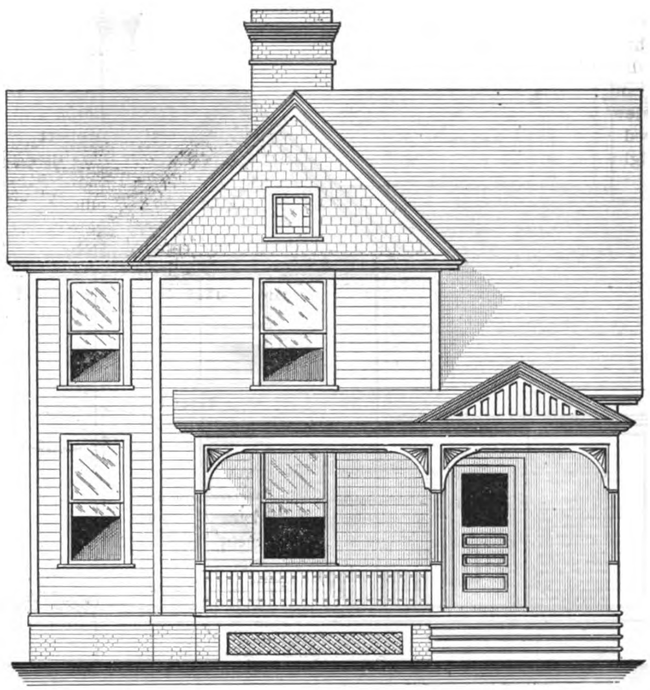


First Floor.

Scale, 1-16 Inch to the Foot.

This cottage was built in the spring of last year for Mrs. Martha Knott in West View, a suburb of Knoxville, from plans prepared by Architect Frank K. Thomson of Knoxville, Tenn.

According to the specifications the foundations are of hard brick, the walls above grade and the chimney being faced with selected even colored brick laid in lime mortar. The superstructure is of frame, the sills being 4 x 6 inches; girders, 6 x 8 inches; first-floor joist, 2 x 10 inches; second-floor joist, 2 x 8 inches; ceiling joist, 1½ x 6 inches, and the studding and rafters, 2 x 4 inches. The exterior of the frame is covered with ⅞-inch surfaced sheeting, on which is laid No. 1 narrow yellow pine weather boarding. The roofs and gables are covered with No. 1 Georgia pine shingles laid 5½ inches



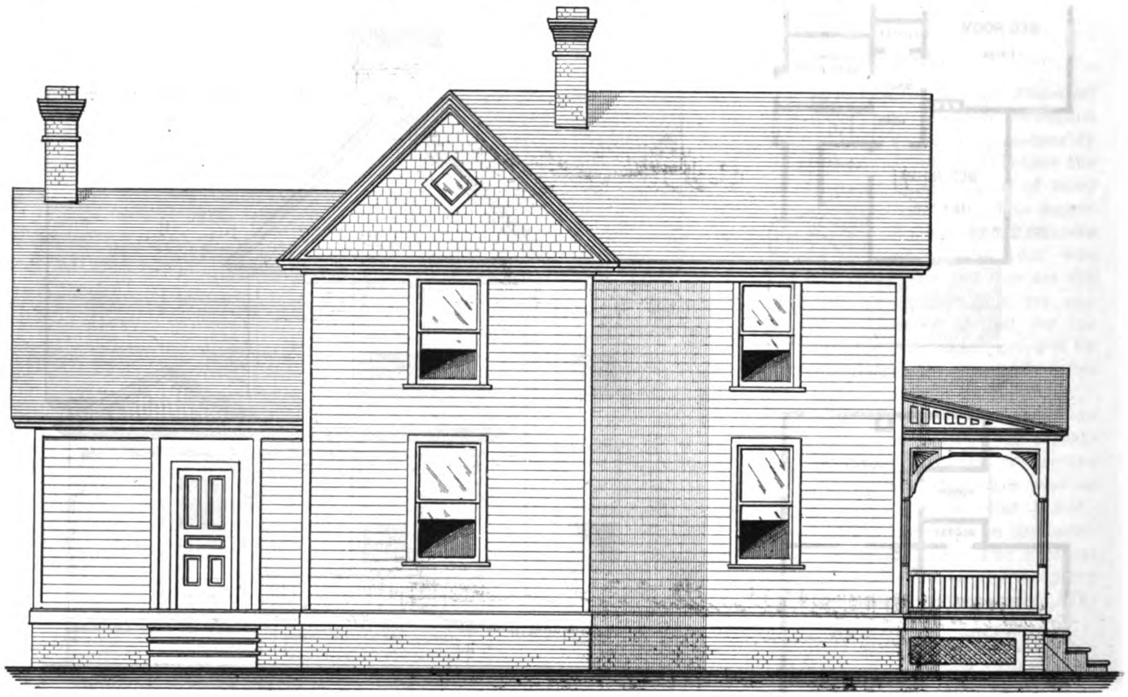
Front Elevation.—Scale, ⅛ Inch to the Foot.

A Low Cost Southern Cottage.—Frank K. Thomson, Architect, Knoxville, Tenn.

to the weather. The exterior of the house is primed and given two coats of lead and oil, the colors selected being Colonial yellow with white trimmings. The walls of the house are plastered two coats with lime putty and plaster of paris hard finish. The interior finish throughout is Southern pine, surfaced, and given two coats of Berry Brothers hard oil. The hardware is bronze plate. The contract price for the building without plumbing was $1050, but this figure would vary with the location and style of finish.

Roman Walls.

An economical mode of constructing walls was practiced by the ancient Romans in the time of the Republic and of the early Empire, the durability of which has been shown by experience. They are the most durable walls that are known, and at the same time the most economical to build. The secret of this is very simple. The walls are built of rough stone, not cut, bound together by the excellent Roman mortar into a concrete mass as hard as a natural concrete rock, harder and stronger than many kinds of stone. The reason that the Roman mortar is so good and so durable is that it was always used quite hot and never allowed to cool before it was used; the lime was used the same day that it was burned, before it had time to absorb moisture from the atmosphere, which it does very rapidly when first burnt. This moisture makes it begin to cool and to expand and crystallize, in the manner that lime always does as it cools. These crystals, being hexagonal, present always jagged edges, and the lime is mixed with rough sand, either of the natural volcanic sand called *pozzolana*, which is found in great abundance in the neighborhood of Rome and in all volcanic districts, or of pounded stone or pounded brick where rough sand is not easily found. River sand will not do, still less sea sand, because each particle is rounded by the action of the water, and consequently the jagged edges of the lime crystals have no hold upon such sand. The truth of this observation is easily tested by putting a piece of hot lime under a microscope, when it may be seen to expand in a marvelous manner, and to crystallize as it expands. The benefit of this action of nature is entirely lost by the modern practice of keeping lime for days or weeks before it is used, and stirring it up several times mixed with road dirt. It is then no better than mud from the road for building purposes, says an English exchange. But as these rough concrete walls are not ornamental, the Romans faced them either with brick, or stone, or marble, or with plaster or cement to be painted upon. The Roman bricks of the first century make the finest brick work in the world. In form they are what we call tiles, large, thin and flat, usually 2 feet square when used for floors or other purposes; but the bricks used for facing walls are not so large, and are of a triangular form; that is, a tile of about a foot square is cut across in a diagonal line, making two triangular bricks, and the long side is placed outward to form the face of the wall; the two other sides form a wedge, which being turned inward and driven into the concrete before it was set, the whole is bound together by the crystallization of the lime in such a manner that it is impossible to draw out one of the bricks or tiles; the bricks will break before the mortar will give way. It is probable that the two rows of tiles were placed first at such distance apart as was required for the thickness of the wall, and the interval filled up with broken stone, similar to what we now use for macadam roads (and which was used by the Romans for the foundation of their paved roads many centuries before Macadam was born). As soon as a bed of this sort was prepared, either for a road or for part of a wall, usually about a yard thick, the lime grouting was poured upon it. This consisted, according to the directions of Vitruvius, of one part of lime to five of rough sand, mixed with water to about the thickness of cream. The water evaporates as the lime expands and leaves a mass of wall, ordinarily about 6 yards wide and 1 yard deep.



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

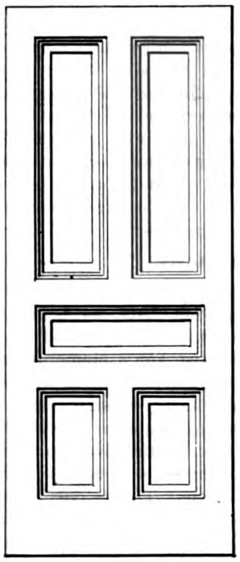
A Low Cost Southern Cottage.

The Oldest Dwelling in England.

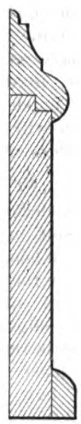
In the town of St. Albans, within easy distance of London, is located what is said to be the oldest inhabited house in Great Britain. The town itself has had a splendid history. It was occupied by Cæsar and made a municipium; later, it was attacked by Boadicea with great slaughter. Here, too, St. Alban was martyred in 286, and the legends of his death are told, with every variety of mythic addition, by the caretakers of the Abbey, a magnificent pile of Roman brick and flint, 580 feet long, which contains the shrine of the saint and many wonderful brasses. But what should particularly interest Americans is a little cottage by the river Ver, which lies out of the general ken, and might very well be missed by the tourist. This is the oldest inhabited house in England. It is now an inn, "the Fighting Cocks," but it stands as it did 1100 years ago, when it was built as a fishing pavilion for the monks of the neighboring monastery. It used to be called the Old Round House, and the name was only changed a century ago, when it became a favorite resort for cock fighting. It lies about 200 yards below the Abbey, on the banks of the river, from which it is now separated by some ten or fifteen yards of road. Originally, it is held, the water came in to the door, where on the summit of a flight of steps the monks would practice the gentle craft of angling. The house is octagonal in shape, and has foundations of immense thickness, built of flint and Roman brick, like the Abbey. From its basement there is a subterranean passage running straight for the Abbey, but now blocked up. There is just such another passage in the Somersetshire village of Street, near Glastonbury, which runs from the stable to the Grange there, in the direction of the Tor. The upper part of "the Fighting Cocks" is of brick and oak, and the beams are so hard that they resist any nail. From the little garden you get a fine view of the walls of the old Roman town of Verulam, which lies on the other side of the river. The line of the fortification is quite perceptible in the open fields. Inside the little house the rooms are small and very low. The kitchen has a settle and a handsome outside chimney of brick. There is fine oak paneling on the walls. Altogether the cottage realizes its character, and it is interesting to know that, though it was at one time fortified as St. Germaine's Gate, it has never lacked a tenant since it was built, by King Offa of Mercia, in 795.

German Technical Schools.

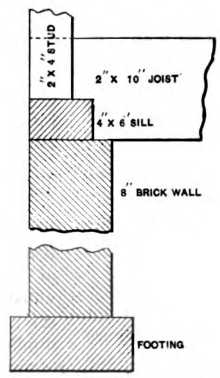
Of the extension of technical education Germany has always been the most prominent exponent. Writing on this subject, a European contemporary says: The whole German people are being educated scientifically in the arts of industrial production. Nowhere in the world does manufacturing become so nearly a profession as in Saxony, for in this small kingdom there are no less than 111 technical institutes; Prussia has 200 such schools, with only 12,000 pupils; 35 of the schools are for painters and decorators, 16 for tailors, 9 for shoemakers, &c., other trades having at least one school. The Government appropriates $600,000 annually for their support and the various towns and cities give liberal subsidies, Berlin alone giving $70,000 per annum. Baden, with 1,600,000 inhabitants, spends $280,000 a year in technical schools. Hesse, with a population of 1,000,000, has 83 schools of design, 43 of manufacturing industries and many others for artisans of various trades.



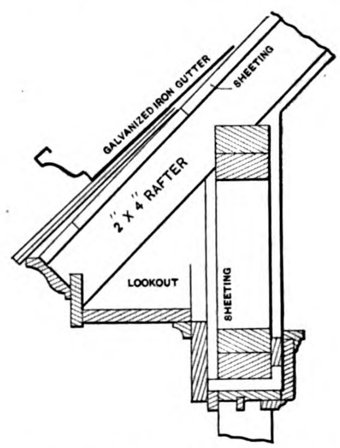
Elevation of Door.—Scale, ⅛ Inch to the Foot.



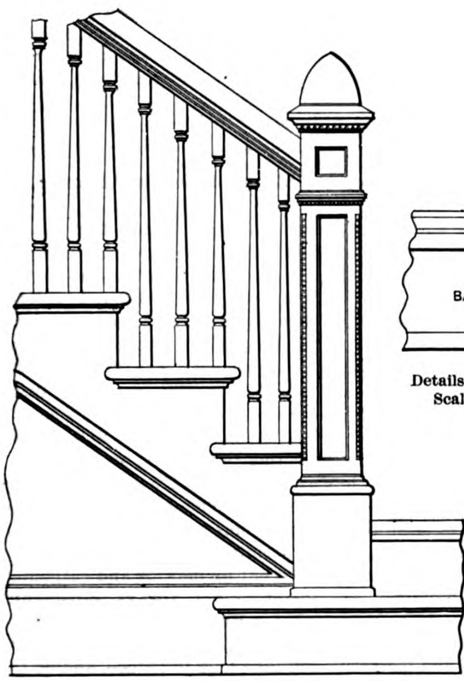
Base.—Scale, 3 Inches to the Foot.



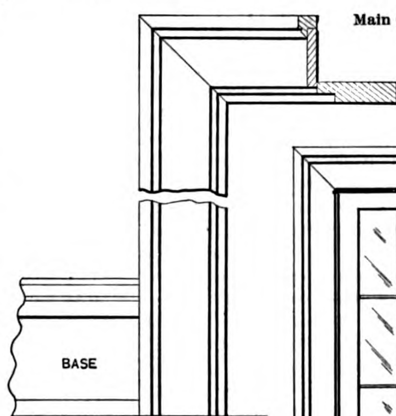
Section through Foundation.—Scale, ¾ Inch to the Foot.



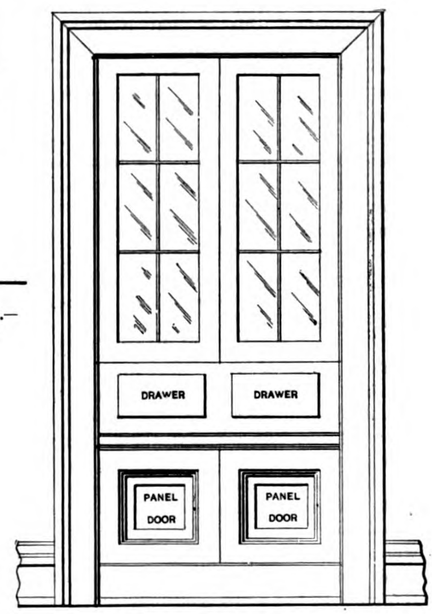
Main Cornice.—Scale, 1 Inch to the Foot.



Detail of Main Stairs.—Scale, ¾ Inch to the Foot.



Details of Base and Casings.—Scale, 1 Inch to the Foot.



Elevation of China Closet.—Scale, ⅛ Inch to the Foot.

Miscellaneous Constructive Details of a Low Cost Southern Cottage.

WORDS FOR THE YOUNG BUILDER.*

By L. J. Aimar.

There are doubtless many young mechanics who to superintend the construction or draw the plans, the contractor, or perhaps the owner, simply making a few rough outlines of the different floors, marking a cross where the windows, &c., are to be located and so on. I would say of this method that it is possible to proceed without plans. But in that case the specifications have a double duty to perform, and consequently must of necessity be very voluminous to cover the entire ground. The shape of the roof, sizes of doors and windows, number of lights, and so many little items must be mentioned that I think this a much larger job than taking a common rule and pencil and making a scale drawing of the thing to be built, for when the dimensions have been decided upon they become as much a part of the contract as the price agreed upon. Sometimes the floor plans are drawn to scale, the openings, closets, &c., accurately located, but no elevations are provided. We have then overcome part of the trouble, but much room remains for misunderstandings. I think it just as easy to draw a vertical section as a horizontal one, and, to tell the truth, I cannot understand how one can lay out a building full size and not be able to lay one out on a smaller scale. Here is where your familiarity with plans will give you the advantage over the fellow whose education has been neglected at this point. Get your tools out and make the necessary drawings, embracing elevations of all four sides of the building as well as the foundations and floor plans. If the character of the finish differs in any way from the usual run of work of that class, make detail drawings of those portions, using a larger scale than that used for the plans. By this means both parties have something tangible as a basis for business. A good scale for the plans and elevations is ¼ inch to the foot. The convenience of this is that it corresponds with the divisions of the common 2-foot rule, and therefore makes any special means for picking off the dimensions from the scale drawings unnecessary. In most cases you will find, too, that the owner will take a new interest when you produce a nice clean set of drawings. His confidence in you will increase thereby, and your abilities are proven perhaps to the extent of awarding you the contract at your figure without inviting competition. If your plans prove satisfactory, get some tracing cloth and make a copy of them and the other drawings. Let the owner keep the originals, and use the tracings to work from, as they will bear handling better.

Care of Drawings.

Take care of your drawings, as you may have occasion to use them again, and thereby save the trouble of reproducing them. Some men can use plans over and over and yet have them in good order. Others will deface them in an hour or two. This is nothing but carelessness, and your business, as a rule, is never quite safe in the hands of such men, for they are apt to lose or misplace the plans or specifications at a time when they are most needed. Little tangles arise sometimes that a clean drawing may straighten out, but upon referring to the plans you may find that very point defaced and consequently no help to you. Clean drawings are as necessary in business sometimes as a clear conscience. I think I have made plain the necessity of plans in the undertaking. No matter how well you may be acquainted with the owner, or he with you, it is well to draw up some form of contract in duplicate, a copy to remain in the possession of each person, as to the amount agreed upon, how payments are to be made, what proportions of the work are to be done before payments are due, what amount is to be held until completion, and so on. If this is given the attention it is worth it will save you many little headaches. Live up to the contract on your part.

The next step after signing the contract would probably be to figure out the quantities of the different materials required for the work. This may have been done previous to tendering your bid, but is often left until later. Make a careful list of your timber, their sizes and lengths; where they belong; if for sills, plates, rafters, &c. If you employ a foreman furnish him a copy of this list, also one for the material man. In this way you will not have your men cut into stuff intended for something else, to do which may make considerable waste—a very important item. I find that if left to themselves men will cut into the first thing that comes to hand, regardless of the consequences.

Economy in Lists.

It is hardly necessary for me to tell you to use economy yourself in making your lists, as it means profit or loss. When the materials are delivered make it a point to have the dealer furnish you a memorandum of what his load consists. The driver is usually provided with two slips, one of which you sign. This is his receipt, and is returned to the dealer as such. The duplicate you place on file, and in this way you can always know how your business stands. By this means you will also avoid disputes. This is customary, but I have known dealers to neglect or refuse to do it. Why, I will not attempt to explain. If you meet with such take your custom elsewhere. They probably do a square business, but be on the safe side. If you get prices before sending in your figures have the dealer write them off for you, for if you expect to pay one price and are obliged to pay another, the cost comes out of your pocket. Dealers' memories, like other people's, play them queer tricks sometimes. Pen and ink work better.

(To be continued)

* Continued from page 163, July issue.

Prices for Building in South Africa.

A correspondent in Bulawayo, Rhodesia, South Africa, writes to one of the London architectural journals relative to the high prices which have to be paid for building in that district. The lowest rate per foot cube is 1 shilling.* Bricklayers and masons obtain 30 shillings a day; carpenters, 25 shillings; 9 x 3 inch deals cost 1 shilling 2 pence a foot run (they were 4 shillings 6 pence before the railway came). Bricks are about £5 a thousand delivered; cement is usually £3 a cask; lime, poor stuff, made locally, is 9 shillings a bag. A five-roomed cottage (one-story, of course) costs about £700, and lets at from £15 to £25 a month, according to position (unfurnished). The commission of 5 per cent. on a large building brings in a desirable sum. As yet there are not many architects in the town, and much of the planning is carried out by masons and carpenters. The buildings are therefore not always satisfactory. This is to be regretted, for Bulawayo is a rising town, and should have a prosperous future. The prices for labor and materials will take long to reduce, and on that account it would be absurd to anticipate rebuilding and rectifying of errors within a measurable time. The district possesses at least two beautiful building stones close at hand in abundance. One is a very fine grained white stone, very easy to work, and in appearance somewhat resembling Ancaster; the other is almost exactly similar to Red Mansfield. But owing to inability to appreciate the advantages of stone, costly cement is too often preferred to cover the exteriors of new buildings.

* Our readers can find the equivalent in American values by figuring the English shilling at 24 cents.

COTTAGE ERECTED FOR MRS. MARTHA KNOTT, IN WEST VIEW, KNOXVILLE, TENN.

FRANK K. THOMSON, ARCHITECT.

SUPPLEMENT CARPENTRY AND BUILDING, AUGUST, 1898.

EXPERT WORK IN HOUSE SHORING.

OUR readers will remember that some months since we illustrated a very important piece of work in moving a large stone church in Chicago, which was done by Harvey Sheeler, 115 Dearborn street, Chicago, Ill., this being a notable undertaking and attracting attention not only throughout the United States but all over the world. While it was a remarkble feat, considering the size and weight of the structure, yet Mr. Sheeler is constantly engaged in other moving operations and in the reconstruction of old buildings in which an equally high degree of mechanical ingenuity and engineering skill is required. We have obtained from C. H. Rector, engineer, who is associated with Mr. Sheeler, some details connected with recent work of this character, which will be interesting to the readers of *Carpentry and Building*.

It is sometimes necessary in the reconstruction of an old building to take out the front wall of an upper story for the purpose of putting in an improvement, such as a bay window, for instance, a change of this character having recently been made in the Citizens' Building, at 119 La Salle street in the city named. In this instance the front wall of the sixth story of a nine-story steel frame building was removed and a new front was inserted with projecting bay windows, without disturbing the occupants of the other stories of the building. A section, Fig. 1, is herewith given which will assist in the explanation of the method by which this was accomplished. The illustration represents a cross section of a portion of the building at right angles with the front wall, and showing that part of the wall removed which is to be replaced. The manner in which this work was done is as follows: Steel beams 14 inches in width were run through the wall, resting on the floor of the sixth story, with the greater portion of the length inside the building and a very small portion projecting outside. Enough of these steel beams were laid on the floor to support the upper stories according to a careful calculation of the weight to be carried. They were also arranged in such relation to one another that any intermediate work could easily be done, such as the insertion of a column for the new front. Heavy cross timbers were laid on the tops of these beams, one on the outside of the building and the other on the inside, to form supports for the screws. Steel beams were also arranged at the ceiling to correspond with the beams laid on the floor. Two heavy cross timbers were placed in position under the upper beams to correspond with the cross timbers below. Two rows of supporting posts with jack screws under

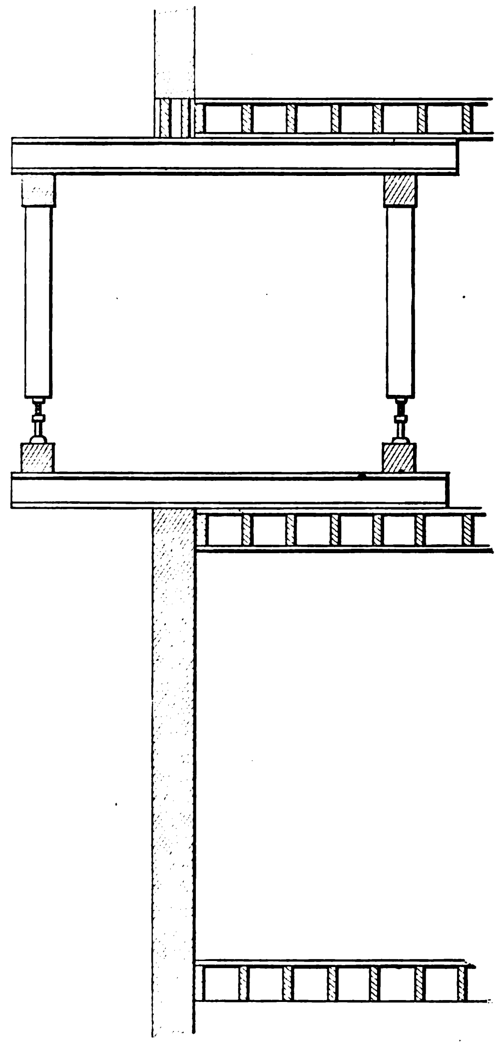


Fig. 1.—Vertical Cross Section of Building Showing Front of Sixth Story Taken Out and the Upper Stories Supported by Means of Jack Screws.

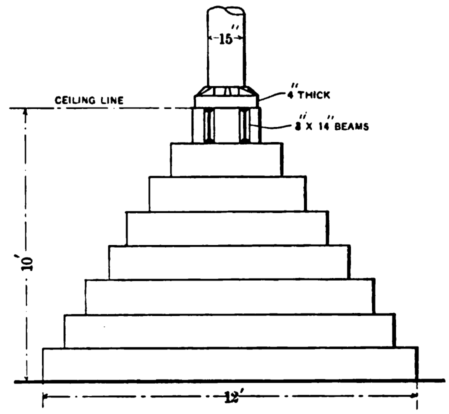


Fig. 2.—Elevation of One of the Foundation Piers of Chicago Opera House.

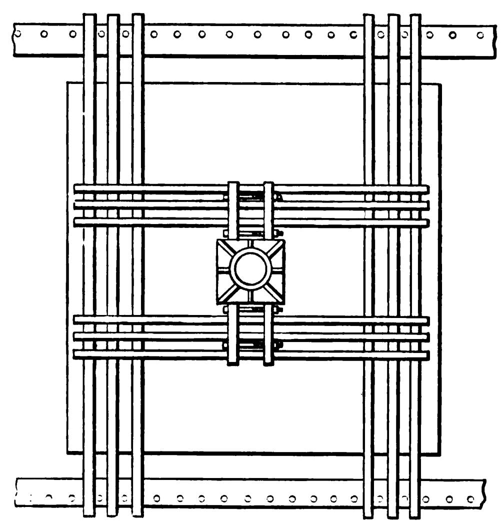


Fig. 3.—Plan View of Foundation with Clamps Shown Around the Column and Block Work Extending Out to the Supporting Screws.

Expert Work in House Shoring.

them were placed in position between the upper and lower cross timbers, and everything was then in readiness to proceed with the work of taking out the old front. The screws were tightened until the support of the upper part of the building was taken from the front wall and it was easily removed. The great length of the supporting beams inside the building as compared with the short part extending outside overcame all liability to thrusting and slipping. The weight was also distributed over a great area, so that no danger of crushing the supports existed. The bearings of the building were taken advantage of in laying the beams so as to make satisfactory results absolutely certain. The tenants of the lower stories were not interfered with in any respect, and would not have known that anything unusual was going on overhead except by getting out and looking at the work from the outside. The same thing was done with the fifth floor of the Atlas Building, Wabash avenue and Randolph street, and with the second story of a six-story stone building at State and Monroe streets, Chicago.

Another very remarkable piece of work was performed by Mr. Sheeler in making some desired alterations in the foundations of the Chicago Opera House. This is a ten-story brick and iron structure, thoroughly fire proofed, carrying a load of 350 tons on each foundation pier. The main supports of the building consist of 15-inch cast iron columns which rest in the basement on massive stone and concrete piers, each having a base 12 feet square. Each of these piers is 10 feet high, and capped at the top by a cast iron shoe 4 inches thick and 2 feet square. The courses of masonry from the base to the cap are built in pyramidal form, as shown in Fig. 2 of the accompanying engravings. The problem in this case was to remove four of these enormous foundations and put in others taking much less space in order to utilize the room for other purposes. Immediately above this portion of the basement is a restaurant which had but recently been decorated at very great expense, and which Mr. Sheeler was put under bond not to injure in the least particular. He was further not permitted to enter the room for the purpose of facilitating his movements by any operations at that point. The work done in this case was the removal of the entire foundation, including the bottom bed of concrete to the naked earth and its replacement by, first, a course of 8-inch steel beams 12 feet long on which was arranged another course of beams at right angles, and on top of these a cast iron base for a short piece of 15-inch cast iron column, which was set in to take the place of the part of the foundation which had been removed. The only part of the room now taken up by the foundation work is thus the four 15-inch columns, making a very great gain in the open space. The manner in which this work was done is shown in Fig. 3 of the illustrations. The first thing was to mortise a hole through the first course of masonry just under the cast iron shoe supporting the column and extending about 1 inch inside of the base of the column. Into this hole was inserted a forged steel clamp, 3 x 14 inches. Another hole was then mortised parallel with the first, through the same course of masonry and also 1 inch within the foot of the column above, through which another steel clamp of the same size was inserted. These two steel clamps were intended to carry the weight of the entire building above, and were, therefore, placed a little inside of the columns so as to avoid all shearing strain on the cast iron plate, which would have been the case if they had been set outside of the line of the columns. These steel clamps were about 5 feet long, and extended a sufficient distance on both sides of the column to enable them to be fastened together with heavy bolts, as shown in the plan view. Their ends were supported on longer beams, and these, in turn, were supported by still longer beams which extended far enough beyond the line of the foundation to be supported by the cribs intended to carry the jack screws, and the work of shifting the weight was thus easily done by the screws. The support of the building was brought on the beams, the foundations were torn out, the new steel beam foundations taking so much less space were laid, the new piece of cast iron column was inserted in its proper place and the work was done. The piece of column inserted, however, had been previously cut at the top so as to fit in between the two steel clamps supporting the column. After the clamps were removed iron pieces were set in to fill the spaces thus left and give the job a finished appearance. The work was satisfactory in every respect, the remainder of the building showing no evidence of the removal of the old foundations and not a particle of damage being done to the decorated room overhead. A similar piece of work, although the building was not quite so heavy, was afterward done in the Royal Insurance Building, Chicago.

Hints for the Plasterer.

A practical writer in discussing the work the plasterer has to do says: Many times he will be called upon to plaster a building before the sash are put in their places, and when this is the case it is usual to close up the openings with rough boards, canvas or felt, to keep out heat, wind or rain. These coverings, whatever they may be, should not be taken off until the glazed sash are ready to take their places. There are two reasons for this: First, by opening the windows while the plastering is progressing, and admitting a draft, portions of the work would dry so rapidly that it would crack, warp and break bond. Second, by taking off these coverings the building is left exposed to storms and sudden wind pressure, and if the wind cannot get out as freely as it gets in it may carry the roof away. We have known of several instances where buildings were unroofed because of the plasterers leaving the windows open on one side and closed on the other during a sudden storm.

Frequently the plasterer is called upon to lay grout floors in cellars and outhouses, and it has been suggested that perhaps, when economy is an important factor, the following method might be employed successfully: Take 4 parts of coarse gravel, or broken stones and sand, and 1 part each of lime and Portland cement, mix well in a shallow box, shoveling it over and over again. The sand, gravel and cement must be mixed together dry. The lime is slaked separately, and mixed with the other ingredients in such proportion as will cement the whole mass together. Six or eight inches of this mixture is then laid on the floor and spread out level, and when set another coating is put on, consisting of 1 part cement and 2 parts sand. This last coating should be not less than 1 inch thick, and should be well troweled and made smooth on the surface. This will answer for making the bottom of a cistern that is to be cemented up the sides without a lining of bricks. A cement of 1 part sand, 2 parts ashes and 3 parts clay, mixed with linseed oil, makes a hard and durable substance like stone, and will resist the weather almost like marble.

National Iron Roofing Manufacturers' Association.

A meeting of the National Iron Roofing Manufacturers' Association was held at the Hotel Cadillac, Detroit, Mich., July 13.

A committee was appointed to arange a list and percentage scale, as it was believed that this action would give much better results than doing business on the net basis plan, as has heretofore been the case. The committee will make its report at the next annual meeting, to be held in Cincinnati in January, 1899. It was also decided to advance the price of roofing 10 cents per square.

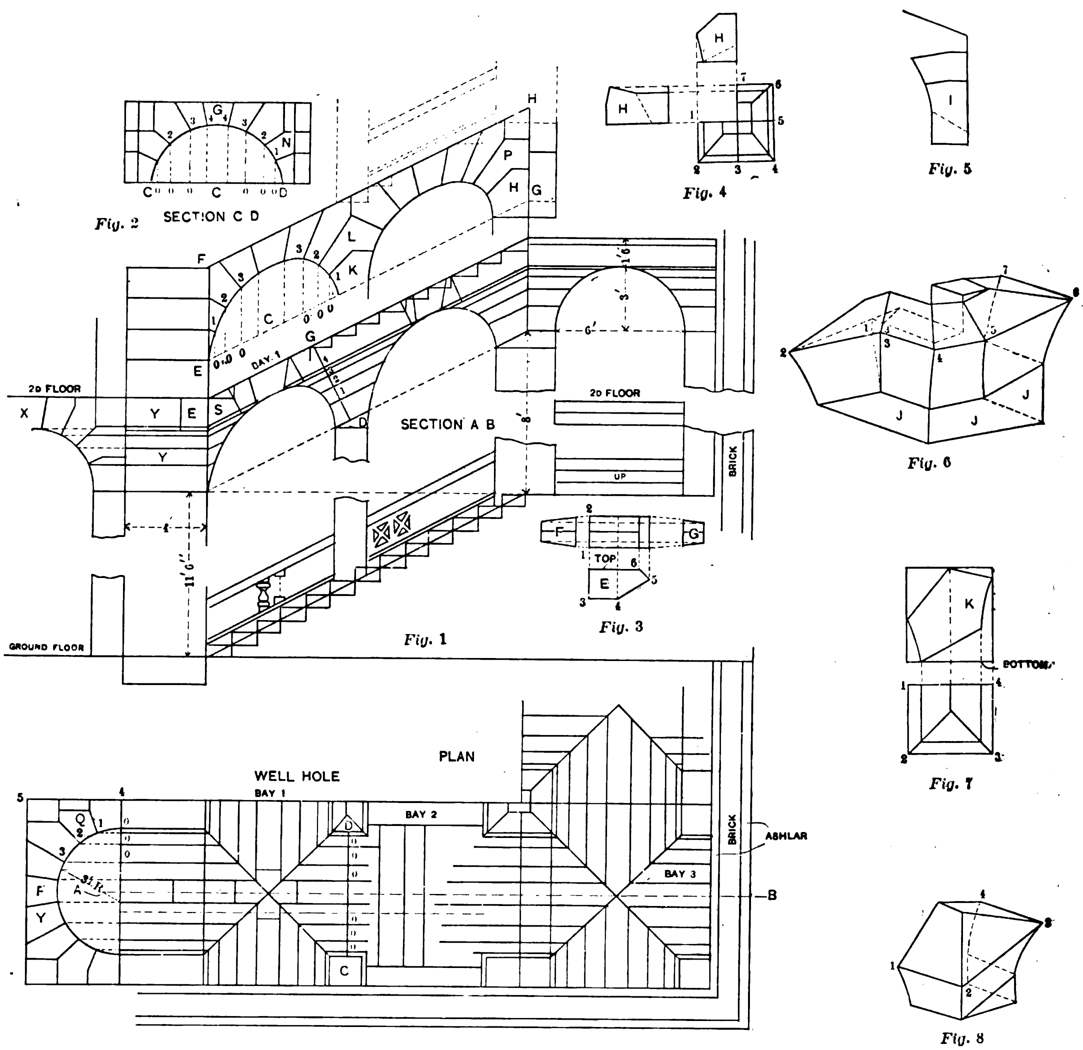
On Thursday, the 14th ult., the members made a trip to Stag Island, where a session was held, followed by a frog supper.

A RAKING CEILING.*

THE subject treated in this article is called a raking ceiling, intersected by raking arches, and serves to lighten the structure as well as to receive light from the well hole. A plan, section and a view of the elevation in the well hole would probably be received by the workman from the architect, while the cross section would be the work of the foreman or draftsman at the yard. I have made the diagram as plain as possible, using no decorations or moldings, these being secondary to the problem. The parts of the arch that involve any difficulty in getting out the patterns are the springers at the single and double piers, the intersecting or groin stones, keystone, and the level arch with rake piece attached.

I have shown one run containing three bays, two of which are raking, while the other is level over the first landing. The bottom arch serves as an abutment for the rake, and is 4 feet through at the soffit. The arch marked X serves as an abutment at the spring of the square arch Y, which is 16 feet from floor to floor, 11 feet 6 inches from ground floor to spring of arch; and the radius of arch being 3 feet and the thickness of keystone 1 foot 6 inches. The runs from the first to the second floor need not be arched over, but laid on a foundation, while the space underneath can be utilized as a storeroom, lavatory or toilet room, the sides in the well hole being laid in ashlar with openings for light and entrance.

Between the piers there can be placed a balustrade, composed of a base with balusters or a perforated piece, capped with a molded cornice. The balustrade next the wall need only be molded on one side, the perforations being cut half way through. It would be better where the steps butt against the base of the balustrade to check out the base to the depth of 3 inches to receive the ends of the steps as well as to serve as an anchor for the base, it resting on the steps to prevent slipping. In the same manner the arch stones on the well hole elevations can be checked, as well as a seat for the piers, as shown by dotted lines.



A Raking Ceiling.—Figs. 1 to 8 Inclusive.

It would be well for the student, if he desires a better knowledge of this problem, to draw it to a 1½ or 3 inch scale, making a plan of the well hole full, and the sections and elevations of each run, with the steps in dotted lines. This will enable him to get a better view, with good practice, and it would be a great help if he should ever be called upon to transfer such a drawing to the board for a full size.

The first work will be to draw the raking arch, Fig. 1. As a basis for our hights we use the arch Y, which has a radius of 3 feet and is divided into nine stones, as shown by the plan. In Fig. 1 draw the rake line, which is found to be 8 feet, as shown in the section A B. Drop lines from the soffit line of arch Y, and prolong them till they touch the plan of the groin in bay 1. From these points erect lines to the section A B, as shown by the dotted lines, which are indicated in part on the plan. Transfer from arch Y the distances 0 1, 0 2, 0 3, &c., as shown by the same figures in bay 1 of the section. Every one must correspond with the basis arch, then through the points draw the curve. For the joint lines draw from the center C, as shown. Make E F and G H equal to 4 5 of the arch Y; connect F H. The curves of the section are found in the same manner. The different hights of the soffit are found by drawing lines across from arch X.

To find the cross section C D of Fig. 2 proceed as follows: Transfer the distance C D from the plan to Fig. 2, which will be the plan of the cross section. C D taken from section A B will be the hight. From the plan take the distances C *o*, *o o*, &c.; D *o*, *o o*, &c. Space them as shown in Fig. 2 and erect dotted lines. We now get the hights from the section A B; take the hights D 1, D 2, D 3, &c., and transfer them to Fig. 2, as *o* 1, *o* 2, *o* 3, &c. Draw the curve through the points. For the joint lines draw radiating lines from center C, and fix the ashlar to suit. It will be noticed that I have shortened the width of the arch, as shown by parallel lines, so that it would not interfere with the face stones; this will be shown when we work the springers.

We will now work the stone marked E in the section A B. It will be seen that the top part is checked out to receive a step, which lessens the size of stone required. Fig. 3 is the pattern taken from section. It shows the size of stone wanted. First work the top, next the joint 1 2, then apply the face pattern F of the arch Y; run the soffit through 3 4, then with a bevel work the drafts 4 5; scribe hard lines on and work back joint 5 6 square with 4 5. Draw a center line on the stone, then apply pattern G, curtailed. Finish soffit and work the beds last. It will be necessary to draw a section of each course to get the shape of pattern and size of stone.

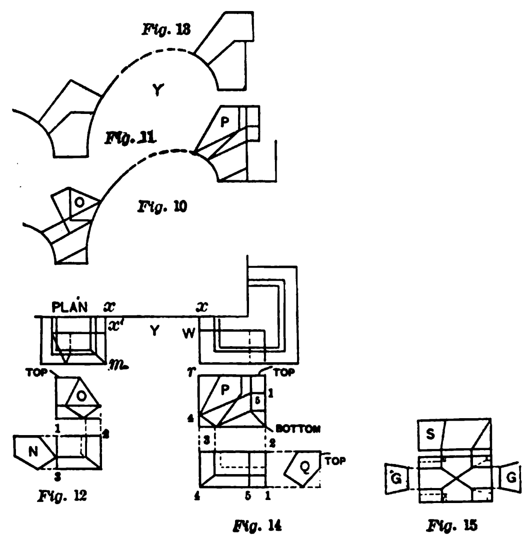
The next work is the double springer. The face pattern for the lower stone is represented by H in the section A B of Fig. 1, and for the higher stone by I of Fig. 5. The plan, with the patterns H, I, is shown in Fig. 4. First work the bottom bed; then apply the plan, or by measurement work the two faces; apply patterns I and H; next work the nosings of the different intersections of soffit with beds, as shown by enlarged sketch, Fig. 6, as 1, 2, 3, 4, 5, 6, 7. The hight of each nosing can be measured from the face patterns, the dotted lines showing the rake. Scribe hard lines, as these will be the lines to work the stone true; rough off the soffits and bottom square. Cut the part marked J J clean to the different hights where the bottom of soffit meets. Work the soffits off with templets taken from C D and the square arch. Cut the beds next, and the top of the lower stone for a seat to receive the upper face stone P. It need not be cut as far back as shown in the sketch, which the student should examine closely for a better understanding.

I will now take up the springer of the single pier, Fig. 7 showing an enlarged pattern of the stone, which gives the hights required, as well as the plan, width and thickness. First work the bottom, next the face; apply pattern K, then find the lines 1, 2, 3, 4, as shown in Fig. 8, in the same manner as explained in connection with the double springer. The method of finishing is the same.

I shall next take up the groin or intersecting stones and explain one of each as an example for the others. I have transferred part of the plan, elevation and section necessary to make the patterns and get the sizes of stone required, as shown by Y, Y, Y, in the various figures. Fig. 10 is the face pattern, with all the lines marked thereon. This must be done to locate the different points. Fig. 10 will give the length and hight, and *x′ m* of the plan the width. The space *x x′* will be filled by a stone of that thickness. The same rule works at the double springer.

A plan with the joint patterns is shown in Fig. 12. First work the joints 1 2 and 1 3. Apply the shapes O and N; after which work the top, then the bed and the soffit last. The miters will form themselves as the stone is cut. The stone marked P has a raking and level piece. Upon the section draw the face mold, Fig. 13, with all the lines, as shown. The size of stone required will equal P and W *r*. Fig. 14 contains all the patterns. First work the top; next the joints 1 2 and 2 3; apply patterns P and O. Find the arris lines of soffit next the beds, as 1, 5, 4, 3 in plan, and 1, 5, 4 in elevation, gauging down from the top; next work the bottom. Draw lines on the bottom measured from the plan pattern, thus completing the lines for the finish.

The keystones, Fig. 15, are worked by cutting the top first, the joints next; mark on the patterns S and G and cut the same as a plain groin key. In this problem it will be found that the work in making patterns for the several different stones is greatly increased on account of the rake. When each section of the courses is



A Raking Ceiling.

drawn they can be divided, so that they will break joint, whereas if they were all marked on the section and plan they would be apt to be confusing. The checks for the step can be scribed on the molds for the top. This will enable us to get them in their right position. It will also be noticed that I have put in a slab to serve as a platform at the landing. This will hide the joints of the arch and lessen the size of stone used for bay 3. In getting out the raking straight stones it would be well to mortise and cut a tenon on alternate beds to prevent slipping, the key course being plain. It is now left for the student to make patterns that he may be able to reproduce at some future time when stone work gains the ascendency.

HAMMERS are represented on the monuments of Egypt 20 centuries before our era. They greatly resembled the hammers now in use, save that there were no claws on the back for the extraction of nails. The first hammer was undoubtedly a stone held in the hand. Claw hammers were invented some time during the Middle Ages. Illuminated manuscripts of the eleventh century represent carpenters with claw hammers. Hammers are of all sizes, from the dainty instruments used by the jeweler, which weigh less than ½ ounce, to the gigantic hammers of shipbuilding establishments, some of which weigh as much as 50 tons and have a falling force of from 90 to 100. Every trade has its own hammer and its own way of using it.

PREVENTING DAMPNESS IN BUILDINGS.*

WHERE no basements occur the damp course should be fixed not less than 3 inches above the level of the surrounding soil, and below the ground floor line of the building. It may be composed of one of the following materials:

1. A course of two layers Welsh slates, set and bedded in cement and breaking joints.
2. A layer of Portland cement 1 inch thick.
3. A layer of asphalt ¾ inch thick.
4. A layer of sheet lead well lapped at joints.
5. A course of glazed perforated stoneware 3 inches thick.
6. A layer of White's Hygeian Rock composition.
7. Tarred felt.

Of these the slates have the disadvantage of being easily broken by the workmen walking over them before the superincumbent walls are erected, and if any settlement occurs in the building, the unyielding nature of the course causes it to crack and admit the damp, which rises in the wall, as is easily seen by the mortar becoming moist. This remark also applies to the so-called asphalts formed of tar and pitch and to that formed of Portland cement only. The tarred felt has the disadvantage of not being permanent, and should not be used except for temporary structures. The Seyssel asphalt damp course has the advantage of flexibility, accommodating itself to any settlement of the building without cracking, and is one of the best enumerated. Sheet lead, which is the most expensive of all, is the best.

Where projecting moldings, such as string courses or cornices, &c., either of brick or stone, are used in the *facade* of a building, care should be taken to see that they are undercut, or the rain water will run round them and enter the wall at the beds and joints. They should be set in cement if possible. Copings of gables must be properly throated and should invariably be set and jointed in cement. Avoid in all situations in the external walls hollow moldings that are likely to hold water.

Solid stone walls, especially those built of limestone, should always be lined with brick on the inside to prevent osmitic action. A lining of the Hygeian composition run between the stone work and brick lining would render an 18-inch wall so constructed thoroughly damp proof in situations where a 24-inch wall constructed in the ordinary manner would not keep out the damp.

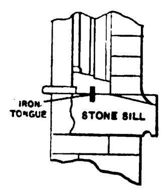


Fig. 8.—Section of Window Frame, Showing Iron Tongue.

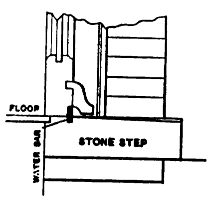


Fig. 9.—Showing Use of Water Bar to Prevent Rain Driving in Under a Door.

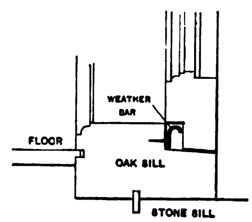


Fig. 10.—Method of Protecting a Window Opening.

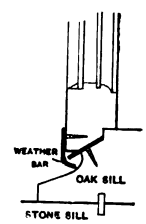


Fig. 11.—Another Method of Accomplishing the Same Thing.

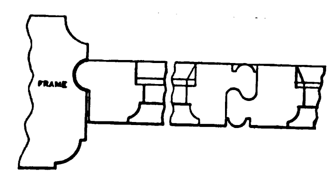


Fig. 12.—Method of "Working" the Meeting Rails and Jambs.

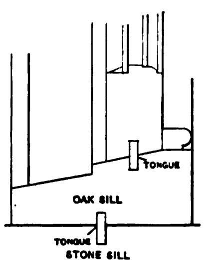


Fig. 13.—Arrangement for Keeping Rain from Driving in Between Oak Sill and Lower Rail of Sash.

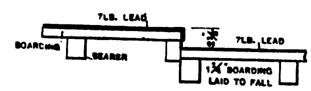


Fig. 14.—Treatment of Central Gutters on Roofs.

Preventing Dampness in Buildings.

Ground Floors.

When the ground floor of a building consists of the usual joists and boarding it is important that it should be raised, if possible, at least 1 foot above the level of the surrounding soil and be properly ventilated underneath, or dampness will ensue and the timbers will suffer from dry rot. The sleeper walls should be built honeycomb pattern, and have a damp course under the bond timber, a precaution often omitted. In the external walls should be fixed iron ventilating gratings, or, preferably, stoneware ones. These gratings, as often fixed, are useless for the purpose for which they were intended, as they are inserted so low as to become covered with soil, acting as a drain for the surface water to find its way under the floor, thus creating the damp they were intended to prevent. Often there are not sufficient of them inserted to obtain the necessary current of air under the floor. Great care should be taken when iron gratings are used that the apertures in which they are fixed are kept clear of rubbish and mortar, and the sides of the openings in which they are inserted should invariably be rendered in Portland cement; and here it may be remarked that no floor board should be laid until the concrete covering the soil under the floor is thoroughly dry or dry rot will ensue.

In fixing window frames in walls a precaution often omitted is the galvanized iron tongue between the oak sill of the frame and stone sill, shown in Fig. 8. If this is omitted rain will assuredly penetrate under the sill and the dampness will show in patches on the plaster inside, and as the cost of inserting the tongue is so trifling there can be no excuse for its omission. The bottom of the oak sill should be tarred before fixing, and the stone sills pointed on the underside with neat cement.

To prevent wet from driving under doors a galvanized water bar should be fixed in the stone step and a molding fixed on lower edge of door to throw off the water, all as shown in Fig. 9 of the illustrations. It is hardly necessary to allude to the importance of insisting that the wood used in external doors and windows

* Continued from page 16[illegible], July issue.

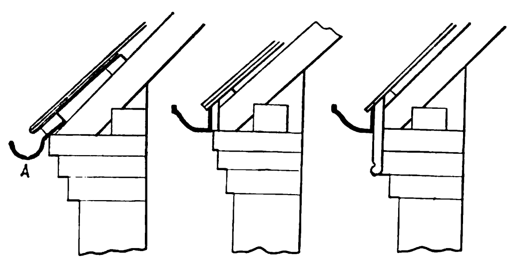
should be thoroughly seasoned. Casements need special precautions to prevent beating rain finding its way through, and water bars are a necessity. In Figs. 10 and 11 of the accompanying sketches are indicated two methods of effecting this which are as simple as any, although other good patterns are in the market. The meeting rails and jambs should be worked as in Fig. 12, to prevent driving rain finding its way through them.

A simple method of preventing rain from finding its way between the oak sill and bottom edge of lower rail of an ordinary sash frame is shown in Fig. 13, which is self explanatory.

Roofs.

The design and construction of the roof have a most important effect upon the dryness or otherwise of a building. It should be so constructed as to be both weather tight and water tight, as it is obvious that unless it fulfills both of these conditions the care spent in the lower part of the structure will in a great measure be thrown away. Complicated and unnecessary breaks in a roof should be avoided as far as possible, each break in its surface being a possible inlet for rain and moisture, as well as entailing additional cost in construction. A roof cannot be too simple for our purpose consistent with the necessary architectural effect.

Central gutters between roofs and lead gutters in



Figs. 15, 16 and 17.—Various Forms of Gutters.

Preventing Dampness in Buildings.

conjunction with parapet walls are always a source of danger, and require the most careful attention to render them water tight. And here a few remarks upon the lead work of a roof may not be out of place. This portion of the work is too frequently "scamped," the lead used being of the thinnest, the laps reduced to a minimum, and zinc of inferior quality too often substituted, in order to keep down the cost. No lead should be used for flashings of a less weight than 5 pounds per foot. Valleys should, if possible, be of 6-pound and gutters of 7-pound lead, if durability has to be considered. No lap in lead work should be less than 4 inches, valleys should not be less than 16 inches wide, and lead gutters should turn the slates at least 12 and 9 inches up parapet walls, and be flashed with 5-pound lead at least 6 inches wide. The gutters should be laid with falls of at least 1 inch in 10 feet and have 2-inch drips at intervals of not more than 10 feet. Care must be taken in forming the drips that the upper lead turned down does not come too near the lower lead, or capillary action will ensue and render the boarding damp. This is illustrated in Fig. 14 of the cuts. The cesspits in lead gutters must be carefully formed and the outlets made of sufficient size and protected by gratings, and snow gratings are a *sine qua non*. If these precautions are observed and care is taken to see that the gutters are regularly cleaned out the risk of damp from these sources will be reduced to a minimum.

When the water that falls upon the roof is carried off by iron eaves gutters, the shape or section of the gutter and the manner in which it is fixed are points of great consequence. It should be of ample size to prevent overflow, and its section should be of such conformation that water overflowing it would fall clear of the wall. Figs. 15 and 16, which represent two simple forms of gutters fixed to the eaves of a building, will illustrate this. Fig. 14 shows an ordinary half round cast iron eaves gutter, fixed either with clips or wrought iron screw brackets, in front of the oversailing courses of bricks forming eaves of building. Water overflowing the gutter and running round same would drop when it reached the point marked A, and the upper part of the wall would be protected. If, on the contrary, the gutter is one of the common O G section, and fixed as shown in Fig. 16, part of the overflow would run round the bottom of the gutter and find an entrance into the top of the wall, eventually rotting the feet of the rafters and wall plate. This is a very common and faulty method of fixing O G gutters and is only partially remedied by attaching them to a projecting wood fascia as in Fig. 17. In this case it is the fascia that suffers. The remedy is obvious. Use only gutters of a section that will permit the overflow water to fall clear of the wall or fascia to which they are attached, or else, and which is the preferable plan, have overhanging eaves. In any case, if oversailing brick eaves are used, have them set in cement. The neglect of these precautions is one of the commonest causes of damp in the upper part of the walls of a building.

The entrance of damp from this source can be prevented by having the overhanging eaves before alluded to, as any overflow from the iron gutters would fall quite clear of the wall, and the eaves would also protect the walls from rain. In exposed situations overhanging eaves and gables are essential toward keeping the walls dry, and when half timbered upper stories are used they are a necessity.

The inside of the eaves gutter should be painted periodically, as well as the outside. If this is neglected the iron rusts and flakes off, and consequently the gutter becomes stopped up and the water overflows, to the detriment of the walls.

Ample provision should be made, in the shape of a sufficient number of down spouts, to carry off the water from gutters. The heads must be of ample size, and each should be fitted with a domical wire grating to prevent the head being choked with leaves and débris and prevent birds building nests in it. The spouts must also be fixed clear of the walls and not abut against them, as is the common and faulty practice, which prevents their being painted at the back and also allows the rain water to soak through the walls directly the pipe gets stopped up and bursts.

The Pointed vs. the Semicircular Arch.

The thrust of a pointed arch compared to that of a semicircular one is as three to seven, and again, the weight of a pointed arch upon its supports as compared with that of a semicircular arch is as three to four, a result, says Rondelet, which is due to the sharp form of its summit and its tapering sides. From these facts it follows that the substitution of the pointed for the semicircular form rendered it possible to construct churches both lighter and higher than before, without any increase either of expense or of labor, and increased hight was the great object of desire. The Orientals, with the exception of the Babylonians, sought to obtain effect by greatness of detail and immense horizontal dimensions; the nations of the west, on the other hand, pinned their faith to grandeur of vertical lines and proportions. Another improvement, not perhaps so striking at first sight, but nevertheless very considerable, contributed to increase the advantage offered by the pointed form of construction. The Romans very frequently employed ribbed vaults; but they did not place the ribs where they were most wanted—along the angles of the diagonal groins—so they were compelled to build all their vaults, even minor ones, with heavy materials, the formidable thrust of which demanded walls and piers of great thickness. The introduction of diagonal ribs gave a double advantage—first, it permitted the employment of very light materials; and, secondly, it enabled all the weight to be so arranged as to fall upon four predetermined points.

WHAT BUILDERS ARE DOING.

THE amount of building under way in Allentown, Pa., at the end of the first six months of the year shows a marked improvement over the record of previous years since 1891. The most important work includes the new hospital, Hotel Hamilton changes, Hotel Linden, Baldwin building, Temperance Hall, First Brethren Church, J. N. Martin's store building, Adelaide Silk Mill office, B. F. Kriebel's store, addition to Spangler's foundry, W. F. Yeager's new stable, T. H. Boyer's new shop, 186 brick dwellings, 11 frame houses, 5 brick additions, a brick shop, 8 frame stables, 2 frame shops, a brick stable, 4 frame additions, a frame store, a frame barn and a bakery.

Baltimore, Md.

The building interests of Baltimore are reported as being quiet at present, the dullness reported last month being unbroken. The members of the Builders' Exchange have undertaken a work having for its object a wider advertisement of the commercial and manufacturing advantages of the city. A committee has been appointed to act in conjunction with other business organizations, and the matter is being energetically pushed. A member of the committee said recently: "As a builder I am obliged to buy a great many things outside Baltimore which might easily be manufactured here. We have facilities for manufacturing them as well and as cheaply as anywhere in the country. It is to develop such industries that the exchange is taking its present step. We have 800 vacant houses in Baltimore, and enough houses have been built to accommodate the population of the city for 10 years to come. We will have to attract industries to the city sufficient to give an increased population something to do before we can expect our houses to be filled and business prosperous. There is no better way of doing this than to let the outside world know of our resources."

Secretary Miller reports the exchange as being in excellent condition, and that the members generally are interested in its work.

Boston, Mass.

The volume of building in Boston has not been materially increased since the last report. A comparison of the number and nature of buildings begun as indicated by the permits shows that the majority of the new work is being done in the city proper, within the fire limits. From January 1 to the end of June permits were issued for 697 wooden buildings, as against 1090 in 1897. During the same period permits were issued for 239 brick and stone buildings, while in 1897 the number for the same term was 315. The falling off in the number of wooden buildings is attributed to the fact that outlying property is generally improved for speculative purposes, and the uncertainty occasioned in money markets by the war has tended to curtail action.

On July 1 the Master Builders' Association opened a newly established department of registration and information for workmen. An effort will be made to secure the registration of all workmen in the building trades in Boston as rapidly as possible, in order that employers may be provided with the means of immediately reaching workmen out of employment.

The plan comprehends a record of the fact that the workmen registered are employed or not employed, as the case may be, it being expected that the workmen will keep the department informed, cards being supplied for the purpose. Employers, as soon as the undertaking is in working order, will then be provided with a source of information as to where every idle workman in his branch of the business may be found at a moment's notice. The expense of the new department is to be borne entirely by the Master Builders' Association, there being no fee or cost of any kind to be paid by the workmen. Arrangements have been made for the registration of workmen in the different trades on different days.

The new department is established primarily for the benefit of the members of the association, but outside employers may avail themselves of its services upon the payment of a fee.

Buffalo, N. Y.

Secretary J. C. Almendinger of the Builders' Association Exchange states that the building business in Buffalo is very quiet just at present. Aside from a few jobs of any magnitude there is little being done. The dullness is attributed largely to the effect of the war, which seems to have caused the postponement of work which would otherwise have now been under way. Builders generally are hopeful that even if business does not resume a more nearly normal activity before the season closes, the opening of the coming year will see a resumption of the usual amount of work.

Chicago, Ill.

During the first six months of 1898 the number and value of building operations in Chicago, as shown by the department, have fallen off from the record of the same period in 1897. The decrease in values is estimated at nearly $400,000 and the number of permits 445. At present there is a more hopeful tendency among contractors, there being some talk of new work on a large scale. Most of the work at present appears to be largely confined to manufacturing plants and wholesale buildings.

A difference between the members of the Stone Contractors' Association and the workmen has tied up most of the large yards. The trouble involved the cutters, engineers, sawyers and rubbers. The difference with the cutters has been adjusted, but the members of the other trades refuse to return to work until their demands are complied with.

The agreement was reached through mutual concessions, although the stonecutters claim it was a big victory for them. It provides for the employment of two men on a single machine and four on a double machine, besides a stonecutter and a laborer on each machine, a day wage of $4, and the doing away of all sub-contracting.

The original demands of the stonecutters were for four men for a single machine and eight for a double machine; the bosses insisted that the machines should be run by planers and that $3 should constitute a day's wage. Two apprentices are to be allowed for every 10 men employed, as against three for 15 formerly.

A general strike of wood workers and a boycott of millmen employing non-union workmen is threatened. The millmen have asked for nine hours and that the wages be $2 per day.

Cincinnati, Ohio.

Cincinnati has recently adopted a new building ordinance, which was largely the product of work done by the members of the local chapter of the American Institute of Architects. The new ordinance is founded on a broad minded base, and is made up of the best points in the ordinances now in vogue in New York, Boston, Philadelphia, Pittsburgh, Cleveland, St. Louis, Minneapolis, and, in fact, the best points of all ordinances in the largest cities have been studied, and when found practicable have been incorporated in the new law.

In the old building law—the one now in vogue in Cincinnati—there is no provision whatever for steel construction, the popular form for all large commercial structures. The only thing contemplated is brick walls of certain hights and thicknesses. Another important feature of the new ordinance is the arrangement for modern ideas in plumbing. Under the present form of building law in Cincinnati there is no provision for building higher than 100 feet. Under the new ordinance a man may build as high as his progressive New York or Chicago friends—300 feet—if he feels like it. Another provision of the new law is for a Board of Reference, composed of one architect, one builder and one engineer, who will decide or arbitrate matters which the Building Inspector may not be able to do satisfactorily.

The plans prepared for the addition to the State Capitol building, by Samuel Hannaford & Co. of Cincinnati, have been accepted. The estimated cost of the new work is $305,565.

Detroit, Mich.

Building in Detroit still continues dull, with little prospect of any considerable increase in volume during the rest of the year. The completion of the new Hamlin avenue police station marks a very pleasing departure in the history of the erection of public buildings in that city. Its cost has been kept within the original appropriation, $12,000, and not a cent of extras has been required. The new station is a handsome building and one where the city has received full value for every dollar expended. The Police Commissioners deserve praise for their achievement, and Commissioner Fowle, under whose personal supervision the work has been done, is entitled to more than passing mention for his share in the success of the undertaking.

Denver, Col.

A unique case in the history of "labor" decisions in the Colorado courts recently occurred in Denver. The case arose out of a request by Fleming Brothers for an injunction to restrain the Congregation Emanuel, for whom they were building a church, from interfering with the work. The Flemings have a contract providing for the employment of union workmen only for the brick and stone work on the church, worth in the neighborhood of $17,000, and employ between 30 and 40 men. The members of the Bricklayers' Union recently claimed that the contractors had violated their contract by putting to work non-union men at reduced wages. Fleming did not heed the protests, and the materials and tools would have been taken away and Fleming forced to surrender his contract had not the courts been sought. Jesse Fleming, one of the brothers, asserted that the men under him show union cards. The other side declares that a goodly number of the men are non-union and that Fleming has knowingly employed them, despite a clause in his contract which reads: "The contractor agrees to use union material and labor." Fleming also says that the congregation cares but little whether the men are unionized or not, so long as the work is performed.

When the case came to trial it was shown that the workmen objected to by the union were under penalties for breach of rules, and as soon as this fact was established the Court refused to permit further proceedings. In dismissing the case Judge Johnson said: "In my mind it is not a question whether or not Fleming Brothers empoyed non-union men, but it was a fight between men of the union who claim to have been improperly fined and suspended and the officers of the union. This is not a matter to be settled in court, but within the business of the union. It is not a case which warrants the Temple Emanuel in breaking its contract with Fleming Brothers."

The real question at issue as contended by the attorneys for the congregation is whether or not a contract is valid that calls for the employment of union labor, but the Court passed over that matter and refused to grant a counter injunction to restrain the contractors from completing the work. He also refused to hear further testimony in the case and said the Court had no right to interfere in private fights of the union.

Kansas City, Mo.

The amount of building reported under way in Kansas City compares favorably with the record of the past few years, but it is far below the mark set by the more prosperous years of the city's history.

A threatening condition of affairs between the Building Trades Council and the Master Plumbers' Association has been averted and what promised to be a serious interruption to building avoided. The journeymen plumbers made certain demands upon the employers, which were refused, and the council then ordered a general sympathetic strike of all the building trades. The strike did not occur, because the allied trades declined to strike in sympathy except against the employment of non-union plumbers, which condition was not the issue between the plumbers and their employers.

Los Angeles, Cal.

Reports from Los Angeles indicate that considerable building is being done in the outlying districts. There are a larger number of residences and suburban stores reported building than at any time for several years past. No labor complications of any magnitude have arisen this year and none are likely to occur.

Lowell, Mass.

Secretary Conant of the Builders' Exchange reports that there has been no perceptible increase in the volume of business during the past month. He states that the "outing" of the members of the exchange, held June 23, proved an unqualified success. Everything passed off delightfully and the attendance represented nearly the entire membership of the exchange.

Lawrence, Mass.

An unusually large amount of work is being done in Lawrence for this season of the year. A large number of tenement houses containing from four to ten tenements each are being erected and the number of residences under way is reported as being larger than usual. One office building is among the number of new structures.

Nashville, Tenn.

Conditions in the building business are expected to be beneficially affected by the erection of the new station for the Louisville & Nashville Terminal Company, to cost approximately $1,500,000. The main building of the station will be at the corner of Broad and Walnut streets, and will cover a ground area of 150 x 175 feet. It will be five stories high, the tower of the structure, however, reaching a hight of 235 feet. The principal entrance will be on Broad street, through a portico measuring 39 x 57 feet. The carriage entrance will be through a covered way on Walnut street, 60 x 120 feet. The interior of the edifice will be in keeping with the exterior, and from Broad street or from the carriage entrance on Walnut street one approaches the ticket offices, lunch and dining room, parcel and news stand. Admittance to the trains is gained by a descent to the level of the tracks, one flight down. Ample waiting rooms and offices are provided in the upper stories of the building.

The train shed extends southward from the rear of the main building to Demonbreun street. This shed will be 250 feet wide by 500 feet long, and will have a clear arch span of 200 feet, without posts or pillars, and will cover 11 tracks. The freight depots will be two stories high, the lower floors being used for receiving and delivering freight, and the upper stories being devoted to offices and warehouse room. In front of the station there is to be an open construction steel viaduct, extending from Walnut to McNairy street, and on the Church street side will be another similar viaduct.

Newark, N. J.

A case that promises to define the legal rights of the lowest responsible bidder in the State of New Jersey has arisen over the award of the contract for the Newark Library building. Patrick J. Carlin & Co. of Brooklyn ask that the court show cause why the present contracts for mason and carpenter work should not be declared void, on the ground that they, Carlin & Co., were the lowest bidders. Carlin & Co. maintain that the action of the library trustees in awarding the contract away from the lowest responsible bidder was illegal on the following grounds:

1. In that they refused to award the contract to his said firm, being the lowest bidder, and because the said Board of Trustees arbitrarily and without justifiable cause rejected the bid of his said firm without hearing.

2. In that the said board advertised that "Sealed proposals would be received until 4 o'clock p.m. on June 13, 1898, at the office of the secretary, 16 West Park street, Newark, N. J., at which time and place the same would be opened publicly," the law requiring that the public notice must fix both the time and the place when the sealed proposals would be received and that no bids shall be received either before or after the hour so fixed.

3. In that the said board invited or allowed two of the contractors to change their bids after the same had been opened without allowing the same privilege to other bidders, and without readvertising.

And this deponent further says that he demanded of the Board of Trustees of the Public Library a hearing and that charges should be made respecting his inability to perform the work in question before the said board awarded the said contracts to any other person or firm, and that the said board refused to make any charges, and stated that no such hearing was necessary.

It is understood that the library trustees claim that they are not bound by the laws regulating the granting of contracts by city officials; that they are not officials in such sense, but trustees created for a specific purpose, having rights independent of the city, and that they acted entirely within their powers, obtaining contracts for the lowest sum and from responsible contractors.

New York City.

On July 15 there seemed to be a grave possibility that the difference between the Building Trades Council and the Board of Walking Delegates, referred to last month, would result in a serious tie up in the building trades. Both sides seem determined to push their efforts to a final test, and unless some compromise has been arranged while this issue is in the printer's hands an extensive strike may result. The cause of the disturbance rests wholly between the men, and employers, notwithstanding their personal loss and inconvenience, would be glad to have the matter settled in order that some body of workmen with final authority might be established.

It is understood that the Iron League, which is composed of most of the leading firms in New York City engaged in the manufacture and erection of architectural iron and steel work, are forming a national organization, into which it is proposed to take all the large architectural iron firms in the principal cities of the United States.

The union plasterers in Brooklyn have made a demand for the eight-hour day, to go into effect in September. It is said the demand will be enforced by strikes, if necessary. The men claim the union plasterers in New York are working under the eight-hour system, as are nearly all the other building trades.

Philadelphia, Pa.

On the evening of June 22 the closing exercises of the eighth year of the Philadelphia Master Builders' Mechanical Trade School were held at the rooms of the exchange. George Watson, president, occupied the chair, and addresses were made by John M. Shrigley, president of the Williamson Trade School; Thomas A. Robinson, Captain James McCormick, John H. Fow and others. Certificates were presented to 32 graduates in the five branches of practical work taught by the school. There were four graduates in the class in carpentry, three in bricklaying, four each in plastering and painting, and 17 in plumbing.

Pittsburgh, Pa.

The report of Superintendent J. A. A. Brown of the Bureau of Building Inspection for the month of June shows a large increase both over the preceding month and the same month of last year. Buildings were erected as follows: Frame, 107; brick, 58; iron, 1; brick and stone, 9; brick and steel, 1; iron and steel, 1; brick and frame, 2; marble, 1; veneer, 2; total, 182. The total cost was $783,530. There were 16 brick and 36 frame additions built at a cost of $41,979, and alterations and repairs made to the amount of $30,745. The total operations cost $856,254.

The increase in the number of buildings over June, 1897, is 35, and amount expended $127,718. The increase over May of this year is 40 buildings and $352,334.

Washington, D. C.

For some time past Washington building and real estate interests have been in an uncertain state over the question of limiting the hight of buildings hereafter to be erected within the city limits. The decision of Justice Cole of Circuit Court No. 1 in the case of Alonzo O. Bliss against the District Commissioners, in which he denies a mandamus to compel the Commissioners to issue to the complainant a permit for a 110-foot hotel building on Sixteenth street, has been received by Clerk of the Court J. R. Young. Judge Cole sets forth the grounds on which the petition is denied at some length for the information of counsel in the case.

This decision of the court will be a precedent for all future cases. The Commissioners' regulations, which the court upholds, prohibit a greater hight than 90 feet on a resident street.

Worcester, Mass.

While most trades in Worcester are recovering from the setback experienced at the opening of the war, architects' and builders' trades are exceptions. Nothing is doing, and many leading architects declare that if these hard times keep on they will close their offices. This lack of business is felt the worst at this time of the year, for it is the season when architects expect plenty of work. A prominent architect is quoted as saying: "We are not even making expenses. We get a little job now and then, but it just serves to keep us half busy. We have no prospects of big contracts, and those we have on hand have been hung up until the war is over. I have had to discharge some of my help, and if times do not improve I will have to send away the rest. There is no business, and, what is worse, no prospects of any."

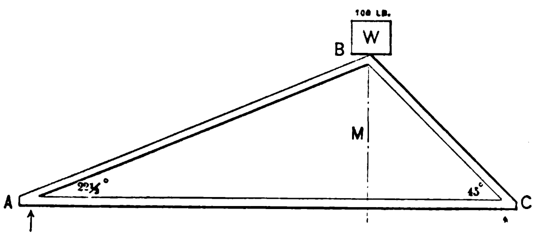
Notes.

About the middle of July a strike occurred at Yonkers, N. Y., which affected about all the carpenters, masons, plasterers and hod carriers in the city. About a thousand men were involved, and it is stated that the trouble was caused by a building concern in Syracuse who recently contracted to erect a large number of houses in Yonkers. Non-union carpenters were said to have been paid $2.50 per day for ten hours, while the union rate is $3 for an eight-hour day. The contractors were unable to secure outside plumbers, so they engaged local men at the union rate. The plumbers refused to strike, on the ground that they had no grievance, and as a result all the labor unions in the city took issue against the plumbers, and at the hour of going to press work was at a standstill.

CORRESPONDENCE.

Strength of a Triangular Frame.

From M. S. S., *Shellman, Ga.*—I desire some information through the columns of the paper, and inclose herewith a diagram to aid in making my meaning clear. At the apex of the triangle is a representation of the live weight upon the two sides or rafters A B and B C. I wish to be informed with regard to the pressure exerted by the load upon these two sides, provided the support M is taken from under the weight



Strength of a Triangular Frame.—Fig. 1.—Sketch Submitted by "M. S. S."

W, which is 100 pounds. It will be noticed that the two supports are inclined at different angles, and the pressures are proportionately unequal. The supports are also unequal in length, one being such as to form an angle of 22½ degrees with the horizontal and the other an angle of 45 degrees. What I want to know is the amount of pressure exerted by the weight W upon the support or rafter A B at its foot; also the amount of pressure exerted by the weight W upon the rafter B C at its foot. At what point upon the lines of the rafters A B and B C would the center of gravity occur ?

Answer.—The pressure or stress due to the load upon the different members of a triangular frame loaded as in Fig. 1, which is practically a reproduction of our correspondent's sketch, may be determined with sufficient accuracy by drawing a vertical line, as *a c*, Fig. 2. to a scale representing the amount of the load at B. Next draw a line from *a* parallel to A B, Fig. 1, and from *c* of Fig. 2 draw one parallel to B C of Fig. 1 until they intersect. The line *a b* measured by the scale to which *a c* is drawn will give the stress at all points of A B, and the line *b c* the stress at any point in B C. Moreover, a line drawn from *b* parallel to A C will represent the stress in the tie A C necessary to resist the outward thrust of the rafters, while the distance *o a* will give the reaction of the support at A, and the distance *o c* the reaction of the support at C.

To apply this to the frame and load in question let *a c* be drawn 1 inch long, or to a scale of 100 pounds

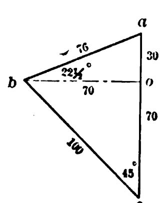


Fig. 2.—Stress Diagram.

to the inch. Then measuring the sides of the triangle we find *a b* measures 76 pounds; *b c*, 100 pounds; *b o*, 70 pounds; *a o*, 30 pounds, and *o c*, 70 pounds. Therefore the stress at either end of A B or at any point between will be 76 pounds in B C, 100 in A C, and the reaction at A will be 30 pounds, and at C 70 pounds.

Checking these figures by trigonometry we find that *a o* would be 29.3, *o c* and *o b* would be 70.7, *a b* 76.5 and *b c* 100, the variation from the scale measurement being immaterial in actual construction. The above method applies to frames of any angles, whether equal or unequal, or whether or not the line A C is horizontal, but it does not take into account the stress due to the weight of the pieces.

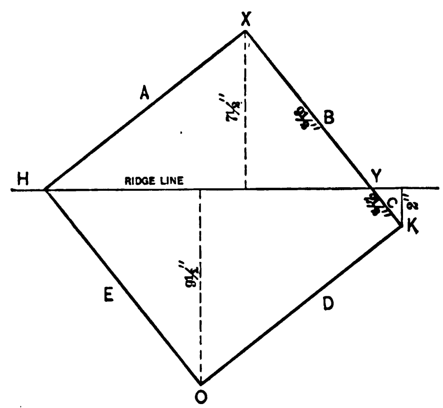
In regard to the point of the center of gravity of a timber, it may be remarked that it remains the same in relation to the piece whether the timber be horizontal, vertical or at an angle. The center of gravity of A B or B C would therefore be at some point very near the center of the pieces, the exact location depending upon the manner in which the ends were cut, supposing the pieces to have the same section throughout.

An Up-Ground Cellar.

From R. J. L., *Winchester, Ind.*—I want to build an up-ground cellar, and I shall be glad to have those readers of the paper who are versed in this kind of work tell me how it should be done in order to give the best results.

A Steel Square Problem.

From PUZZLED.—I want to fit a box 12 inches square over a saddle roof of one-half pitch, or which has an inclination of 12 inches to the foot. The box drops over the roof at the angles shown in the diagram which I send. The question is, How can I obtain the proper cuts by the use of the steel square ? It will be seen that



A Steel Square Problem.—Diagram Accompanying Letter of "Puzzled."

the angle X is 7½ inches from the ridge, and that the angle at O is 9½ inches from the ridge. It will also be noted that the angle H is directly on the ridge, while the angle K is 2 inches from the ridge. The box is, of course, to stand plumb over the ridge. If any brother chip will solve this problem he will confer a favor.

Constructing Veneered Doors.

From H. T. F.—In reply to the inquiry of William T. Davies, Somerville, Mass., which appeared in the March issue, I beg to state that no matter what the veneering may be—mahogany, cherry, oak, birch or any other wood —the kernel, or the foundation on which the veneering is glued, is to be of clean, straight grained material. The three best known woods for this purpose, so far as American and English workmen are concerned, are white pine, white wood and bay wood, or Honduras mahogany. The latter is not much used in this country for cores, owing to its expense, but it is largely used in the manufacture of cigar boxes. If the core or kernel is of a kind that will not warp or twist it makes but little difference what the thickness of the veneer may be, providing it does not exceed ¼ inch. Nor does it matter of what the veneering consists. For first-class doors the cores are made of strips glued together with the grain reversed. Sometimes the stuff intended for doors is chosen and the stiles are split into battens about 1¼ inches wide and left the thickness of the core. These are then dressed and jointed, reversed end to end, and glued together. The rails are done likewise, only the strips are 2 inches or 2½ inches wide. By this method all chances of warping, springing or buckling are swept away. The core is afterward framed and made ready to receive the veneer, which, of course, is applied in the usual way. A house built for Mr. Hoe of printing press fame in the city of New York has all the doors, trimmings, exposed stair strings, base and fittings made in this style, and the whole ground and second floor finish is veneered with real Spanish mahogany. It is now nearly 20 years since the work was finished and to-day there is not the least indication of any change in the work. When both sides of a door are veneered, and different woods are used, the edges of the door should be veneered with a different kind of wood, the reason for which needs no explanation.

A Few Hard Nuts Cracked.

From H. T. F.—The best of workmen are sometimes called upon to do jobs they have never before attempted themselves or seen others accomplish, and in consequence are frequently put to their "wit's end" to discover the best way to go about it to do it speedily and properly.

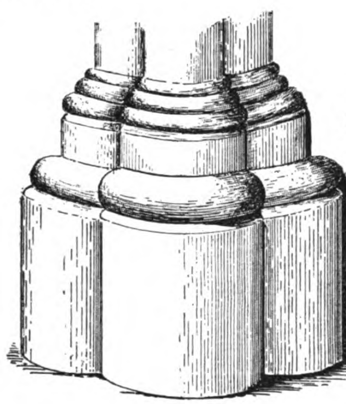


Fig. 1.—A Four-Column Cluster.

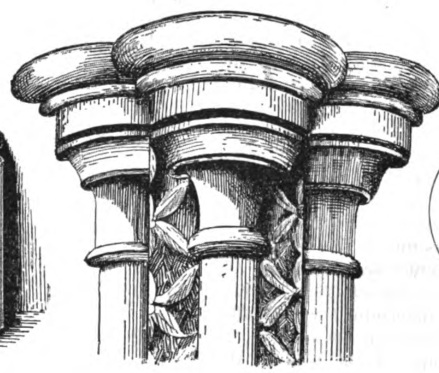


Fig. 2.—Capital With the Angles Between the Columns Ornamented.

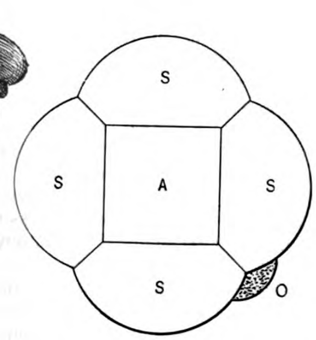


Fig. 3.—Plan View of Cluster Showing Core, etc.

A Few Hard Nuts Cracked.—Treatment of a Four-Column Cluster

In order to help the workman in some cases I submit a few problems and their solutions in the shape of some special pieces of work the better class carpenter will sometimes meet in his regular vocation. Let us suppose it is required to build a series of Gothic columns for any given purpose, the columns to have a cluster of four sections, as shown at Fig. 1. In this case it will require two turned base blocks with all the members complete, as shown in the illustration. These blocks are split down the center, making four half blocks. A core of the size determined on and shown at A, Fig. 3, is made, which is to extend the whole length of the column, including base and capital, and the four halves of base blocks are then mitred around this core, as shown in Fig. 3. The base being finished, the next thing is to form the stem. This is done by making four half round pieces of the length required—radius of circle to be determined according to requirements, and the edges to be mitered, as shown in Fig. 3. This being done, the cluster may be glued or nailed to the core and made to appear as solid. The capital shown in Fig. 2 is built up in the same way, but, for variety's sake, shows a carved molding planted in the angle as at O, Fig. 3. This planting of a sculptural molding in the angle is not usually employed except in church work.

This example exhibits a four-cluster column, and is offered because it will be the easiest to understand and because it is the foundation scheme of all clustered columns in wood. Any number of members may be made into a single cluster by giving the core the number of sides required. A very little study will enable any workman to thoroughly understand this simple problem.

In Fig. 4 is a diagram that may answer for a hipped skylight, a hip roof or other similar purpose. The line A B gives the hight of skylight, and the line O B gives the length of the angle bar or hip. The bevel H gives the exact backing of the bar or hip. The bevel G shows the angle of the hip taken from the plane of the inclination of the roof. Fig. 5 exhibits a skylight over a hexagon plan. The conditions ruling this are the same as those of Fig. 4, and may be solved in the same manner, substituting S for G in obtaining the backing of the angle bars or hips.

In Fig. 6 is shown an easy method of framing a purlin in a hip roof with one face against the rafters. Let A B C D be the purlin, G the common rafter drawn to the proper pitch, and E H the plan of the hip. From the angles A D C of the purlin drop lines A I, D M and C N parallel with E R; make M L equal to the depth of the purlin and K M equal to thickness of it. Draw L P and J K parallel to E R. From the points where the lines from A and C cut the plan of the hip draw I J and N O square from E R. Draw lines from O to M and from M to J. The angle O M Q will be the bevel for the down or side cut, and the angle M J K will be the bevel for the cut across the edge.

This method will apply to roofs of any angle, also to circular or molded roofs. In laying out the plan it is always best where possible to set out the lines giving the full size of the purlin. This may be done on a good sized drawing board, or on the floor of the shop or house. By making the purlin full size of the plans, the bevels may be obtained close enough to make a glue joint.

I exhibit in Fig. 7 another method of working purlins, showing how to get the cuts when the face is against the rafter, and also when the corner rests against the rafters. This method is based on the one Peter Nicholson invented. The purlin shown at E, Fig. 7, has its face parallel with the line of rafters. From E as a center, with any radius, describe the arc *d g;* and from the opposite extremities of the diameter draw the lines *d h* and *g m* perpendicular to B C. From *e* and *f*, where the upper adjacent sides of the purlin produced cut the curve, draw *e v* and *f l* parallel to *d h* and *g m;* also draw E L parallel to *d h*.

From *l* and *h* draw *l m* and *v h* parallel to B C, and join *h* L and L *m*. Then E L *m* is the down bevel of the purlin, and E L *h* is the side bevel. It will be noticed that this method of obtaining the cuts is somewhat more condensed than the method shown in Fig. 6, and it has the advantage of giving the operator the opportunity of taking his bevels directly from the paper without enlargement, and with a certainty of their being fairly correct.

When a purlin has two of its sides parallel with the horizon, as shown at F of Fig. 7, the bevel cut is taken from the lines *n r* and *r q*, the down cuts being square. By following the same method of describing the lines the angles for purlins for a roof standing over any plan, right angled or otherwise, may be obtained quite readily.

Plank Frame Barn.

From J. J. D., *Hennepin, Ill.*—I have been a reader of *Carpentry and Building* for a number of years, and have noticed with a great deal of interest the articles relating to plank frame barns. I constructed a hay barn 24 x 60 feet in area with 20-foot posts, using the published drawings of Mr. Shawver's barn plans. The person for whom I built the barn is highly pleased with it. Two men and myself put it up in five days ready for the hay. Another set of carpenters were putting up an old style frame hay barn, with center post and cross ties, and it took three men two weeks to frame it and put it up. My hay barn without cross ties and center posts is just what takes the eye of the farmers who have seen it.

Setting Up Stair Work.

From IGNO RAMUS, *Lafayette, Ind.*—I have been a reader of *Carpentry and Building* off and on ever since it was published, but I have never seen anything in its columns as to the best way to set up stair work. All the articles seem to be on hand railing. Now, I would like to hear from the contributors as to the best way of setting up a neweled platform staircase with closed front string. Is it best to put up rough carriages and let the plastering be finished before putting up the stair work, and if this is done are both wall and front strings housed ? How does one proceed to get the work together over the rough carriages ? Also what is the best way of connecting hand rail with newels ? I trust those readers who have experience in this work will come forward with replies.

Laying Tile Roofing.

From J. T. W., *Ottoville, Ohio.*—I am to lay a tile roof this summer, and having had no experience in this work I would like to ask some of the readers to inform me through the columns of the paper how to proceed in laying the valley, lapping the tiles and cementing them in the valley, and what kind of cement to use. Also what is the best way to cut the tile ?

Answer.—A tile roof is usually started with what is known as closed end tiles, after which the succeeding tiles are laid, lapped as much as called for in the specification, which is usually 2½ to 3 inches, or as much as the different makers allow for their special goods. When laying the valley, in some cases there are used what are known as valley tiles; these are tiles which have been specially made to fit the pitch and angle of the valley, and are lapped the same as the tile used, so as to have straight courses. They are laid in what is known as roofers' cement or paintskin, care being taken to obtain the cement of the color to match the shade of tiles used. Under no circumstances use Portland or other cement, which breaks and cracks under the heat of the sun when laid between the tiles. When there are no special valley tiles made the valleys should be laid of copper lapping about 7 inches on each side, with a water lock of ½ inch folded on each side; then over this 7-inch flange the tiles are laid, laying them close if desired or with an open valley of 3 or 4 inches. Around the eaves, hips, valley and ridges the tiles should be laid in roofers' cement or paintskin for a distance of about 2 feet wide, as at these places leaks are

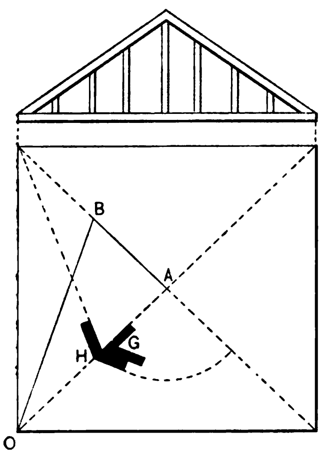


Fig. 4.—Diagram of a "Hipped" Skylight.

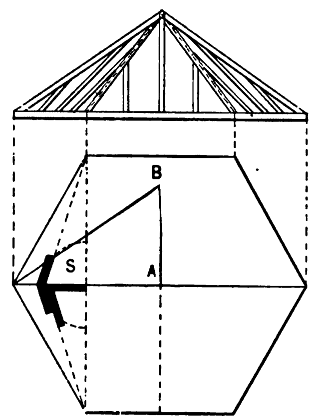


Fig. 5.—Skylight Over a Hexagonal Plan.

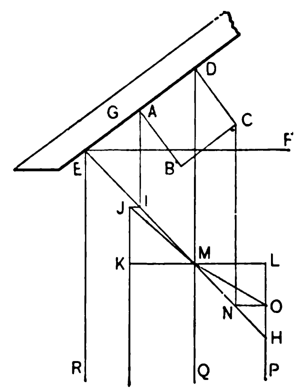


Fig. 6.—Easy Method of Framing Purlin in Hip Roof where there is One Face Against the Rafter.

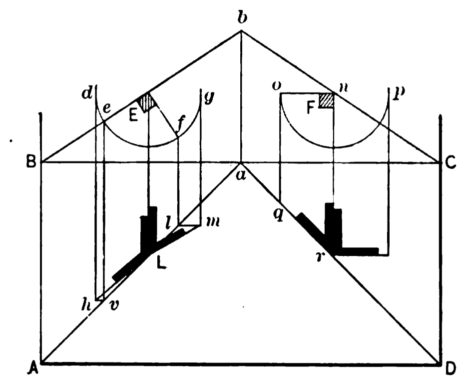


Fig. 7.—Another Method of Working Purlins when Face is Against the Rafter, and Also when One Corner Rests Against the Rafter.

A Few Hard Nuts Cracked.—Problems in Framing.

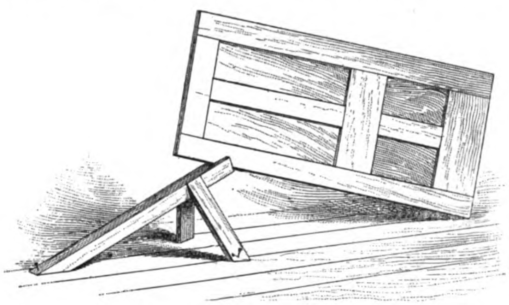
more liable to occur than in the middle of the roof. When cutting the tiles the usual way is to use a hammer and sharp chisel, cut a slight groove, and break by tapping with the hammer on the opposite side. There are, however, tools known as tile cutters, being in shape like a large shears, the jaws of which crush and cut the tiles as desired. When the tiles are baked hard there is quite a loss in cutting, owing to their brittleness. The hard tiles while being more difficult to cut make a better roof, as they absorb less water and have less tendency to disintegrate than the softer tiles. If there are special tiles, made by a certain firm, it will be well for our correspondent to write to them, as they may give special instructions for laying. Our correspondent does not state whether he has a shingle tile or Spanish tile roof to lay, but the difference in laying is so slight that the above answer applies to both tiles.

Design for a Roll Top Writing Desk.

From HARMAN, *Volant, Pa.*—I have often noticed in the columns of the paper a call for more correspondence. and will endeavor to help a little by [illegible]tions which may be of interest to others as well as myself. Among other things I would like to know how to build a curtain or roll top writing desk.

Door and Window Clamp.

From YOUNG CHIP, *Montreal, Canada.*—I have noticed with some interest the sketches of door and window clamps in the June issue of the paper, and I would like to place before my brother chips a rough sketch of



Door and Window Clamp.—Sketch Submitted by "Young Chip."

one I saw used by that class of carpenters commonly known as "wood butchers." The idea was all his own, and it was not a bad one, for after shooting the edge of the door it may be set up as shown in the accompanying sketch and the top planed by drawing the plane downward, a feature that is entirely absent from all other door clamps that I have seen. The legs of this bull dog (for it looks as much like that as anything else), are cut to the proper bevel and a nail driven through about ½ inch into the floor, which keeps it steady. The back bone of the dog is a 2 x 4 scantling, and the legs are 1 x 4 inch boards.

Designs for Summer Cottages.

From SUMMER RESORT, *Watervliet, Mich.*—I would like to have some plans for summer cottages published as soon as space can be found for them, also plan for a cat boat from 20 to 25 feet in length. I would like to have "S. W. D.," Ashland, Pa., send the plans of his sail boat mentioned in the April number of the paper. The increasing popularity of the summer resort business in the Central West creates a demand for these two items which the hustling carpenter must meet. As some of the readers of the paper must undoubtedly be interested in this kind of work, I hope they will send in for publication any plans they may have.

Ventilating a Cistern.

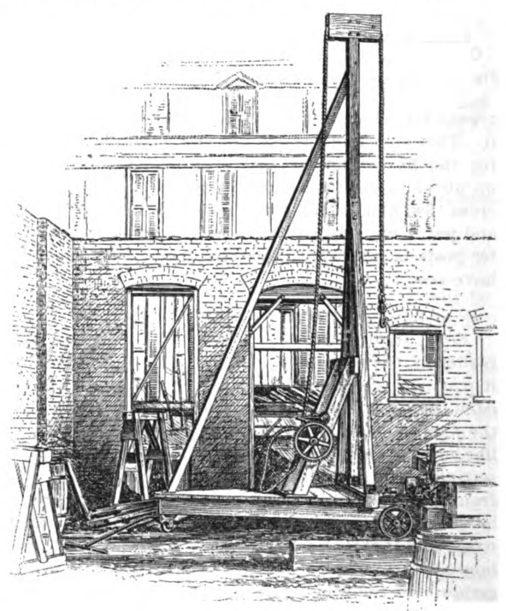
From F. I. P., *Coleman's Station, N. Y.*—I have a customer who has a cistern under his house; 3 feet from the floor to the top of the cistern curb. The nearest opening to the outside is 22 feet and the air in the place is damp and dead. Ventilating it on top of the cistern does no good and the water cannot be kept pure. There are two 3-inch conductor pipes leading into the cistern, but nevertheless the water gets dead so that it cannot be used The foundation of the building is ventilated with air spaces, but they are not large enough apparently to give sufficient air to the cistern. Please advise me through the paper if it cannot be ventilated with a pipe running from the top of the cistern under the floor to the outside, which will give a pitch of 3 feet to the pipe. My idea is to run two 3 inch pipes to the cistern as low as they can be put, with the opening on the outside 6 inches in size, the pipes running in opposite directions so that there will be ample ventilation.

Note.—We think undoubtedly the plan suggested by our correspondent will result in getting some fresh air into the cistern, but we do not know whether the supply will be large enough to keep the air sweet and freshen the water. We would be very glad to hear from any of our correspondents who have had experience in this line giving suggestions as to how to accomplish the end sought.

A "Jigger" Derrick.

From JAMES F. HOBART, *Pittsfield, Mass.*—In the construction of a composite building in this enterprising city there are several points likely to interest carpenters and builders, one being a very handy form of raising derrick, a picture of which I send with this letter. The machine, as I may designate it, has a 6 x 8 inch frame, placed upon 4 x 8 inch sills, which are spread apart in the shape of a letter A. An axle and a pair of truck wheels are placed under the extended ends of the sills, and a single wheel, pivoted and fitted with a handle in the manner of ordinary trucks, is placed at the other end of the sills, at the apex. It will be seen from the picture that the device is thus mounted upon three wheels, making it easy to turn it around in the space it occupies. The mast consists of built up 8 x 8 inch timber placed as shown. The bracing also carried the hoisting apparatus, which consists of a drum mounted upon two 3 x 6 braces and geared back 73 to 14 on a 1½-inch sliding shaft, which is fitted with two 18-inch cranks. The rope passes over two sheaves placed 18 inches apart in a housing on top of the mast.

In raising timber the mast forms a guide against which the timber is supported during its upward journey. The floor is 4-inch plank and is permanently placed, then the timbers are raised by the three-cornered derrick and put in place for the floor above,



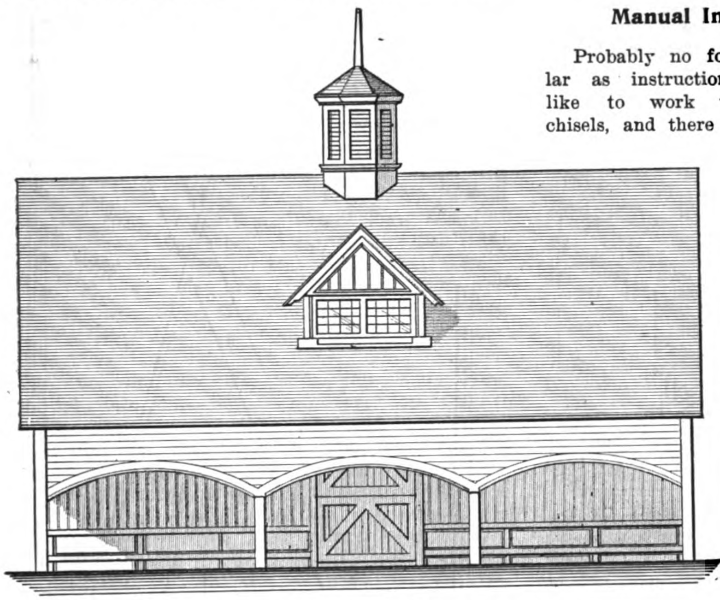
View of "Jigger" Derrick as it Appears When in Use.

which is placed upon these timbers and the derrick is shifted up a story, at the same time an ordinary frame derrick is set up on the new floor and the timbers and plank hoisted by means of it. Then the little three-cornered or "jigger" derrick is used for putting the timbers in place as mentioned above.

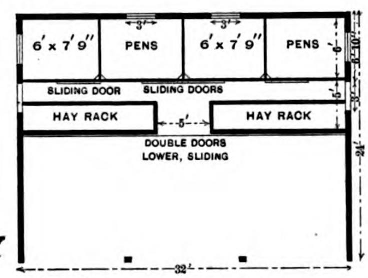
I noticed another derrick of similar construction, but supported on four wheels, which was much easier to move than the three-cornered one, but the men could not begin to handle or turn it or put it just where it was wanted as easily and quickly as they could the little three-cornered concern which is the subject of this sketch.

Design of a Sheep Barn.

The illustrations presented herewith represent a sheep barn and inclosure erected not long ago for John Lloyd of Altoona, Pa., the building being intended for the raising of Southdowns—the four pens being for ewes and young lambs. The floor plan shows the arrangement of the pens and the passage separating them from the hay rack. The latter opens into the mow direct, and in the bottom of the rack, which is 9 inches wide, is a board to prevent seed and dirt from falling into the feed trough below. A small door the hight of the trough, 10 inches, and four feet 9 inches long, is held up in an open position by means of a rope fastened on the inside, so that it may be lowered when necessary. This construction is shown by means of the accompanying detail. The rack is supposed to be kept well filled with hay, and with the door or shutter closed at the trough it is expected to give sufficient warmth for the interior of the building. The door on the side leads to an inclosure on a hillside to be used as a pasture. The mode of access to the hay mow is a small well 2 feet 6 inches x 3 feet, immediately over the center door. It is reached by a ladder, which is put up only when necessary. The hay mow is lighted by two windows, one in the front and the other in the rear of the building, and also by two doors at the ends. The ventilator is constructed in such a way as to be over the well in the center to draw off all foul air, &c. A very pretty effect is obtained by constructing the upper portion or mow with a 2 foot 6 inch projection at both ends, making the roof conform thereto, and shingling all above the first story. The plans of the sheep barn here illustrated were prepared by S. C. Corson of the place named, the approximate cost of the structure being $600.



Front Elevation.—Scale, ⅛ Inch to the Foot.



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

Design of a Sheep Barn.

The Boston Mechanics' Fair.

Preparations for the twentieth triennial exhibition of the Massachusetts Charitable Mechanic Association, to be held in the Mechanics' Building, Boston, October 10 to December 3, are progressing very satisfactorily, and we are advised that mechanical exhibits already booked exceed in number those of any previous exhibition at so early a date. The building in which this exhibition is to be held is owned by the society; it contains 200,000 square feet of floor space, and was designed to be used as an exhibition hall, and is therefore well adapted for the purpose. Previous exhibitions have been very successful, and the one to be held this autumn is to be particularly an exhibition of machinery in motion and mechanical and manufacturing appliances in actual use rather than a department store bazaar. The projectors describe it as a great moving industrial plant, and advise us that many representative firms have already secured space. Power, heat and light are furnished during the two months free, and the freight charges, we understand, are paid one way by the association. The entrance fee on working mechanical exhibits is $5. The exhibitions in the past have been well advertised, and this one will be no exception, and out of a population of 1,500,000 in Boston and vicinity the attendance, it is estimated, will be fully 500,000. Henry D. Dupee, secretary of the Executive Committee, has had numerous requests for the prospectus, rules and conditions from prominent firms all over the country.

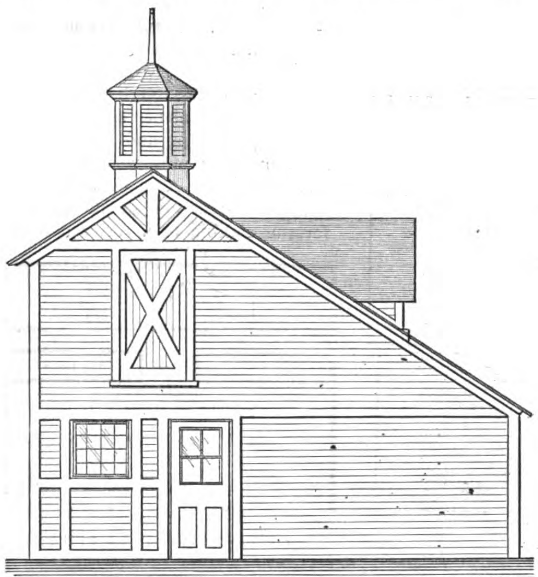
Manual Instruction in Wood Work.

Probably no form of manual training is so popular as instruction in wood work. Most pupils like to work with hammer, saw, planes and chisels, and there is a peculiar fascination in watching the gradual evolution of a model from the rough wood into a complete well finished object. Wood is cleanly in use, and the models made may be preserved in a permanent form. A good scheme of manual instruction should provide for the making of a series of models, carefully graduated, commencing with easy examples and proceeding gradually to more complex ones. The models should not be so difficult or of such a nature as to occupy several lessons, because pupils under such circumstances are apt to tire of the work and lose the enthusiasm which is so necessary to success.

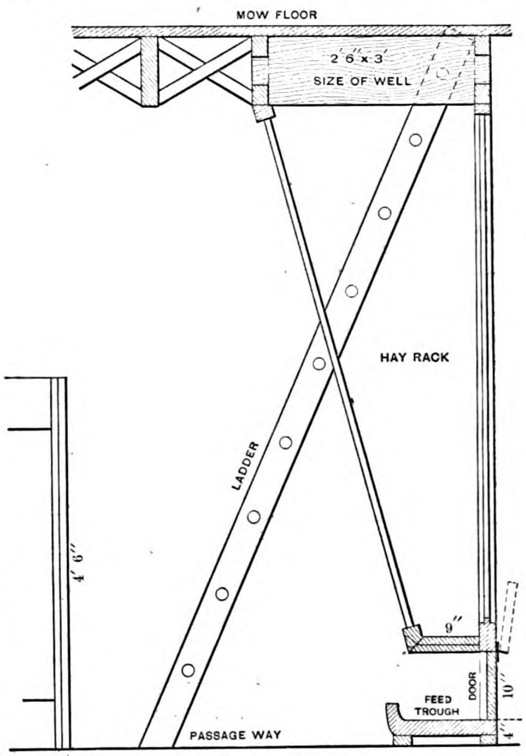
The exercises should consist of complete models or of joints leading to them, and if they are articles of general utility they will be attractive to the student and so will command interest and care in their execution. The exercises should be so arranged as to bring into play the mental faculties in a definite order, a new difficulty being introduced with each model. All the models, before being made, should be drawn on paper to a large scale, in either orthographic or isometric projection, and the series of exercises should be arranged so as to give a good exercise in drawing.

The student should have an intelligent knowledge of the wood which he is working. This would include lectures on the growth and structure of trees—the different kinds of plant food in the soil, together with oxygen, hydrogen, nitrogen dissolved in water to form sap food—the ascent of the sap through the roots, and up the sap wood of the stem to the leaves, which may be compared to a workshop, where the crude sap takes up i s carbon from the carbonic acid of the atmosphere, forming starch, sugar, fat, oil, &c., their combination with nitrogen to form the living and life giving chlorophyll and protoplasm—the journeying of the elaborated sap down the combium of the twigs and branches, laying up stores of food for next year's buds, traveling down the stem and adding new growth to it—the general shape and aspect of the trees, the forms of their leaves, habits of growth in dry or damp situations, the different varieties of trees, their characteristics and the uses to which the timber is afterward put, the processes it has to undergo before being made into the completed object.

Manual training stimulates and quickens the perceptive faculties, giving a taste for all that is beautiful, noble and good. It is opposed to crooked dealings and encourages energy, determination, perseverance, straightforwardness, truthfulness and resolution. It takes the instinctive creative faculty and makes use of it, leading pupils by a path they delight to tread, until they take pleasure in the acquisition of knowledge for their own sake. It strengthens the memory, says Willis Walker, in *Education*, and stimulates the powers of observation and comparison, facilitating a rejection of evil and a reception of that which is good. Finally, it gives a mastery of tools which often enables the home to be made comfortable and happy.



End Elevation.—Scale, ⅛ Inch to the Foot.



Section Through Hay Rack and Feed Trough.—Scale, ⅛ Inch to the Foot.

Design of a Sheep Barn.

A method of education which gives abundant scope for that training of the mental faculties without which no person can be said to be educated, and which at the same time imparts a manual dexterity and skill which will be of the utmost service to those who may have to gain their living by industrial labor, ought to commend itself to all thoughtful people.

Quicksands in Foundations.

Twenty-five years ago, anticipating that I would probably have to contend with quicksand in my work, says J. B. Gordon, I read up on the subject everything that I could find, but with very little satisfaction. In fact, the theories set forth by the majority of writers on the subject were virtually of no use when I met with the actual facts in the course of my experience. I investigated the matter very thoroughly, however, finding a very essential point in the fact that in all quicksands a great variety exists in the sizes of the atoms, this variation requiring various plans to be tried to successfully contend with the difficulties that must be overcome.

I did not have long to wait before meeting with a quicksand bottom. I was then engaged on the foundations of the bridge work of the Delaware, Lackawanna & Western Railroad in Hoboken. In foundation east of Henderson street we had to go 2 feet into a bed of quicksand to get our depth. In this case it happend that I had a large bank of oyster shells in the way, which I utilized. I cribbed my sump large enough to give me plenty of room, mixed the oyster shells with gravel, and put a bed of the mixture all around the sump, shoveling the sand out of the middle and allowing the mixture to sink until I got below the required depth, the mixture closing in and making a solid bottom for sump. After this I uncovered about 10 feet square section of the sand, throwing out the sand as quickly as possible with as many men as could conveniently handle a shovel. The moment the required depth was reached we covered the bottom with a foot of the gravel and shells. When this was done and walked over, it would all be in a movement, but after standing a few hours it would become perfectly solid. The cause of its becoming solid is that the larger atoms of the sand passing up through the mixture adhere to the shells, gradually closing up all the crevices. Leading drains across the foundation we successfully completed the work. After this I used crushed stone with better results than with the gravel.

Some years later, when superintending the construction of a large tank—200 feet in diameter—for a gas holder in Brooklyn, at 30 feet in depth—just the depth we had to go—we uncovered a quicksand bed. The contractor was very much excited, having previously lost several thousand dollars in a similar case. I proceeded this time with crushed stone in getting my sump down, sinking a wall of broken stone all around the well hole, got our pipes into their proper depth and made this our sump, leading box drains from this point all over the bottom, uncovering sections 10 feet square and replacing with crushed stone a foot thick, completing the whole bottom on this system with entire success.

Application of Heat to Greenhouse Structures.

ONE of the most perplexing questions for the man who contemplates constructing a greenhouse to decide, says W. R. Beattie in the *Columbus Horticultural Journal*, is what kind of heating to put in. To-day the old flue would, of course, not be considered, and the choice would be between steam and hot water.

Professor Taft, in his book upon greenhouse construction, after discussing methods and advantages of each system, sums up as follows:

"Steam needs constant attention. Temperature will ordinarily be less regular with steam heat than hot water.

"First cost of steam plant will be 15 to 20 per cent. less than hot water, and a trifle less than hot water under pressure.

"On the other hand, the cost of fuel for hot water will be 20 to 25 per cent. less than for steam.

"On the whole, for a place not exceeding 10,000 feet of glass hot water will in most cases be found cheapest and most convenient, but above that amount of glass steam might be advisable, as night watchman is needed anyway."

Recent experiments at the establishment of Henry A. Dreer of Riverton, N. J., made by Mr. Eisele, seem to confirm the results of past experiments, demonstrating the economy of hot water heating, even upon a large scale. The observations of Mr. Eisele were taken from two sets of houses, one of 45,000 feet of glass heated with steam and the other of 53,000 feet of glass heated with hot water. Heat for the steam heated plant was furnished by three tubular boilers aggregating 160 horse-power. These consumed 265 tons of coal at an average cost per 1000 feet of glass of $10. Heat for the hot water plant was furnished by 135 horse-power boilers consuming 248 tons of coal at an average cost of $8 per 1000 feet of glass.

As for my own preference, and leaving out of account first cost, I would choose hot water for several reasons, but steam has advantages at times not found in any other form of heat—for instance, in checking mildew or rot steam is more effective. On the other hand, however, the attention required for hot water is never nearly so great and is safer in case of a sudden change from warm to cold during the night.

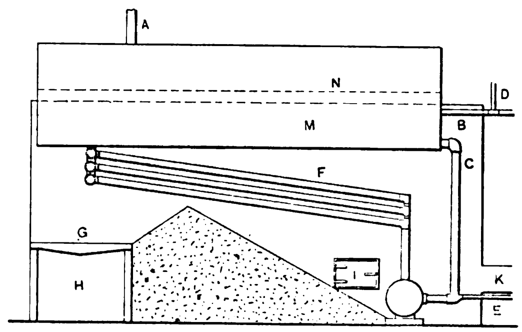
In order to employ the advantages of both systems, I have successfully combined the two systems in one. During the past winter I have operated a small boiler built upon this plan, the working of which has been entirely satisfactory, and which, I think, meets all the requirements of either system taken separately. The only practical difference between this and any steam boiler is that it has larger flow and return openings and the system is supplied with an expansion tank.

The arrangement of the system is shown in the sketch herewith, in which A is the flow pipe, B the return pipe, C rear circulating tube, D supply pipe, E discharge pipe, F water tubes, G grate, H ash pit, I soot door, K chimney outlet, M drum, N water level.

The drum or tank above serves as a reservoir and supply for the water tubes below, which form the boiler proper; of course this tank would not be really necessary for the hot water system, but it increases the water volume in the boiler, which is quite an advantage, as the water tubes hold but a small amount of water and cool quickly after the fire goes down, should such thing occur; the tank, however, is indispensable for steam use, in order to have a water level and a steam reservoir from which pipes are supplied. Starting with the entrance of water to the drum from returns, it passes by action of gravitation downward through the circulating tubes at rear of boiler, then upward into heating tubes toward front of boiler, re-entering the drum at front of boiler, having made a complete circuit around and through the flames.

When steam is being used, the water should stand about half way up in the drum, circulation being the same as with hot water, the steam being formed just as the water passes through the tubes at the hottest point over fire; then the steam rises into the drum above by means of the upper circulating tubes and thence to the flow pipe and the houses. If this arrangement be followed the boiler will be noiseless in its action when steam is used.

As to the amount of fuel consumed by each method, it was found that more heat units were produced per pound of coal when using steam, because then, and then only, could enough draft be allowed to secure good combustion; but could there have been enough load or radiating surface to have worked the boiler to its full capacity the results would be stronger in favor of the hot water system. When firing boiler at Delaware which was built upon this principle, the indications were that it took less fuel to keep a given temperature with steam than with hot water under pressure, but am satisfied now that the difference was due to lack of piping in houses, so that heat was not utilized when water was being used; steam will part with its heat more readily, thus forming a quicker medium for the transmission of heat from the fire to the atmosphere in the houses. Economy in amount of pipe put in for radiation surface is poor economy, as it constantly takes off the profits by allowing expensive heat to pass up the chimney instead of carrying it to the houses, and a surplus of radiating surface is more desirable than the opposite.



Application of Heat to Greenhouse Structures

The greater the difference of temperature between the fire and the water in the boiler the more heat will be taken up by the water, and if economy of fuel were the main object sought, enough radiating surface should be provided to give off the necessary heat without heating the water in the boiler above 195 or 210 degrees F.

By combination of the two methods the first cost may not be so great, perhaps only a little more than for steam alone; the heater can be run with hot water during mild weather and changed to steam during severe cold, when it may be advisable to be about the houses most of the night anyway. By changing to steam quick results may be had in case of sudden change of temperature.

Opposed to combined water and steam methods might be mentioned the waste of water in making the change, as all the pipes and a part of the boiler have to be emptied and the water drained off; labor and attention required in making the change; liability to leakage caused by changing, for joints of boiler and also those of pipes will invariably leak when cold water is put into them after using steam for a few days.

As to size and arrangement of pipes for the combination, they may be practically the same as for steam, the hot water being used only in mild weather, so rapid circulation is not required.

Where any low places or pockets occur in which water would collect drips should be put in, connecting to the return pipe with a valve so they can be closed when using hot water.

I do not deem it wise to use pipes that are smaller than 1¼ inch for greenhouse heating; but where, as is often the case, 1-inch pipe can be bought very cheaply, a great many lines might be used as returns; even then crooks and turns should be avoided.

DINING ROOM FINISH.

THE dining room should be one of the most cheerful apartments in the home, and some remarks concerning the style in which it should be finished, which are found in a recent issue of the Connecticut *Industrial Journal*, from the pen of F. R. Comstock, may prove interesting. The author states that the usual answer given to the inquiry as to the kind of wood in which the dining room shall be finished is, of course, hardwood. Oak, he says, seems to be the popular wood, for what is better than to see beautifully selected quartered oak finished with stain of a shade sometimes called golden oak, bringing out the rich quartering of the wood? Of course, we think that the designer of the wood work is sufficiently up in his business not to mold and bead the window and door finish so as to lose all the beautiful graining of the oak, but has used his pencil in designing a casing which has plain surfaces in it to show the quartered oak.

So many people will take a beautiful piece of wood, paying oftentimes a great deal of money for it, and will cut it up in so many moldings and lines that one cannot tell whether the piece is oak or pine; in fact, one might just as well have putty.

Painted wood work can be overmolded and enriched without spoiling the effect, but it is not so with hardwoods. Also, different kinds of wood should be treated differently. Wood good for one purpose is not always proper for another. Mahogany at $250 per 1000 feet should not be treated in the same way as ash at $40. Did you ever stop to consider this? What is more handsome than a large panel of mahogany veneer, bringing out the dark rich coloring and shading of the veining of the wood?

People of taste use hardwood to blend with their scheme of decoration and to give richness to the effect, and it is proper that the wood work of the furniture should harmonize. To be critical, however, we would suggest that ash be used sparingly for the wood work of dining rooms, unless the ash is to be treated with a green or perhaps a dark red stain, bringing out the strong color of the graining of the wood and thus making a decorative effect. Ash wood work and oak furniture of different colors and shades are far from being harmonious.

A Beautiful Finish.

Natural cherry, if the wood is selected for its beauty of grain, makes a beautiful finish, provided no attempt is made to imitate mahogany. This red colored cherry, known as "barroom cherry," is not a thing of beauty.

We have recently seen a dining room that had a beautiful quartered oak floor and the baseboard around the room was of mahogany. The cap of the wainscoting and the doors were also magnificent specimens of mahogany. The room was wainscoted 5 feet high, with well proportioned panels finished in pine and painted with enamel of an ivory shade. Around the ceiling was a painted cornice, and the ceiling was treated in water color with a little relief work brought out in parti-colors. The furniture of the room was modeled after the old Colonial standard, and was of mahogany with glass and brass trimmings, and the hardware of the doors was of old brass and the door knobs were of glass. That portion of the wall above the wainscoting was papered with striped wall paper of a shade of red that blended beautifully with the rich color of the mahogany and a watered silver strip, the strips about 2 inches wide. The sideboard being of an old Colonial style did not come above the cap of the wainscoting, and on either end were two beautiful candelabra after the old Colonial pattern. The side walls were a treat in the picture line—odd frames, water colors, photographs and pictures of all kinds and shapes and subjects. The room was well lighted and, in fact, the most attractive place in the whole house, and yet the total cost of this room was not beyond the reach of many people who aspire to have it entirely of hardwood and who are simply astonished at the idea of painted wood work in the dining room. But to see this room would convince you of its practicability.

Dining Room Floors.

It is well, if there is to be but one hardwood floor in the house, to have it in the dining room, and this brings out the fact that there are a number of kinds to select from and different methods of putting the floor down.

People who have plenty of money may go into elaborate borders composed of a dozen or more kinds of wood cut up in complicated designs and known to the visitor to cost money; but there was never put together one of these floors that would stand any length of time without a crack or a defect of some kind; and considering the fact that the central portion of the room is usually covered with a large rug, what is better or handsomer than 3 x ⅞ inch matched quartered oak flooring put down so no joints show outside of the rug, with perhaps a wall border two strips wide or about 6 inches, stained a rich color and finished in the best manner? To be sure, the oak floor named will shrink and season in due time, and there will be numerous joints, but they will all run in one direction, and it is not as noticeable as if the border was composed of a number of kinds of wood. The general public have an idea that the border should never have a defect in it, and so when they see one they naturally make a great deal of it. The hardwood floor is more easily kept clean, for as the dining room is used considerably it requires constant attention.

The Wainscot.

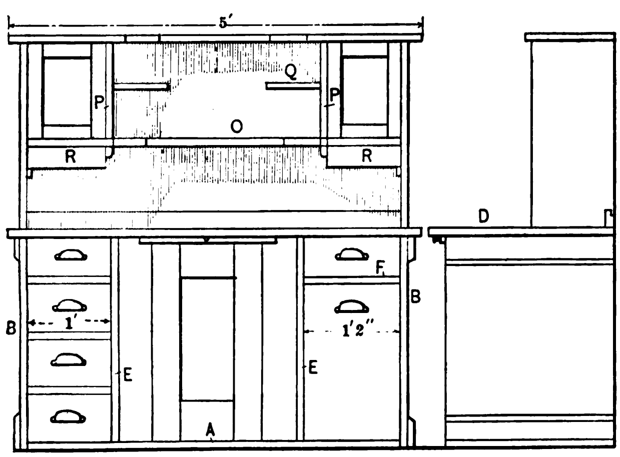
To follow out the ideas of our ancestors, it seems proper that we wainscot the dining room. Panel wainscot, of course, is good, yet more expensive than many can afford. We have seen wainscoting formed of a 3-inch molded batten alternating with a 6-inch piece of wood work, perfectly plain, to bring out the rich coloring and graining of the wood. There is no set rule for the hight, yet it should be considered if you are going to have a plate shelf around at the top of the doors, or if you are going to decorate the room with a frieze. This should control the hight. If you desire to protect your wall from the backs of chairs the wainscoting should be of sufficient hight so the chairs could set up against it.

We have seen a number of dining rooms that have a chair rail of the same wood as the finish of the room, neatly molded and mitred and finished at the door and window casing as though it was designed to end there, which, of course, should be done. The space under this chair rail was prepared with lincrusta of appropriate design, and treated in oil paint to harmonize with the color of the decorations. If lincrusta is too expensive there are many kinds of wall paper that are of proper design and coloring to form this dado. We have also seen the decorations carried from the baseboard to the top of the door and finished with a plate shelf with a frieze and ceiling of the same color above, which makes a very effective treatment.

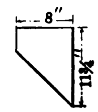
VIENNA has been astonished lately by some daring steeple climbing. A steeple jack celebrated the beginning of the festivities for Emperor Francis Joseph's jubilee by climbing in the night to the top of one of the steeples of the Votive Church, 306 feet from the ground, by means of the lightning rods and architectural ornaments, and hanging on it a yellow and black banner 20 feet long. He gave a minute description of the manner in which he accomplished his foolhardy feat to the newspapers. A few nights later some one else imitated him by climbing the steeple and stealing the flag.

MAKING A KITCHEN CABINET.

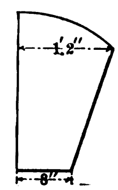
THERE are doubtless many young mechanices who are sufficiently handy with their tools to make almost any number of articles for the convenience and decoration of the household, and the particulars which are given below relative to one method of making a kitchen cabinet may appeal to some of them as well as to the older craftsmen. The article in question is of great convenience, and being simple in its design and construction can be made without any great difficulty. The illustrations which are presented show a kitchen cabinet as made for his own household by a correspondent of one of our contemporaries. He states that the cabinet is built of pine and finished with oil cherry stain and a coat of varnish. In doing the work the first thing was to get out the bottom piece, marked A, this being 1 foot 11¾ inches by 4 feet 6 inches, and fastened together with strips placed 13 inches from the left end and 15 inches from the right end. The ends or sides, B B, which measure 2 x 2 feet 7 inches, were rabbeted on the back edge to receive the ¼-inch lap ceiling backing, and held together by the top casings. These were nailed to the bottom and stay lathed square. The top D was then put on, this being made of two boards neatly jointed and matched and set together



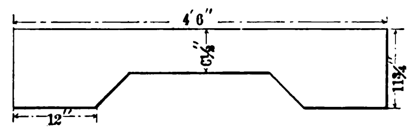
Front and Side Elevations.—Scale, ⅛ Inch to the Foot.



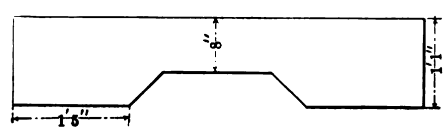
Shape of Shelf in Cupboards.



Side Elevation of Flour Bin.



Plan View of Shelf O.



Plan View of Top of Cabinet Rabbeted on Back Edge.

Making a Kitchen Cabinet.

with white lead. The top measures 2 feet 2 inches by 5 feet. On the under side of the top are cleats placed directly over those on the bottom, and after this was done the partitions E E were inserted.

The supports for the drawers are 1 x 3 inches, and there are strips 1 x 1 inch running back from them and fastened to the ends and partitions. The casing is put in with a 1-inch slit in the top wide enough to receive the bread board. Two L-shaped strips are made by nailing together pieces of 1 x 1 and 1 x 2 inch stuff, and these are fastened to the underside of the top to support the bread board. There is a shelf in the cupboard about 12 inches from the top. The flour bin has sides, as shown, the bin being hung at the bottom with loose pin butts, so that it may be taken out if necessary. There is a button on the back of the bin at the top, so that when turned up it will strike the cleat F and keep the bin from tipping clear out. On the front of the bin is a drawer pull to match those on the drawers.

With regard to the top section, the first thing is to get out the ends, which are 1 x 2 feet 3 inches, then rabbet the back edge and cut a notch in the lower rear corners 1 x 2½ inches. Then get out the bottom strip, which is 4 feet 8 inches by 2½ inches, and rabbet the upper edge. After this has been done get out the top end, which is rabbeted on the back edge, and shape as shown, after which nail the four pieces together. Put in the shelf O, the shape of which is shown in the sketches, then the partitions P P, making a small cupboard at each end of the shelf, as shown. In each of these cupboards place a shelf, and also put in the shelves Q, the shape of which is also indicated. The drawers R R are supported on the inside by a groove in the side of the drawer and on the outside by a cleat nailed to the end piece. After putting on the doors and nailing on the back, the cabinet is complete.

The dimensions which are here given may, of course, be varied to suit individual requirements, and the author states that a very handy kitchen table can be made by leaving off the top section and putting only the flour bin and cupboard at the bottom.

Suggestions for Painters.

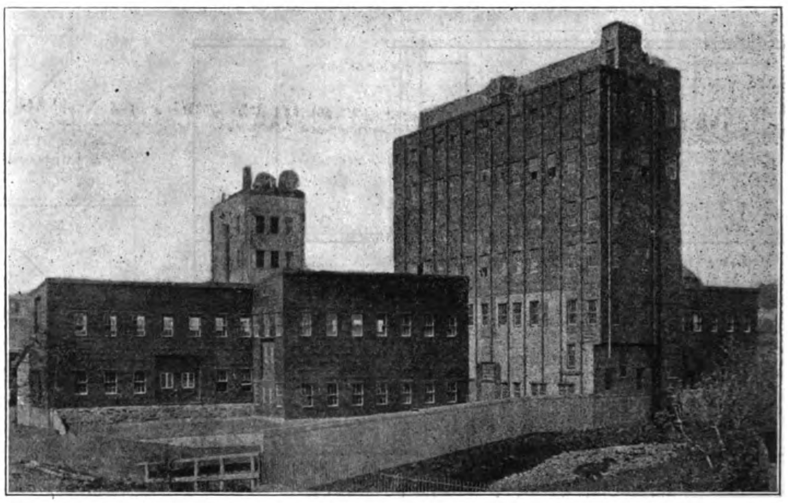
Few painters know, with anything like exactness, the amount of paint required to cover a given surface, and this lack of knowledge often leads to disastrous results in estimating. A writer who has had experience says that a gallon of well mixed paint will cover from 450 to 630 superficial feet of wood. On a well prepared surface of iron the gallon will cover 720 feet. In estimating painting over old work the first thing to do is to find out the nature of the surface, whether it is porous, rough or smooth, hard or soft. The surface of stucco, for example, will take a great deal more paint than wood, much depending on the circumstances— whether it has been painted and what state the surface is in. A correct estimate of repainting wood work cannot be made from the quantities only; a personal examination ought to be made in every case where there is much work to be done. Trusting to quantities or measurements alone will only tend to lead the contractor into a trap; there are so many unforeseen conditions cropping up all the time that the painter should see the locality and the work to be painted, when such is possible, before he gives in his figures for the work. There is painting and painting; it can be done well and it can be done indifferently. A slovenly, inartistic painter will often repaint and regrain on work that ought to be well rubbed with pumicestone or sandpaper before the first new coat is laid, but the work goes on without even cleaning or stopping, and the result is a bad name for painters all round. In

three-coat work the following amount of materials will be required to cover 100 superficial feet of new wood work: Paint, 8 pounds; boiled linseed oil, 3 pints; spirits of turpentine, 1 pint. The work, to do it as it should be done, will require over two days for one man. According to an authority 45 yards of first coat, including stopping, will require 5 pounds of white lead, 5 pounds of putty and 1 quart of linseed oil. Painting, when done well and the best materials are employed, should remain fresh and good for seven years, but the most done nowadays does not last over four. It pays both owner and painter better to have the work done well at a good price, and good materials employed, as the work lasts so much longer and is much more satisfactory.

Use of Sheet Iron in Building Construction.

It is a well-known fact that a large amount of sheet iron and steel is consumed every year in the construction of buildings. Not only are ornamental cornices a feature of some very handsome buildings, but in many instances the entire front of the building is covered with sheet steel in imitation of pressed brick or rock, which when painted and sanded gives a very handsome effect. Corrugated iron for roofing and siding is used for manufacturing buildings, storage buildings, and of late years has been largely employed for sheds on the docks of various seaport cities. One of the largest buildings that has been covered with sheet iron which has come under our notice is that of the Western Oil Mfg. Company, at Belleville, N. J., a view of which is given herewith.

The main building is 30 x 100 feet and 100 feet high. The extension at the right is 30 x 60 feet and 35 feet high, and the left extension is 100 feet long, a portion of which is 40 feet wide, and the remainder 20 feet wide, and the whole extension is 35 feet in hight. Sheet iron was selected as a covering for this building, owing to the protection afforded against contiguous fires and for its cheapness as compared with clapboarding. Clapboarding of a good quality put on the building was found to be worth between 5 and 6 cents per square foot, and the sheet iron covering of No. 24 black iron, 30 x 96 inches in size, put on, cost a little more than half the cost of clapboarding, owing to the little labor required, and the large space covered with a sheet of iron. The buildings are of frame construction, and the timbers are covered with a sheeting of 1-inch board. The sheets are attached to these boards with a layer of building paper beneath, and several tons were required for the covering. After the work was completed the entire building was treated with one coat of red lead paint. The wooden tanks holding the water supply for the buildings, which were not set upright at the time the picture was taken, are also covered with sheet iron. Galvanized iron was used in covering the tanks, and galvanized iron was also used in covering the building which supports the water tanks. This building is 20 x 40 feet and 100 feet high.



The Use of Sheet Iron in Building Construction.

IT is stated that the recent earthquake in San Francisco, Cal., while proving very destructive to many buildings, offered another evidence of the strength of the modern steel structure. It is reported that the nineteen-story Claus Spreckels Building, although swayed like a tree in the storm, was not injured in the least. The damage to buildings of ordinary construction was very considerable, while some, presumably of the older and weaker buildings, made an utter collapse.

Models of Buildings at the Paris Exposition.

It is likely that one of the most attractive parts of the Paris Exhibition of 1900, at least for architects and builders, will be the annex which will contain models of some of the most important modern buildings of the city. These will be very costly representations, the model of the Hôtel de Ville, it is stated, costing 58,000 francs, or nearly $12,000. As the model of the great Church of the Sacré-Cœur on the top of the hill of Montmartre will not be in plaster but in cut stone, the expense will reach a larger sum. The New Sorbonne is also to appear, but the model will cost the comparatively small amount of 25,000 francs ($5000). The two palaces of the exhibition in the Champs-Elysées, and the Pont Alexandre III will be among the structures to be reproduced on a small scale. Architectural models, which at one time were not uncommon, appear to be out of fashion, but if the collection which will be seen in Paris attains the success that is anticipated, we may expect to see a revival of an art with which Shakespeare was better acquainted than with architectural representations on paper.

A Water Curtain.

The protection of buildings against fire from without by means of a water curtain, to be made to fall all around the structure, is gaining favor in many quarters. The most recent instance of the application of this plan is in the great Public Library Building in Chicago. The arrangement in this case, which is very simple, is described as follows: A 7-inch steel water main is laid around the top of the structure, upon the broad stone table formed by the top of the coping, this pipe having connection with force pumps situated in the basement, and, through perforations properly arranged, insures the introduction of a substantial sheet of water from cornice to pavement, around the whole or any imperiled portion of the building. The arrangement of the system of piping is such as to enable operating in prescribed sections; additional relays of smaller pipe are also placed in position above windows and doors, in order to complete the curtaining of those points in the most serviceable manner, should the curtain in the main be broken by wind impingement against the building.

The Builders' Exchange

Directory and Official Announcements of the National Association of Builders.

Protest vs. Action.

The attitude of the average contractor toward the evils existing in the building business is one of marked inconsistency. Contractors, almost universally, complain against certain of the methods under which the business has come to be transacted, alleging injustice, restricted profits, uncertainty in the settlement of accounts, and many other obstructions to the safe conduct of business, clearly indicating their recognition of the evils against which they complain. The inconsistency of their attitude lies in the fact that however clearly they may be able to define the conditions of which they complain, the mere complaint marks the beginning and the end of their effort to correct or eradicate the conditions against which they protest. Their position in reality amounts to actual insincerity, for their words and their actions are at glaring variance. The average contractor complains loudly that he is being unjustly treated when his estimate of the cost of a given job is used as a lever to force some competitor to undertake the work at a less price; and yet he will be the first one to ask the privilege of bidding on other work to be let by the architect by whom he has been thus unjustly treated.

Sub-Contractors.

Sub-contractors, as a class, are constantly complaining that they are unjustly treated by general contractors; that it is their (the subs') capital which enables the general contractor to continue in business; that the general contractor appropriates to his own uses the moneys paid by the owner on account of the whole job, and leaves the subs to wait in uncertainty for their pay. These and many other complaints are heard daily, and while they are astonishingly unanimous in their complaining they are equally unanimous in religiously avoiding any concerted action which might tend to the eradication of the evils to which they object.

It frequently occurs that a large contract is let to a general contractor whose financial resources are very small, who is solely dependent upon the payments from the owner to meet his obligations; and yet sub-contractors tumble over themselves in their efforts to secure a part of the work. In such a case as this they are always menaced with the necessity of invoking the law in order to secure their money, for however honest the general contractor may be, some difference between him and the owner may obstruct payments on account for an indefinite time.

These are conditions with which all sub-contractors are familiar, and yet the total of their effort at self-protection consists in complaints and objections and continued united submission. It is unquestionably possible to establish methods and customs in the building business which shall be fair and honorable to all alike. It is possible to turn protests into action, and if the responsible contractors—general and sub—in any city acted with a unanimity equal to that with which they complain, it would be a comparatively short time before order would begin to appear.

The fact that contractors complain but submit is conclusive evidence that in spite of their complaint they will continue to submit; and it is self-evident that so long as this state of affairs continues they will be compelled to submit and their complaints laughed at as being meaningless words.

General contractors know when they are unjustly treated by an architect, and they also know that an architect to whom no responsible contractor would submit an estimate would be obliged to go out of business.

Sub-contractors know when they are unjustly treated by a general contractor, and they also know that a general contractor to whom no responsible sub-contractor will submit an estimate would be obliged to go out of business.

The welfare of every contractor, general or sub, depends very largely upon the manner in which work is let. Unfair trading upon bids by architects or general contractors reduces the profit on work to the vanishing point, not only, but sets a premium on dishonesty and establishes prices that are next to ruinous. Competition loses all its true value and significance under such conditions and becomes a farce, entailing endless and really unnecessary labor.

Protection for Contractors.

Contractors need protection, but they most need protection against themselves. The National Association of Builders has unceasingly urged that contractors come together and plan out lines of business conduct which shall be as right and just as possible, and in which all points of view are considered. Builders in local organizations are urged to recognize the fact that they possess within themselves the power to greatly reduce the evils of which they complain, if they would only act. Local organizations as such are urged to send their representative men to the annual conventions of the National Association in order that the best advice as to what should constitute universal practice may be obtained.

All reform depends upon the individual; and in the building trades the individuals increase in power for reform as they increase in unity of purpose and of action. Careful organization is the machine through which unity may be secured, and therefore through which results may be obtained. Builders everywhere are urged earnestly to identify themselves with the work of the National Association in its effort to better the conditions under which the business is transacted.

Architects and householders in Hong Kong have two matters of serious import concerning which they are obliged to be on their guard—typhoons and white ants. To guard against the first of these many special forms of construction have to be resorted to, especially as regards roofs, the scantlings of the timbers employed being very heavy, and the covering, consisting of curved plain tiles with tile and mortar ridges, being laid double with a space between the layers. What are known as white ants constitute a most persistent scourge, and from their habit of eating away at the center of a balk of timber without revealing their presence on the surface are a source of continual danger where wood beams are employed for constructional purposes.

New Publications.

LIGHTING BY ACETYLENE. By William E. Gibbs, M.E. Cloth; 141 pages; illustrated. Published by D. Van Nostrand & Co. Price $1.50.

The interest taken in acetylene gas for illuminating purposes has led to the writing of this book by Mr. Gibbs. In the introduction it is pointed out that this system of lighting for general use is of recent date and that the book only describes what has been accomplished up to the present time. The history occupies a few pages, attributing the discovery of acetylene gas to Edmond Davy in 1836 and following the progress to the present, when by means of electric furnaces the production of calcium carbide at a low cost became possible. Another department of the book is devoted to the dangers of acetylene, in which it is pointed out that being sure of the purity of the carbide the hazard attending its use may be exactly determined. The dangers of attempts to liquefy acetylene should warn all against experimenting in this field. To prevent explosions in house lighting apparatus it is only necessary to prevent a mixture of acetylene and air in the apparatus. It is stated that it is less poisonous than ordinary gas and the light is less wearing on the eyes. A chapter is devoted to electric furnaces for producing calcium carbide, and a chapter to the generation of acetylene and the impurities of carbide and the purification of the acetylene. Forty pages are occupied with a description of the various acetylene gas generators that have been put upon the market. Another chapter is devoted to acetylene lamps, followed by a chapter on acetylene burners and their construction, and another giving the experiments which have been made by the author. The book also contains the requirements of the New York Board of Fire Underwriters for the installation of acetylene gas generators and for the storage of a limited supply of calcium carbide. A list of the United States patents on calcium carbide and acetylene apparatus is presented.

Law in the Building Trades.

PROVISION FOR ARCHITECT'S CERTIFICATE.

A provision in a building contract that the decision of the architect shall be final and conclusive is binding, subject to the implied condition that it be honest.—Welch *vs.* Hubschmidt B. & W. Co., New Jersey, 38 Atlantic Reporter, 824.

BREACH OF CONTRACT BEFORE COMMENCEMENT.

When one, prior to the commencement of the work, refuses to carry out the contract, the contractor cannot proceed with the work and recover the contract price, but must leave matters as they stand, and sue for the breach of the contract.—Borough of Winton *vs.* Mulherin, Pennsylvania, 8 Lack. Leg. N., 264.

NOT LIABLE TO ADJOINING LAND OWNER.

Where a party is only entitled to lateral support from the lot of the adjoining land owner for the soil in its natural state, and not for a building placed on his land, and such owner, when excavating a cellar, in the exercise of ordinary care, with due notice, dug near the foundation of the other's house, and caused it to fall, he was not liable for the damage.—Obert *vs.* Dunn, Sup. Ct. Mo., 41 Southwestern Rep., 901.

OWNER MAY APPEAL FROM DECISION OF ARCHITECT.

A building contract provided that, if alterations were made in the plans, the value of the work added or omitted should be computed by the architect, and in the event of dissatisfaction of either party the matter should be referred to arbitrators. The contract elsewhere set forth that the architect was acting as the agent of the owner. The court held that nevertheless the owner was entitled to appeal from the decision of the architect to the arbitrators.—Weggner *vs.* Greenstine, Sup. Ct. Mich., 72 N. W. Rep., 170.

EFFECT OF ABANDONMENT BY SUB-CONTRACTOR.

Where a sub-contractor abandons his work and makes a voluntary assignment, and afterward neither he nor his assignee makes any attempt to execute same, the original contractor may take charge of the work and complete it, and may recover for damages sustained, without first procuring certificates from the architect as to the propriety of such course, or the amount of his damages under the contract, although such certificates are required by the contract.—Intn. Cement Co. *vs.* Beifeld, 67 Ill. App. Ct. Rep., 110.

RESTRICTIONS IN DEED ON BUILDINGS.

A condition in a deed providing that the property conveyed "shall be used for residence purposes only" does not forbid the erection of an apartment building, to contain flats, each complete for housekeeping, but to be provided with a large dining room for the use of occupants who may desire to use it instead of their own private dining rooms.—McMurtry *vs.* Phillips Inv. Co., Ky., 45 S. W. Rep.

FLATS NOT PRIVATE DWELLING HOUSES.

A party conveyed certain building lots to another by deed containing a covenant that the latter would not erect thereon any "tenement house," or "any house except private dwellings." In a suit to restrain the proposed erection of a building in violation of the covenant, it appeared that it was a three-story building, of which each floor constituted one complete apartment for housekeeping. The court held that such building was not a private dwelling, within the intent of the parties, and that as the covenant was one against construction, and not against use, the fact that the builder did not intend to have it used by three families was immaterial, and the erection would be enjoined.—Levy *vs.* Schreyer, 50 N. Y. Supp. Rep.

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CARPENTRY AND BUILDING

WITH WHICH IS INCORPORATED
THE BUILDERS' EXCHANGE.

DAVID WILLIAMS COMPANY, - PUBLISHERS AND PROPRIETORS
232-238 WILLIAM STREET, NEW YORK.

SEPTEMBER, 1898.

Registration of Workmen.

The Master Builders' Association of Boston has recently established a new department for the registration of workmen in the several branches of the building trade. It is the intention of the association to register all workmen who apply and to keep a record of their addresses and of the fact that they are or are not employed, as the case may be. The purpose of the undertaking is to provide a list of workmen for the use of members of the association and other employers, together with accurate information as to their whereabouts and mechanical ability. The existence of such a registry it is believed will be of great value to employers, when the nature of its purpose becomes sufficiently known to the workmen to insure a comprehensive registration. The value to the workmen is equally evident in that it provides an opportunity to any one seeking employment in the building trades to place his name on file in the place where the heaviest and most responsible contractors will look for workmen. The department is maintained entirely by the Master Builders' Association, there being no cost to the workman for registering his name. Notwithstanding the fact that the undertaking is without precedent and is something in the nature of an experiment the experience of the six weeks during which it has been in operation seems to have proven beyond question the wisdom of the undertaking, the number of workmen registered being largely in excess of the number expected at first.

Chicago's New Coliseums.

Two new buildings involving a large expenditure of money and designed to take the place of the ill-fated Coliseum, which was destroyed by fire last Christmas, are to be erected in different parts of Chicago, one to be known as the West Side Coliseum and the other as the South Side Coliseum. The former has been designed by architect F. W. Newell and will cost about half a million of dollars, exclusive of the site. The structure as proposed will entirely cover a plot of ground which has a frontage of 600 feet on Throop and Loomis streets and 340 feet on Harrison and Congress streets. The building will be of steel frame construction inclosed in masonry, faced with buff pressed brick and Bedford stone with terra cotta trimmings and tile roof. Each street frontage will have two towers 175 feet in hight connected by an ornamental façade five stories high. The main entrance and exits will be between the towers on all four street fronts. The arena will be 216 x 472 feet, without an intervening post or pillar, and from the floor to the ceiling will be 100 feet. Outside of the arena and above the main floor will be a raised gallery 65 feet wide containing 10,000 permanent opera chairs, arranged in raised tiers. For conventions and mass meetings the building will have a seating capacity for 27,000 people. The South Side Coliseum has been designed by architect S. S. Beman, and it is expected that the structure will cost $1,000,000. It will front east 800 feet on the lake, 597 feet on Twenty-fifth street, this being the south line, 655 feet on South Park avenue and 420 feet on Twenty-fourth street. It will be 166 feet high, with a tower over the entrance 40 feet square and 350 feet high. The exterior will be constructed of glazed brick and glass, and the interior will be a steel frame and fire proof. A feature of the equipment is metal seats. It is intended to build a double decked pier out into the lake from the building at the foot of Twenty-fifth street, with a large pavilion over the water at the end, where concerts may be given. On the pier will be a space for trolley cars, bicycle tracks and for pedestrians, the whole comprising a mammoth amusement enterprise.

Our Country After the War.

The condition in which the United States find themselves at the close of the war with Spain seems, on the whole, better than before. First, no hindrance to our commerce has resulted. On the contrary, during the war period our exports have been greater than for the corresponding months in any preceding year of peace, besides which the imports of gold have been greater than in former years. At home there has been an improvement in railway earnings, with no decline of productive industry, and money is unusually plentiful. The burden of cost of the war, though on no small scale, is being borne almost unconsciously. Altogether, as things are measured ordinarily, we are in no wise worse for the war, unless we point to the sacrifice of our sailors and soldiers, and in this respect our loss has been slight, considering the scope of the war and the results attained. Peace has brought new interests and problems of a kind not suspected hitherto of having a bearing upon our affairs. Nor are they, necessarily, disturbing problems. It is well for us to have had our minds withdrawn from the self contained mood into which we were drifting, to notice new opportunities within our reach. To neglect them may leave us behind other nations in the march of progress. No longer should a populous community like the Philippines, with a foreign trade of $62,000,000 a year, have only four American residents at its business capital. And it is safe to say that such a condition will not exist again.

Self Confidence of Americans.

The war has strengthened the self confidence of the American people, while having uncovered enough weak spots to prevent our boasting unduly. Not merely confidence on account of our navy proving better than we expected, and our enemy's worse than we feared ; not merely on account of the people being willing and able to come forward on short notice and improvise an effective army; not merely because we are able to pay the bills without being distressed therby—though all these facts will contribute to that new feeling of strength which is to influence our future rank among nations. But we have not only borrowed money on terms that prove how good is the national credit ; we have borrowed it from American citizens—we are holding our bonds at home, which is as it should be. Likewise, to that extent to which we have been buying railroad securities held abroad we have increased American ownership of American railroads, which checks one outlet for the export of gold. The nation is feeling prosperous, strong and confident, as it has the right to feel, and it is being stirred by new ambitions. But with regard to the financial aspects involved, they are not due alone to the war. That is to say, while the war may have awakened us to certain things, it has not made us prosperous. More than one recent so-called panic might have been avoided had proper consideration been given to the real condition of the country. Our panics, however, have been due solely to scares, and, if no other good should grow out of the war, it is to be hoped that the alarmists will remain lost to view and their hold upon the public destroyed. We shall then be in a better frame of mind for further promoting progress at home and taking that proper share in the development of those new markets which are to be sources of wealth in the coming century.

Important Building Improvements During First Half of 1898.

In spite of existing conditions the first half year of 1898 did not pass without producing some notable building improvements, more particularly in the downtown section of New York. The new buildings enumerated below are well worth mention as affording evidence of the architectural skill and business enterprise which exist in the city. The 19-story building of the Washington Life Insurance Company on the southwest corner of Broadway and Liberty street was the first to reach completion this year, this being speedily followed by the magnificent 20-story structure on the southwest corner of Rector street, built by the O. B. Potter Estate, and the 12-story "Exchange Court" Building of the W. W. Astor Estate. This latter, with its frontage of 124.9 feet on Broadway by 135.3 feet on Exchange place and 125.5 feet on New street and 159.4 on its rear or southern line, offers an example of considerable divergence from the general form of plans upon which large office buildings are usually erected, being practically two separate buildings joined together by a narrow section. The primary objects of this mode of construction were light and air, but the opportunity was taken to render the building of the Court fronting on Exchange place so handsome as to make it a distinctive feature of architectural beauty. The 12-story building at the northeast corner of Broadway and Maiden lane and the 16-story edifice of the Hudson Building Company, at 32 and 34 Broadway, are also worthy of notice, together with the 11-story structure erected by the Singer Mfg. Company on the northwest corner of Liberty street and Broadway. Reference may also be made to the remarkable structure of the Ivins Syndicate on Park row, this building, with its 31 stories, holding the record of being the highest building in the world.

A VERY distressing accident occurred on the afternoon of Thursday, August 18, whereby the falling of a very heavy cornice from the roof of a building in Philadelphia, Pa., caused the death of four men and the serious injury of three others. While at the time of writing the responsibility for the accident has not been fixed, it was due, according to the Chief of the Bureau of Building Inspection, to the fact that the plans as approved by the department were not strictly followed. The iron lookout, consisting of a heavy joist, was anchored to the brick wall by means of an iron rod, which according to the plans, should have extended vertically downward a sufficient distance below the lintels of the windows to insure its holding the projecting weight of the cornice. According to the chief of the bureau this anchor was not put on until after the wall was built, and then the mortar used in laying the bricks was not dry when the cornice was put in place. The primary cause of the accident, according to the authority named, was that when the terra cotta workers came to put on the cornice they found the anchor too long, and instead of having the wall rebuilt so that the whole length would be incased in masonry, nearly a foot of the rod was cut off. This rendered it insufficient to hold, and the mortar not having set when the cornice was put on, the weight of the latter pulled out the anchor, allowing the lookout to pitch forward, throwing the cornice into the street below.

Mills House No. 2.

D O. Mills, the New York capitalist, whose successful social experiment in the line of poor man's hotels was referred to in these columns a short time ago, has just completed a second hotel built on the same lines as Mills House No. 1 and intended for the same general purposes. Mills House No. 2, as it is called, was opened for business recently and it promises to receive as steady a patronage as the original institution. It is located on the east side of the city, at Rivington and Chrystie streets, in one of the most densely populated tenement house districts. Like the older hotel, it is nine stories high, but it will accommodate only 600 guests, whereas the Bleecker street hotel has room for nearly 1600 men. The new hotel is a massive structure covering an area 100 x 75 feet and built of white brick and Indiana sandstone with ornamental copper cornices. Its clean and artistic front makes it a striking feature of a dingy neighborhood. The floors of the entrance and public rooms are of imitation marble in a mosaic design, while the 6 feet high wainscoting is of Tennessee marble. Each bedroom is well lighted, heated and ventilated and is comfortably furnished. There are two shower baths and ample lavatory and toilet accommodations of the most approved type upon each floor. Reading, writing and smoking rooms are provided for the guests of the house, together with a large library, and an excellent restaurant serves meals at a small cost. All these advantages are offered to the respectable workingman at a cost of 20 to 30 cents a day for his bedroom. It is not to be wondered at that there are crowds of men eager to substitute such cheap and good accommodations for the more expensive and far less comfortable and cleanly life of the Bowery lodging house or the dingy tenement. A specially attractive feature of both the Mills hotels is the central court. In the newer building this court is 40 x 60 feet, covered with glass. In the court are tables and chairs and the Mills House boarder can make himself comfortable there in all weathers. These courts are naturally largely patronized. Elevators ascend to the upper floors, and, in short, the conveniences of a high-class hotel are placed within reach of a man earning his $8 or $10 a week. In these model "poor man's hotels" the solution of the problem of better housing for the working classes seems to have been reached, so far as the single men are concerned. Judging by the experience with Mills House No. 1 they are decidedly profitable investments, while they give to the poor and respectable worker a comfortable, wholesome dwelling with advantages and even luxuries that he could secure nowhere else for the same money.

THE announcement of the New York State College of Forestry, at Cornell University, contains a great deal of valuable information relative to the courses of study in that institution. The College of Forestry was established by an act of the State Legislature in April of the present year, the object being to "furnish instruction in the principles and practice of forestry and to provide facilities for the education, especially of managers of forest properties." There are fundamental and supplementary courses in forestry, and the resources of the entire university are practically at the disposal of the college by the action of the Board of Trustees. Among the faculty and filling the chair of Professor of Forestry is Bernard E Fernow, well known as the Chief of Division of Forestry in the United States Department of Agriculture, at Washington.

AN EXAMPLE OF SUBURBAN ARCHITECTURE.

OUR half-tone supplemental plate this month represents a row of cottages pleasantly located in the residential section of one of the enterprising towns in the State of Connecticut. The house shown in the foreground is the subject of the illustrations which appear upon this and the following pages. It will be seen that it is a two and a half story frame cottage of pleasing exterior, and it was erected at a cost which is likely to render it especially attractive to very many of our readers. The building has stone foundations with brick underpinning, and the frame is covered with shingles and siding, as indicated on the elevations. The cellar has cemented bottom, and is partitioned off for heater, coal bins, vegetable room, &c. On the first floor are reception room, dining room and kitchen, besides a commodious stair hall, the arrangement being such that direct communication is readily established between the kitchen and the front door without the necessity of passing through any other rooms. Another feature of the plan is the location of the reception and sitting rooms, which gives the occupants a front view from both, this arrangement being highly appreciated in many localities. In fact, the author of the design states that he has duplicated this arrangement of rooms five times owing to its popularity, but has, of course, changed the exterior to suit different tastes. The location of the main stairs brings the landing on the second floor at the center of the house, thus permitting of regular and good sized sleeping rooms on that floor. In the attic is a sleeping room with space for storage of trunks, &c.

The entire first floor and bathroom are finished in brown ash, and the second floor in white wood. All wood work is filled and varnished two coats, the last coat on the first floor being rubbed down to a dull finish. The kitchen and bathroom have hardwood floors, while the rooms in the rest of the house have pine floors, those in the first and second stories being double. The plastering is one coat brown mortar and skim coat finish. All plumbing is of the open work type with nickel trimmings. The exterior of the house is painted two coats, lead and oil, while the heating is by means of hot air.

The cottage here illustrated was completed a few months ago for W. V. Blair of Meriden, Conn., in accordance with plans prepared by D. Bloomfield, architect, 129 State street, of that place.

Front Elevation.—Scale, ⅛ Inch to the Foot.

An Example of Suburban Architecture.—D. Bloomfield, Architect, Meriden, Conn.

Making Blue Prints.

The extent to which blue prints are used at the present time by the architectural profession renders interesting the following description of the process of making them, as advocated in an English contemporary:

In the first place, sensitize the paper with the following solution: Ten fluid ounces of distilled water, 1 ounce of soluble citrate of iron (or else double citrate of iron and ammonia) and 1 ounce of red prussiate of potash. Mix these ingredients when required for use, and brush the solution over the surface of the paper to be sensitized as uniformly as possible. The sensitized paper should be kept in the dark out of the reach of light until it is required for use, the process of which is as follows:

Cover a drawing board with two or three thicknesses of blanket, and upon this place the sensitized paper, with the sensitized side uppermost; then lay the drawing to be copied, which should be on tracing or other transparent paper, on the sensitized sheet of paper. Lay a piece of glass over the drawing, and press it firmly and evenly down, so as to make every part of the drawing and sensitized paper to be and remain in contact. These operations should be carried out in a dark room; then expose the whole to clear sunlight from four to six minutes in summer, six to ten in winter, and, in the absence of sunlight, for 30 minutes under a clear sky. Remove the drawing from the sensitized paper, and pour water over the latter from one to two minutes, so as to thoroughly saturate it, and then hang it up to dry, when the yellowish bronze color will become darker, and the lines of the drawing still darker; the sensitized surface becomes of a blue tint, with the lines of the drawing in vivid contrast.

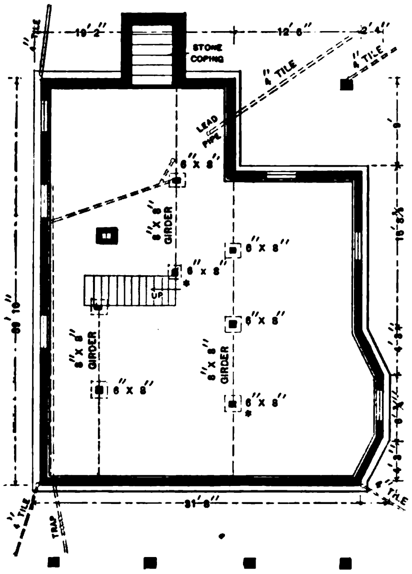
Instead of the above sensitizing solution, the following mixtures can be kept ready prepared, and mixed when wanted for use:

Solution (*a*): Dissolve 1 ounce of citrate of iron and ammonia in 4 ounces of distilled water; keep this in a stoppered bottle.

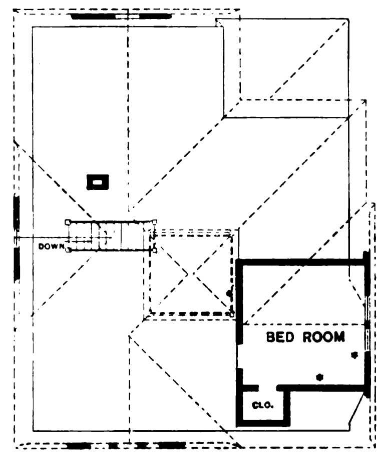
Solution (*b*): Dissolve 1 ounce of potassic ferrocyanide (red prussiate) in 4 ounces of distilled water, and keep in stoppered bottles. When wanted for use in sensitizing the copying paper, mix equal quantities of (*a*) and (*b*), and either float a sheet of paper in a bath of the mixture, or else brush or sponge it over evenly.

Blue prints obtained by the above process may be changed to green by the following method: Solution (*a*): A crystal of nitrate of silver as large as a pea, 8 ounces of distilled water. Solution (*b*): One fluid ounce of hydrochloric acid, 8 fluid ounces of water. Solution (*c*): Potassic iodide solution (1 ounce of potassic iodide, 8 ounces of water), saturated solution of bichloride of mercury water. To prepare this solution add as much of the potassic iodide solution to the bichloride of mercury one until the red precipitate is just redissolved, then reduce the resulting solution with four times its bulk of water. Solution (*d*): One dram of iodide of potassium, 16 ounces of water.

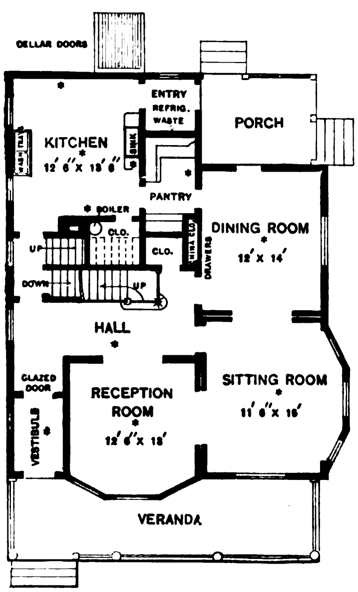
The method of using is as follows: Dip the blue print in a bath of solution so as to bleach it until the blue lines turn either a pale yellow or else slate color;



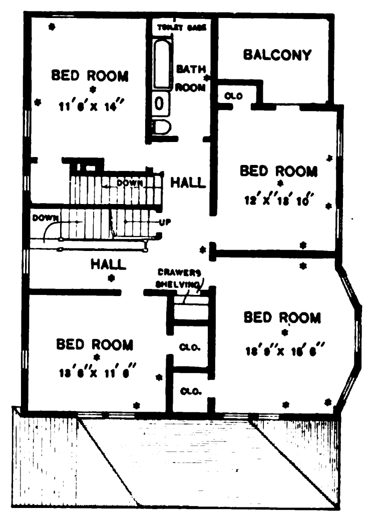
Foundation.



Attic with Outline of Roof Plan.



First Floor.

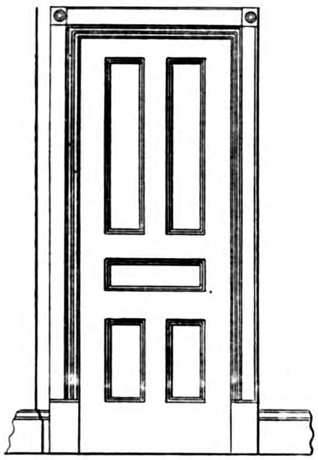


Second Floor.

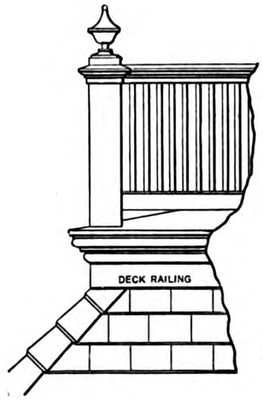
An Example of Suburban Architecture.—Floor Plans.—Scale, 1-16 *Inch to the Foot.*

then wash the print thoroughly in water and dip it in solution (*b*). This will restore the blue printing. Next, without washing, put the print into solution (*c*), when the printed lines will be of a green color; but the "whites" of a yellow color. Then put the print in (*b*) again, without washing. Next pour solution (*d*) over the print to purify the white, and give the green image a bluer tint. Do not let the print remain in this solution too long, or it will become blue again.

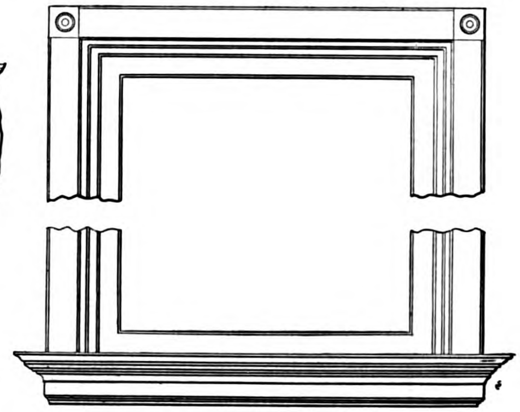
To produce copies in black lines on white ground, the following method is suggested: Prepare the sensitizing bath by dissolving in 47 ounces of distilled water 4 ounces of tartaric acid, 5 ounces of sulphate iron purified crystals, 10 ounces of perchloride of iron (45 degrees Be.), 3 ounces of common salt (sodic chloride), 25 ounces of gum. For the developing bath use a solution of red or yellow prussiate of potash (*i.e.*, ferricyanide or ferrocyanide of potassium). It does not matter whether this solution be alkaline, acid or neutral. After removal from this bath, wash the paper in water to free it from excess of prussiate, and then dip in a solution of acetic, hydrochloric or sulphuric acid. To take copies of the drawings, sensitize sheets of paper by dipping them in the sensitizing bath and then drying them in the dark. Then put this sensitized paper in the photographic printing frame, and lay over it the drawing which it is desired to copy, and expose the frame to sun or strong light. Then remove the sensitized paper, and dip it in the prussiate solution to develop the printing, and afterward pass it through water, and finally dip it in the acidified water, and dry. The parts of the sensitized paper which did not receive



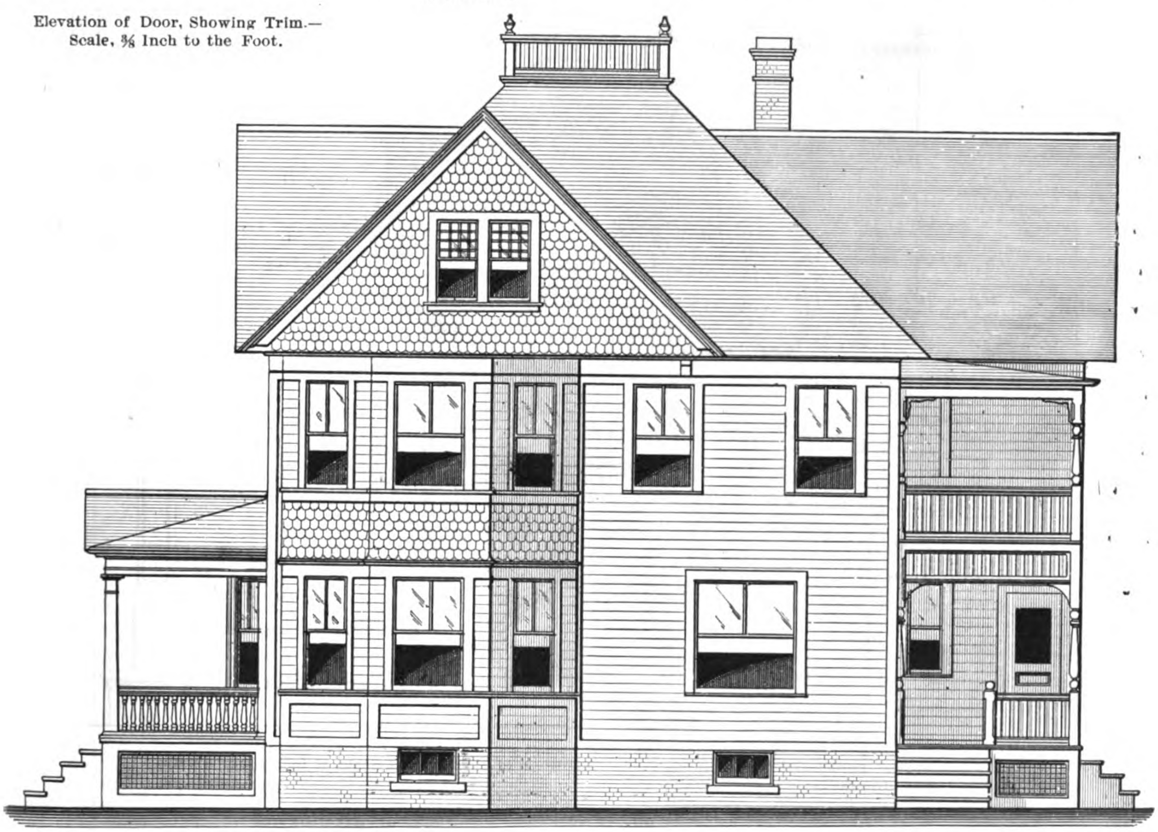
Elevation of Door, Showing Trim.—Scale, ⅜ Inch to the Foot.



Detail of Deck.—Scale, ⅛ Inch to the Foot.



Detail of Window Trim.—Scale, ¾ Inch to the Foot.

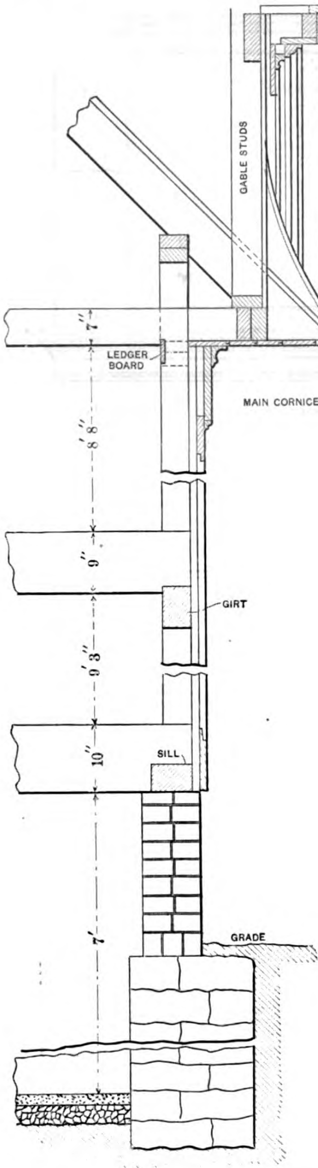


Side (Right) Elevation —Scale, ⅛ Inch to the Foot.

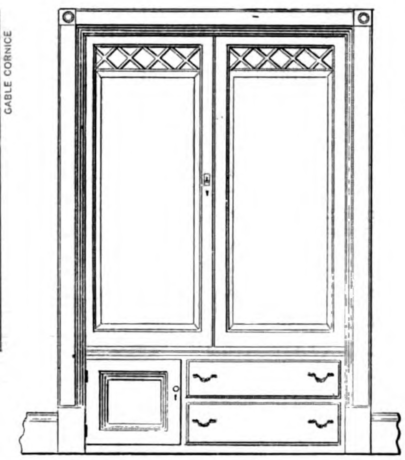
An Example of Suburban Architecture.—Side Elevation and Miscellaneous Constructive Details.

the light will take a dark green color; but the other parts do not change. After washing, however, the lines which have been printed on the sensitized paper will be of a deep indigo or black color.

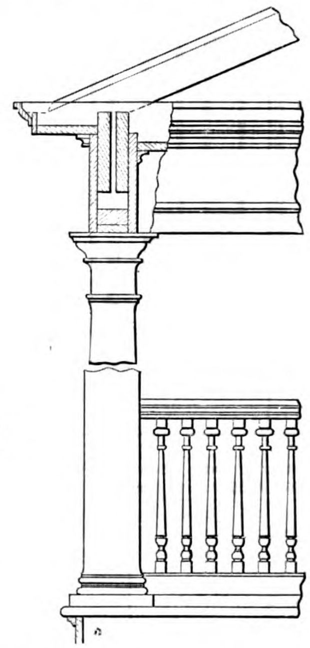
To change blue printing on a white ground to black proceed as follows: Make a solution of potash by dissolving 1 ounce of common potash in 25 ounces of water, and dip the blue printed proof in this solution, when the blue figures will assume a rusty brown color by conversion into iron oxide; then dip this proof in a solution composed of 1 ounce of tannic acid and 20 ounces of water. The brownish oxide of iron will be changed to a black color by the tannic acid, and this is fixed by washing the print in pure water.



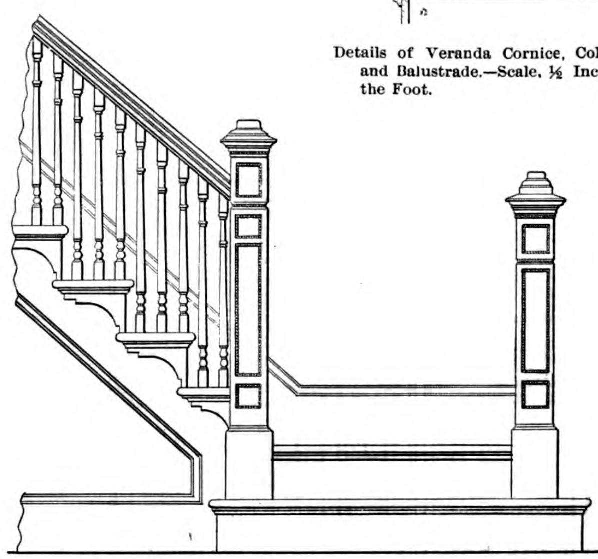
Section Showing Main Cornice, Foundations, &c.—Scale, ½ Inch to the Foot.



Elevation of China Closet.—Scale, ⅜ Inch to the Foot.



Details of Veranda Cornice, Column and Balustrade.—Scale, ½ Inch to the Foot.



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

Miscellaneous Constructive Details of an Example of Suburban Architecture.

The Tendency in Wood Carving.

In wood carving the modern tendency to great speed, while it makes impossible the development of elaborate details, has the effect of increasing breadth of style, crispness of outline and contrast of effects. Every stroke must be made "to tell." The play of light and shade must receive great attention, for without this a quick sketch (which necessarily lacks finish of details) becomes utterly worthless. By the quickest processes, character and expression are gained by both lines and clearly cut, contrasting relief. A few generations ago, as the story is told in the *Art Amateur*, when a piece of high relief was to be executed a strong arm was needed to gouge out the spaces between the parts of the design down to the background, and this background was not always of one level. Sometimes it sunk in spots below the general level, and again was allowed to remain much higher to gain the desired effect. Later the jig saw was invented, and the spaces between the parts of the design were jigged out of a slab of wood, which was then glued on to the background and the modeling of the design proceeded by hand. Since then the wood carving machine has greatly facilitated the work.

FRAME RESIDENCE OF MR. W. V. BLAIR IN MERIDEN, CONN.

D. BLOOMFIELD, Architect.

SUPPLEMENT CARPENTRY AND BUILDING, SEPTEMBER, 1898.

THE CONTRACTOR AND BUILDER.

WE have pleasure in laying before our readers the following communication dealing with the contractor and builder as viewed from the standpoint of the architect, and contributed by T. Buckler Ghequier of Baltimore, Md.

It was a canny Scotchman, Robbie Burns, as he is affectionately called yet among the Ayrshire people, who penned that oft quoted verse about what fools we would discover ourselves to be if we could only see ourselves with others' eyes. And surely if we could hold a mirror up to our daily actions and view them by the broad, reflected sunlight of the world's fairly given criticism, we would, for very shame, be prevented from doing many things that our perverted minds think right, or that we do to aid our selfish ends, hoping to escape detection.

It is this very criticism, if given and taken in a friendly way, that purifies the air, that seeks out, as the sunlight does, the unhealthy places and shows what needs correction. If our systems are out of order it may be like a medicine to us in the taking, but it may also prove, as it does, a wholesome mouthful. *Carpentry and Building* has had its fling at us professional men, sometimes by way of poking fun at us, at other times by means of cutting, sarcastic remarks that hurt, and perhaps for that very reason deserved the more consideration. Heaven help the professional or any other kind of man that must have his pills sugar coated; whose egotism puts him beyond correction; whose self sufficiency has so hardened the coatings of his stomach that, even after taking the medicine, it produces no effect.

All Have Faults.

We all have our faults, but the eternal fitness of things is disturbed by conflict or ill feeling between the architects and contractors. The very word architect means head builder, and the mere fact that he uses his hands drawing on paper with a pencil, instead of laying brick or slinging on plaster, does not in the least alter matters. But it must be remembered that he is *the head* and in certain directions must have absolute power. Assuredly no one but himself knows just how to carry out his designs, nor can the majority of workmen appreciate the pain he feels when he finds some pet idea of his—the product, perhaps, of hours of thought—put into execution in a slovenly manner. But his authority need not and should not make him a dictatorial autocrat. Good fellowship and sociability are appreciated by the majority of the building confraternity if shown in the right spirit. As an honorary member of the Builders' Exchange I make it a rule, showing my appreciation of the compliment, to attend all the quarterly meetings (or "eatings," as a wag terms them) of that body. A good supper is served, which helps sociability, and afterward questions of much practical interest are discussed in an earnest and frequently very intelligent manner. Some few months ago this exchange was honored by a visit and discourse from the clever secretary of the National Exchange, Mr. Sayward. When I was introduced to him by our local secretary, Mr. Miller, he jokingly remarked, "What! architects here! This is unheard of. Why, I was prepared to pitch into them. I can't say half of what I intended." Mr. Miller smiled and replied, "The architects are our best friends; we can't let you say anything against them." I felt that I was in the right place, and I wished that every architect in Baltimore had been present to enjoy the sound good sense of the discourse that followed.

I desire to say right here that in some 20 years' experience with many contractors and sub-contractors I have met with but one or two instances of unfitting treatment or intentional dishonesty. Nor have I ever had any trouble regarding liens or debts contracted. I have encountered stupidity, carelessness and ignorance, but these were the very worst. I think this good record is largely due to the courtesy, confidence and consideration we architects have shown. Like begets like, and if architect and client start out with suspicion and the idea that all contractors are dishonest if they get a chance they are likely to suffer for it. No man likes to be considered a rascal, and it is time enough to draw the rein, all proper preliminary safeguards having been taken, when there is evidence of evil intent. So that having expressed myself so favorably to the builder in the concrete, I can hardly be called to account if I criticise in detail a few points on which he seems to be at fault.

Architects are sometimes unreasonable, and clients still more so. I was both surprised and disgusted at some remarks one of my professional brothers once made. I asked him regarding the progress of some work he was doing at a distance. "I found the work well done," he replied; "but it would never do not to make some complaint. My client would have thought he was paying for nothing. So I ordered various changes to be made." There could have been taken no surer course to incur ill will and to insure slighting of the work. Even an angel would hardly be proof against such injustice.

I have just been glancing over an article of mine, entitled "Our Workmen," published some years ago in the *American Architect and Building News*, and also over a lecture entitled "The Labor Question," to see if any new developments and experiences had changed my views. Practically the outlook is the same, modified, it may be, in some slight degree by the continuous growth and solidarity of the trades unions and by the influence of the manual training schools, but personality is the same, and the average builder has not changed very greatly in the last generation.

Carelessness.

I have said above that carelessness, stupidity and ignorance are the three great rocks on which too often shipwreck is made. The first of these proceeds in a large degree from lack of enthusiasm and interest. The governing ideas in most building work are haste and money making. There is no regard for the business in itself; no pleasure in watching the growth of the edifice; no desire to make it thoroughly good in every particular; no breadth of conception as to the part it plays, be it a palace or a hut, in the general economy of the world; no humble following of the processes of nature, which after all is the proper guide, noting how in everything her work is perfect and nothing slighted or carelessly handled. If every building could have the loving attention (not of necessity sentimental) it deserves, what a revolution would be worked in a short time.

(To be continued.)

A Glass Hospital Ward.

An "aseptic" ward in one of the London hospitals is said to contain some rather novel features. It is 14 x 11 feet in area and 13 feet high, being intended for only one patient at a time. The walls and ceiling are of enameled glass, with rounded angles, and the floor is of marble mosaic, with angles also rounded. A plate glass window, with outside blind, forms three-fifths of the west wall; the door is of ground glass, and the frame—the only wood about the ward—is of hard teak. No pipe or drain opens into the ward, and great care has been taken with the ventilating arrangements, the ward being also cut off from the rest of the hospital by a ventilated lobby. The bed, chair, patient's locker, &c., are of metal. Everything in the apartment can be washed in hot water without harm of any kind, and it is suggested that future houses will be provided with the most complete protection against the growth or entrance of any description of harmful germs.

NEW YORK'S TALLEST OFFICE BUILDING.

UP to the present time the tallest office building in this country, if not in the world, is without question the structure located on Park row, opposite the Post Office, in this city, which is being put up by the Ivins Syndicate, in accordance with plans prepared by Architect R. H. Robertson. As the structure is now under roof, the steel work fully inclosed, and the interior rapidly being made ready for occupancy, it may not be without interest to present some particulars regarding its constructive features. It has a frontage on Park row of 104 feet, 20 feet on Ann street and 48 feet on Theater alley. The main portion of the structure is 26 stories from curb to roof with four stories in each tower, and counting those in the domes and lanterns above them, together with cellar, basement and sub-cellar, there is a total of 33 stories from the foundation to the extreme portion of the accessible interior. The hight from the street level to the same point is 391 feet, and from the street level to the top of the main cornice 336 feet. The main front on Park row is of the Renaissance style of architecture, with a wide reveal in the center which extends to the heavy main cornice at the roof and is crossed by a belt course at intermediate stories. The two sides of the structure form projecting pavilions which terminate in circular towers above the roof line, with smaller octagonal turrets surrounding them. Doric columns three stories in hight are ornamental features of the front at the street level, these being capped by a Doric cornice. At the fourth story are four sculptured figures of heroic size. The front walls to the top of the third story are of granite; thence to the top of the sixth story of Indiana buff limestone, and from thence to the top of the cornice they are of brick with stone and terra cotta trimmings. The roof is covered with concrete to a depth of 4 inches above the flanges of its girders.

The Foundations.

The excavation for the foundation was carried to a depth of 34 feet 4 inches below the curb, heavy sheet piling being first driven around the edge of the opening and other necessary precautions taken to avoid endangering the safety of adjacent structures. In the case of a six-story building on one side, however, structural weakness developed to such an extent that it was necessary to remove the party wall, support the outer ends of floor beams on girders and shores and rebuild the foundations and brick work. In order to secure a stable support for these walls during and after the excavation of the new cellar, they were carried on bottom sills which rested upon the tops of 6-inch wrought iron pipes 4 feet apart and about 20 feet long, which were jetted down under pressure until they were sufficiently below the proposed bottom of the excavation, and were considered to have developed enough skin friction to secure their stability. They were sunk in 10-foot sections, coupled together by outside screwed sleeves.

Before the construction of the steel work was commenced tests of the site were made by water jet test pipes, which indicated the presence of a uniform bed of fine wet sand extending about 95 feet to hard pan, or bed rock, and in this sand about 3900 spruce piles were driven about 18 or 24 inches apart on centers in the closest position, and were calculated to receive a maximum load of 16 tons each. These were capped with granite blocks 10 inches thick and brick piers loaded to 15 tons per square foot. Over an area of 15,000 square feet covered by the structure is distributed a total load of 65,200 tons. Of this about 3740 tons is estimated for possible wind pressure resulting from a computed pressure of 30 pounds per square inch upon the exposed surface of buildings and 9000 tons for the weight of the steel frame work. Around the tops of the piles concrete made of 1 part sand, 2 parts Portland cement and 5 parts broken stone was rammed to a depth of 1 foot. The grillage beams were set on granite caps in a ½-inch bed of Portland cement mortar, and where spaces of more than ½ inch existed between the beams and the caps they were supported on layers and cross layers of thin, flat steel bars with the interstices filled with grout.

The grillage beams receive their proportionate parts of the sub-structure either direct from the extended bases of single columns in the cases of small piers, or from sets of piers through multiple webbed plate girders distributing the loads over the larger piers. The 66 lines of columns are built of angles and plates in box section, heavily web spliced in alternate lines at every second story. The floor girders and beams are rigidly riveted to them, and being trussed with systems of diagonal rods virtually form horizontal diaphragms with a continuous hollow brick floor construction to resist lateral strains. There are also sets of diagonal braces in the vertical planes of some of the interior columns which continue to constitute vertical trusses to resist the pressure of wind strains, against which the building is additionally stiffened by heavy lattice girders built into the exterior walls and around the open courts. The lanterns and domes have frame works of steel columns, beams and curved riveted ribs, and are covered with 18-ounce copper on steel frames. The heavy cornices are made of stamped copper carried in iron brackets cantilevered out from the main construction.

Walls and Columns.

The outside wall columns are carried 2 feet above the roof beams and connected with a belt course of 3-inch channels across their top under the coping, into which the terra cotta balustrade is securely doweled. All the columns throughout the building are fire proofed with 4 inches of brick work. The inside of all the walls below grade that are exposed to contact with natural or filled earth is faced with hollow brick bonded by headers extending into the main brick wall at every sixth course. All of the sub-structure is covered to a hight of 2 feet above the excavation with a triple layer of hot asphalt and paper. Four layers of the same water proofing material are also laid on top of the ¾-inch tiles composing the roof surface.

The floors are built of 10 and 12 inch hard burned hollow end construction tile, laid in cement mortar and filled in above with concrete composed of 8 parts cinders, 2 parts sand and 1 part cement, the whole weighing 65 pounds per square foot for the 15-inch beam construction and 45 pounds for the 10-inch beams, all floors being constructed to carry a load of 200 pounds per square foot. The skewback tiles are lipped to protect the bottom flanges of the beams, and all partitions are built of hollow tiles which are 3 inches thick. All the mortar used throughout the building is made of washed sand and 1 part Atlas Portland cement mixed dry by machinery, and delivered in bags to the building, where it was distributed as required and wet to the proper consistency in tubs adjacent to the places where it was used.

The building when finished will be equipped with ten main passenger electric elevators, besides which there will be an elevator in each of the front towers which will run from the twenty-sixth to the twenty-ninth floors. The water supply is derived through two 4-inch connections with independent street mains, and after being filtered is pumped into 20,000-gallon storage tanks at the top of the building, from whence it is distributed through a single system of down supplies controlled by a series of valves in the cellar. Heat will be furnished by direct low pressure or exhaust steam radiators, operated by a 16-inch main in the basement.

Elevator Air Cushions in Office Buildings.

WITH all the experience and skill which have been devoted to the study of elevator safety appliances, with the best material and workmanship with the most rigorous and continuous systems of inspection, and with competent persons in charge, passenger elevators sometimes fall and cause more or less serious accidents. The manufacturer of elevators uses the best and most efficient safety devices he can obtain to control the movement of the car and to surely arrest it if a certain speed should be exceeded. The very nature of his business compels him to do this, because the result is financial embarrassment to him if his elevators drop occasionally. This applies with equal force to owners of buildings, who would have difficulty in securing tenants if the elevator apparatus were suspected of being dangerous. Many even go beyond the purely mechanical device and introduce a pneumatic arrangement as a last resort—only to be brought into action when all else fails.

The air cushion, located at the bottom of an elevator shaft, possesses peculiar inherent advantages which cannot be gainsaid. First and most essential, it is always ready instantly to perform its work and to do it successfully under all conditions. Of itself it cannot get out of order, since practically it is only a hole into which something may drop some time. Whether the car dropped one or twenty stories its movement would cease, not suddenly, but gradually and without shock. The first cost of the air cushion is small and the outlay for its maintenance *nil.* It occupies space not otherwise valuable. All things considered, it is difficult to understand why it is not more widely employed.

One of the most extensive and elaborate applications of the elevator air cushion is to be found in the Empire Building, at Broadway and Rector street, New York, designed by Kimball & Thompson, Manhattan Life Building, New York. The elevators were installed by Otis Brothers & Co., New York, and the air cushions were designed by F. T. Ellithorpe, 136 Liberty street, New York.

The building is a 20-story office building, recently completed and provided with all the most modern appliances and conveniences. There are ten elevators, of the high speed hydraulic type, arranged in two groups of five each, one group being shown in sectional plan in Fig. 3. While nine of the elevators are distinctly for passenger service, one is more powerful and is capable of lifting safes weighing 8000 pounds. Each shaft is entirely independent from the floor of the third story to the bottom and is inclosed by walls which are not perforated except by the door openings. This forms the air cushion proper, which, as indicated in Fig. 4, is about 50 feet in depth. The doors of the main floor, Fig. 1, and of the second floor are in two parts which slide in recesses in the wall. They are of bronze and of ample strength to resist the air pressure that would come upon them if a car should fall The usual open iron work is entirely absent on these two floors, solid masonry replacing it. The cars have also been strengthened with the view of resisting this pressure. By consulting Fig. 4 it will be noticed that the shaft walls are battered for a short distance below the third-story floor. The shaft at this point is 10 inches wider than the bottom, the batter extending just below the second floor. This provides a graduated air escape and adapts the cushion to any fall which the car may make. The car fits more closely in the lower portion of the shaft, the walls of which are vertical. It has been estimated that the air cushion should be in proportion of 1 to 6 of the travel; in the present instance the cushion is 50 feet and the travel 287 feet. In the bottom of each shaft is a suction valve which opens inwardly as the car ascends, thus preventing the vacuum which would result from the car

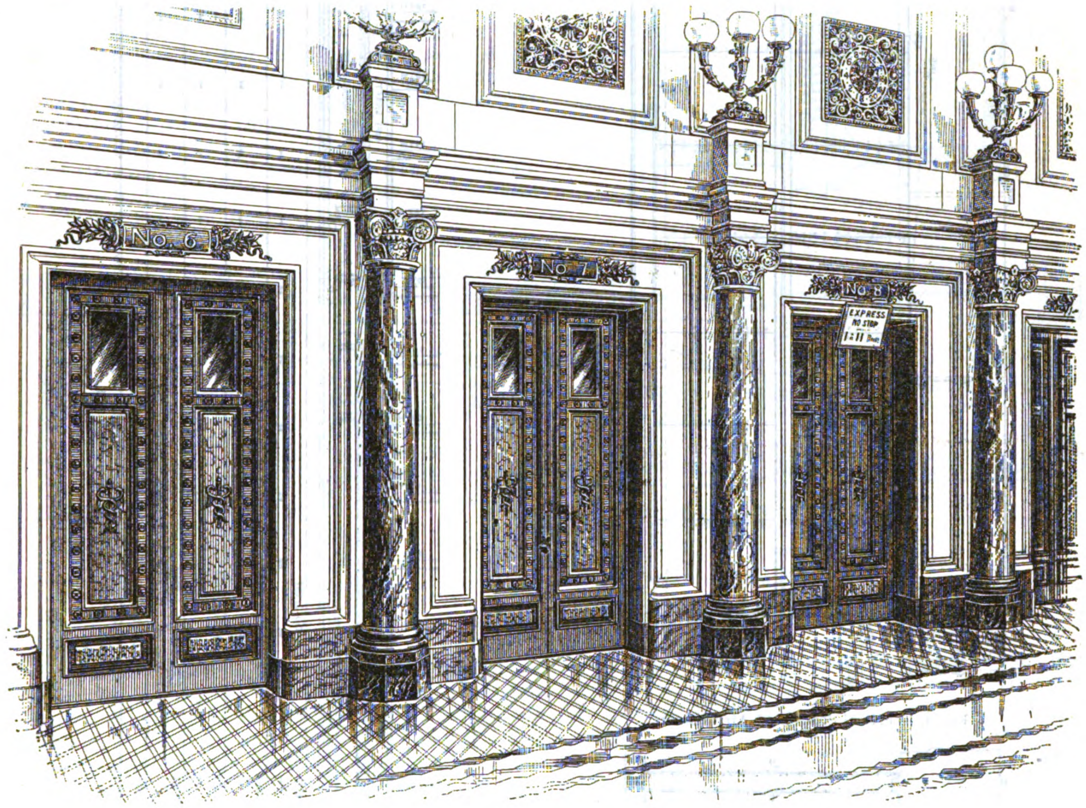


Fig. 1.—View of Elevator Openings on Main Floor of Empire Building.

Elevator Air Cushions in Office Buildings.

leaving the cushion. There is also an Ellithorpe improved escape valve, Fig. 6, which opens outwardly into the atmosphere. It is so adjusted as to sustain the weight of a car under ordinary conditions, but will, in case of accident, relieve the cushion of undue pressure when the car falls. It has been calculated that the pressure in the air

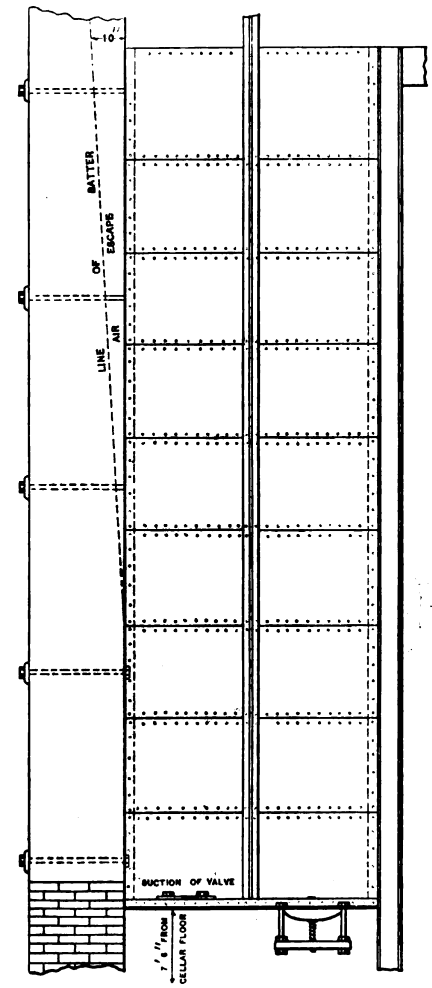


Fig. 4.—Vertical Section of Air Cushion.

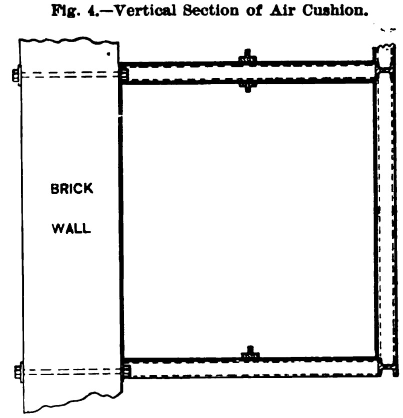


Fig. 5.—Plan of Air Cushion.

Elevator Air Cushions in Office Buildings.

cushion if a car should fall from the top would be 3½ pounds to the square inch.

On July 18 a car weighing 2000 pounds was dropped from the twentieth story. The efficiency of the cushion was shown by the fact that the eggs and incandescent lamps carried upon the floor of the car were uninjured.

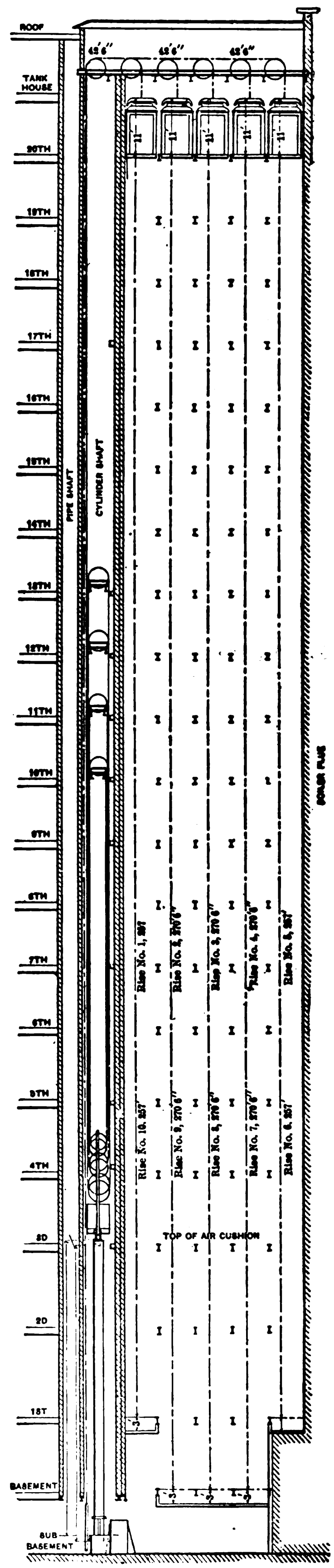


Fig. 2.—Vertical Section of Elevator Shaft.

Preparing Tracing Paper for Architectural Use.

Tracing paper may be prepared for architectural use by taking common tissue or cap paper of any size, laying each sheet on a flat surface and sponging over one side with a solution composed of 2 parts of Canada balsam and 3 parts spirits of turpentine, to which a few drops of old nut oil has been added, taking care not to smear any part of the surface of the sheet. According to one of our foreign exchanges a sponge is the best instrument for applying the mixture, which should be used warm. As each sheet is prepared, it should be hung up to dry over two cords stretched tightly and parallel about 8 inches apart, to prevent the lower edges of the paper from coming in contact. As soon as dry the sheets should be carefully rolled on straight and smooth wooden rollers about 2 inches in diameter covered with paper. The sheets are dry when no stickiness can be felt.

In order to render tracing paper more translucent so as to allow the finest lines to be seen through it, soak it in benzine by means of a cotton pad so as to thoroughly permeate the fiber. For rendering opaque drawing paper translucent so as to permit of a photographic image of a drawing done on it to be depicted on some of the highly sensitized papers, there is nothing better than to saturate it with benzine. As this rapidly evaporates the paper will resume its normal opaque appearance without showing any trace of the treatment to which it has been subjected.

Another process of rendering ordinary drawing paper transparent consists in dissolving a given quantity of castor oil in one, two or three volumes of absolute alcohol, according to the thickness of the paper, and applying it by means of a sponge. The alcohol evaporates in a few minutes, and the tracing paper thus made is dry and ready for use. The drawing can be made with lead pencil or India ink, and the oil removed from the paper by steeping it in alcohol, when the paper assumes its original condition.

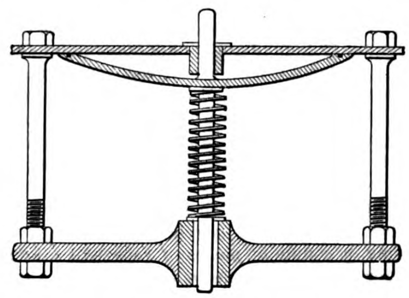


Fig. 6—Escape Valve in Bottom of Shaft.

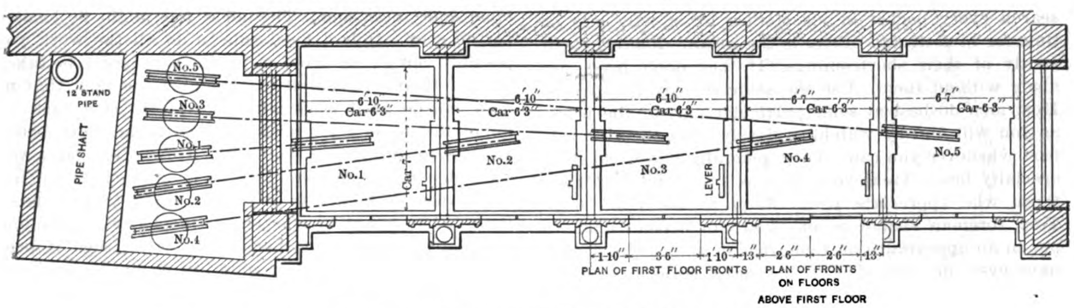


Fig. 3.—Sectional Plan of Half of Elevator Shafts on Main Floor.

Elevator Air Cushions in Office Buildings.

Strength of Scaffolding.

I have been very particularly impressed of late, writes an English authority, with some of the methods carpenters adopt when scaffolding from windows of brick buildings, and have noted that there is scarcely enough consideration given to this important detail of construction. I find that there is a great deal too much reliance placed on old and unsafe timber and nails, without considering the statical conditions to which the timbers may be or are subjected, with the too often result of a break and an accident. This mostly occurs in using the plank scaffold from windows, which consists of projecting about one-third of a 3 x 9, 3 x 10, 3 x 12 or 3 x 14 inch spruce plank placed on edge outside the wall line, and securing the inside end to the floor beams with wood or iron ties, so as to form, as it were, a bracket outside the wall. The scheme is excellent and one of the greatest utility for setting cornices or laying bricks on high buildings or where it is not possible to use the pole and pulley scaffold, but it should be done carefully and I would recommend the following suggestions to all carpenters: Examine the planks if they be spruce or pine very carefully, and see that the grain is long and that the fibers are overreaching and sound. Examine for curly grains or short diagonal cross grains, as all such are unsafe and impair the elastic strength of the timber. A good test is to grasp the plank by one end, drop the other end violently on a steel beam or on the ground. If there be a brittle spot in the timber it will fracture or make a sufficient cracking sound to signify its weakness. Sounding it on the end with a hammer is not to my mind a safe test, as it may ring sound yet be weak beyond two-thirds its length, but the blow will tell if it rebounds after the impact. Oftentimes it happens that scaffolds of this class are formed of masons' scaffolding planks covered with old lime or cement mortar so that it will be impossible to examine the grains. In this case each may be examined by springing them sidewise or edgewise, but masons' plank are generally well tried or seasoned and may be relied on with but a superficial examination. Split plank or hemlock plank, dozed plank or very knotty plank should never be used for scaffolds, and I have known many men to skimp the nailing together of their scaffolds, and in several cases pay for their temerity with their lives, all for the want of a few extra nails. In concluding these few suggestions, I would state that I am very much opposed to the prevailing practice of scaffolding from each window with one bearing plank without a supporting brace to prevent its springing, and if overweighted its subsequent fracture, so if possible a brace should be carried down to the window below.

A READY means of taking a *fac-simile* copy of a drawing done in ink which contains a salt of iron or copper it to lay over it a sheet of paper which has been moistened with yellow prussiate of potash and pressing on it, when the iron or copper salt will react on the paper and leave a copy wherever it comes in contact with the ferrotype paper.

WORDS FOR THE YOUNG BUILDER.*

By L. J. AIMAR.

NOW that we have negotiated for our materials, the next step will be the preparation of the site. You have, as a matter of course, been over the ground before this, and if your contract covers the excavating and grading you have decided what disposal you will make of the earth from the cellar. If you need it on the premises don't place it in the way of your other operations, or make rehandling necessary, for this may cost as much as taking it from the cellar, consequently making the cost of excavating one building what it might have been for two. Piling your lumber in disadvantageous places adds to the cost as well. I doubt if you would do this yourself more than half a dozen times before knowing better, but others will do it for you unless you keep your eyes open, when cuss words may ensue, which is unbecoming to your dignity as a contractor, to say the least. Have your bricks, stone, &c., placed as near the foundations as possible. Material of every description should be well taken care of, piled straight and even, and protected from the weather at all times. When you get to framing have proper facilities for your men to work on. It costs much less to have proper saw horses, &c., than to have them straddle a pile of bricks or timber or stand on barrels and nail kegs to work. In raising, a couple of pieces of rope will save a man's wages for each day while in use. While I think of it, give an eye to the fellow who sows nails at each step. He cares but little for you if he won't keep his nail pockets in order. Also beware of the man who has to search every pocket in his clothes for a nail—loss of time for himself and others is the result. Remind them gently of their shortcomings. If they don't heed, get along without them. Use the same remedy for drones. Most men do best at some particular part of the work, as you will find by watching closely. Let them do this part whenever you can. They generally like to do their specialty best. Treat your men as such, and only keep those who appreciate your efforts to use them well. Your foreman should be one you can depend upon to put in an appearance on time, rain or shine. He should have eyes in each side of his head, so as to see all around at once, know where every man is, what he is doing, when he will finish, and have something ready to start him at afresh. He should be capable of reading the plans quickly. His memory must be good, his head level, his eye true and his temper under control at all times. He will have much to do. Your success depends upon him greatly, and each of you should bear this in mind.

Agreements in Writing.

Where you let part of the work to sub-contractors be just as careful as in the original contract. Make your agreements in writing. Have them state plainly what portions they are to do and what materials they are to furnish. Their contract must be one in which they agree to be governed by the plans and specifications entirely in so far as they apply to their parts of the work. They must do the work to the satisfaction of the architect where one is employed, in accordance with the conditions under which you are working. The importance of this is, should any question arise as to the true meaning of the plans or specifications, the decision must apply to them as well as to yourself.

Often an important item is the water required for the mason's work. You can well see the difference in cost between being able to procure it upon the premises and having to cart it a mile uphill. If not, you will at completion. Sand, too, for your mortar is another thing to get in your eye at the start. Sometimes good building sand may be taken from the cellar. If such is the case see that it is not carted away, or you will be made to pay for carting it back again.

In the construction of the modern cottage there will be scores of items not dreamed of by the builder of the past—some of them meritorious, others which are not. Nevertheless as you must be governed by the specifications entirely, the question of merit cannot be taken into consideration by you. The question of cost will interest you, however. It is easy enough to keep posted, as the manufacturers will be pleased to send you catalogues and prices if furnished with your address. With these before you it is easy to make up your estimate and know just where you stand in case you are awarded the contract.

Look After the Shop.

The shop should not be forgotten in the meantime. After you get started at the building you are apt to feel that you should spend most of your time there, no matter how competent your foreman may be. This is natural, and probably wise. Still there will be a number of things at the shop which will need looking after. Much of the finish for the building will be worked out there. You will need a good man here also, not only competent to finish off the work right, but able also to understand the detail drawings and to follow them accurately, and, above all, to be honest and make good use of his time and that of his helpers. In comparison with your outside foreman he should know better how to avoid waste in using his materials, as his cost more. If you are fortunate in securing such a man it will yet be necessary for you to divide your attention between the shop and buildings, for he will need your advice upon many occasions. The office, too, might be located at the shop. It is a good rule to do all the work you possibly can at the shop, as it can more easily be taken care of there. It is well to remember the fact that no man can do good work with poor tools. It is just as impossible to do a job properly upon a bad work bench as it is to cut with a dull saw. How often have you seen men trying to joint a piece of stuff on a bench 1 inch lower or higher in the center than at the ends? Provide the means to sharpen the tools at all times, and good, straight and true benches as well; then if poor work is turned out the trouble lies elsewhere and can be easily located. Now, my young and ambitious brother, if you can memorize these few simple rules, and several hundred others which I have not mentioned, you may live to have the inestimable pleasure of knowing that you have been instrumental in furnishing homes for others, beside which the fact that you have never been able to raise the mortgage from your own (which in your dreams of future fortune you had placed upon it) will fade into insignificance.

I will only add; should success crown your efforts, and you can look back and see where what I have written has benefited you, and after taking all the credit due for your own good management you feel that I have rendered any service, you may cancel all obligations by passing whatever you may have gained down the line. There are many who might have told more interestingly what I have tried to put before you. Be this as it may, the points of importance remain the same, and I would have given much for them earlier in my own life.

THE formal opening of a builders' exchange at New Castle, England, took place about the middle of July, the master of ceremonies being John G. Walker, president, who, in opening the proceedings, said that the idea of the exchange was imported from America by Colonel Bennett of Glasgow, through whose efforts an exchange was founded about three years ago in that city, and had been followed by others in Edinburgh, Halifax and elsewhere. The objects of the exchange were to advance the interests of the trades associated with the building industry, to raise the standard of work and to strengthen public opinion in the aims and objects of their members. The headquarters of the new exchange are in the building with the Arts Club.

*Continued from page 188, August issue.

THE ART OF WOOD TURNING.—II.

By Fred. T. Hodgson.

A PLAN of the lathe complete, with treadle, rest, poppet heads, pulleys and centers, is shown in Fig. 6 of the engravings. From this and the elevation, Fig. 3, a fair idea of the finished lathe may be gathered, but to make the matter clearer I show an end view, Fig. 7, embracing elevation of head and tail poppets. Referring to Fig. 6, B B represent the bearers, W S the stiles connecting the feet F F, while D C show top ends of uprights and H O poppet heads or head and tail blocks. L shows plan of pulleys and T T the treadle attached to back stile of floor frame by a pair of strap hinges. The rest and other attachments are shown, with adjusting set screw, at K. The corresponding parts are shown in end elevation, Fig. 7, the reference letters being the same in both cases. It will be seen that the driving pulley, which answers the purpose of a fly wheel, is constructed of wood, but may preferably be of cast iron, if it can be afforded; so also the driven pulley. The hook, link and other connections between crank and treadle are shown by dotted lines. I need hardly say the transfer of power from driving pulley to the driven pulley is by means of a suitable cord—sash cord in this case—and that the grooves in the pulleys are V shaped. A sectional view of the head block, with adjusting screw and nuts, *e* and *f f*, is shown in Fig. 8, which also shows the bearings *m h*, spindle R R, iron stirrup K, iron washers on pulley *p p*, tional dimension must also be employed in the driven pulley, and care must be taken to have the stepping, A A, exactly the same in both wheels, in order that the same length of cord will answer for any series of grooves when a change of speed is required. Fig. 10 shows a section of the fly wheel, one-eighth full size. The method of construction is shown in this drawing, and it will be seen that the two outside grooved segments are shouldered on to the central arm pieces. The driven pulley is, of course, made solid, as shown at Fig. 8, and is keyed on the spindle or mandrel as shown at *k*. In both pulleys it will be necessary to have steel plates, *p p*, Fig. 8, let into the face in order to give the pulleys sufficient grip of the mandrel and crank shaft to do their work without slipping.

These dimensions and diagrams are taken from an actual example of a lathe built by a young carpenter seven years ago, and who has made several hundreds of dollars in the sale of turned work executed after he had done his day's work, besides doing a lot of fancy turned work about his own little home, some of which I hope to illustrate in these papers.

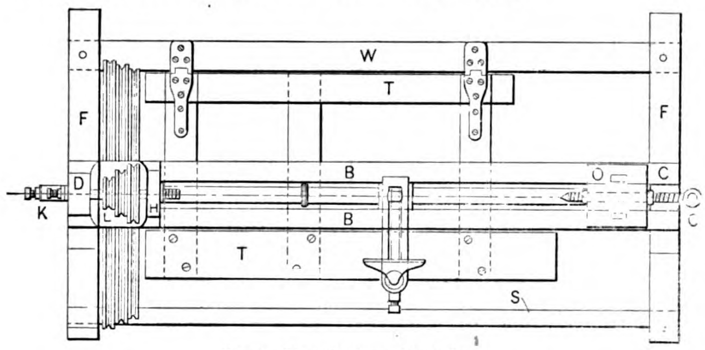


Fig. 6.—Plan of Home Made Lathe.

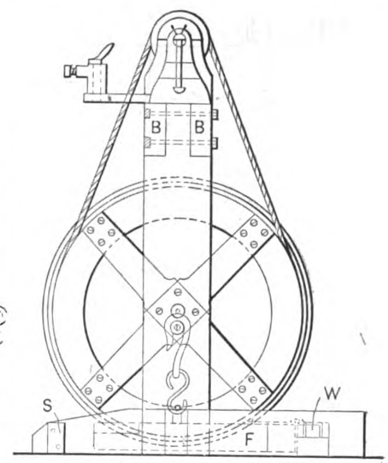


Fig. 7.—End Elevation.

The Art of Wood Turning.—Details of a Home Made Lathe.

and iron wedge *k*, which is to key the driven pulley on to the spindle; *w w* show the screws which secure the iron stirrup to the back standard.

It will be noticed that the movements are all hung on centers, as it is generally understood that this method has the advantage of having less friction than if the bearings ran through the thickness of the timbers represented. This method also has the merit of allowing the movements to be readily adjusted if any of the parts should get out of order. If preferred, however, the crank shaft and the spindle R R, Fig. 8, may pass through the timbers and be supplied with proper adjusting screws. This plan will be a little more economical than the former, but will not give as much satisfaction.

All the metal portions of the lathe, ready to be fitted on the wood work, may be purchased from the manager of any jobbing machine shop. The plates P P, Figs. 4 and 5, and the adjusting set screws should be made of steel, so also should the mandrel and the tightening screw in the tail block; indeed, it would be better to have all the metal work of steel, as the difference in cost as compared with iron is so small as to be scarcely worth noticing, and the steel will give much better satisfaction in every respect. The rest and rest stand may be made of hardwood or of cast iron. If of the latter, the pattern may be made at home, or very likely a suitable rest complete may be procured at the foundry, and if so the cost should not exceed $1.25 for the complete outfit.

Fig. 9 exhibits the rim of the fly wheel, half full size, the diameter being obtained from Fig. 7. The same sec-

The frame and body of the lathe being finished, and the fly wheel in the rough being keyed solid on the crank shaft, the face, sides and grooves may be turned as it hangs on its own shaft, a temporary rest being fitted up on the floor for the purpose. This would not be a difficult job, and I would suggest that a diamond pointed tool be used for the purpose of roughing off the work until the tool cuts the wood at all points, after which a finishing tool may be employed. Care must be taken in forming the grooves, and the beginner must not be too anxious about taking off large shavings. Take light cuts, as in this wheel the grain of the wood will strike the cutting tool at various angles, and trouble will be sure to follow if too deep cuts are attempted.

A temporary or jury pulley may be fixed to the mandrel in order to enable the operator to turn the small pulley, though it is much better to key the pulley in place on the mandrel, and, when possible, have the mandrel and pulley turned together in some other lathe; but where this cannot well be done the temporary apparatus may be employed, or, better still, move the driving pulley or fly wheel a trifle to the left side, and take a cord, string the fly wheel and pass the cord once around the mandrel close to the pulley to be turned, connecting the cord tight enough to drive the mandrel. The driven pulley may now be turned by making use of a temporary rest. When finished take off the cord, move the fly wheel to its proper place, annex the cord as shown in Fig. 7, and the lathe is ready for service.

It must be noticed that the conical angles of the pulleys are reverse to each other, and the greater speed—for soft wood—is attained when the cord is strung over the largest section of the large wheel and the smallest section of the small wheel. The changes of speed are obtained by moving the cord to the different grooves. The cord should be spliced by means of what is known as a "sailor's splice," or the ends may be plaited together and then wound tightly round with very fine copper wire. The "stretch" should be taken out of the cord before it is spliced, as any lengthening of the cord after it is once made to work will cause it to slip around the pulleys when any pressure is brought to bear on the work. If stretching does take place, the only remedy is to undo the splice, cut the cord shorter and splice again.

So far as the wood work is concerned, I think but little more may be said, for the experienced carpenter will be able to finish that part of the machine without any further illustration of details. Should any one, however, who may undertake to build a lathe after the scheme set forth in these papers, require further information or details, I will gladly give such through the Correspondence

performances are almost works of art, and his devices for accomplishing difficult work are many and some of them very ingenious. These devices are attachments, and their costs are, of course, not included in the bill presented.

We now suppose the lathe to be ready to operate, but before we can do anything it will be necessary to provide a prong center or chuck similar to the one shown in Fig. 11. This should be made of steel, and the stem should be made so that it will fit snugly into the recess left in the mandrel, but it must not fit so tightly that it cannot be taken out if desired. The chuck is shown in two positions, A showing it on its flat side and B on its edge. It should be about 1 inch broad on its face, and the center prong should be as near in the center as it can be placed. Another form is shown in Fig. 12, this possessing some advantages over the other. It can be taken out of the mandrel easily and the recess in the mandrel need not be so long. Being thicker or more "stubby" at the prongs, it is less liable to split the work, yet has sufficient grip to hold the work firmly to the tool. In placing work to be turned in the lathe, the center of the stick must be

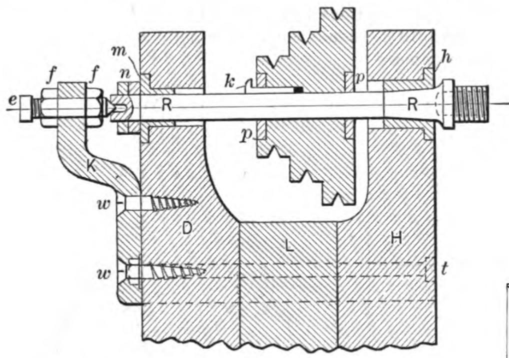


Fig. 8.—Sectional View, Showing Head Stock

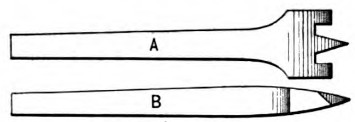


Fig. 11.—Side and Edge Views of Prong Center or Chuck.

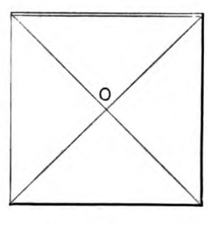


Fig. 13.—End of a Baluster, Spindle or Newel.

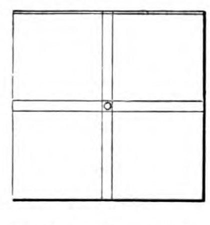


Fig. 14.—Finding the Center of a Piece of Wood to be Turned.

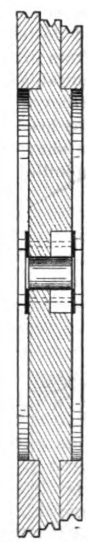


Fig. 10.— Section of Fly Wheel.—Scale, one-eighth full size.

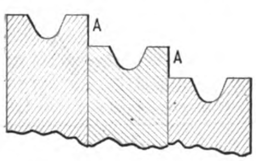


Fig. 9.—Broken View of Grooved Pulleys.—Scale, one-half full size.

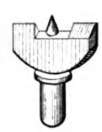


Fig. 12.—Stubbed Prong Chuck.

The Art of Wood Turning.—Details of a Home Made Lathe.

department if the parties wishing for the information will make their wants known.

The best way to get the iron or steel work will be to make some arrangements with a machinist to furnish the complete outfit. This should not cost more than $7 all told. I give herewith a bill of the cost of the lathe complete, as made by the young man from whose machine this description is given, exclusive of his own labor on the wood work:

To 40 feet maple at $20 per M	$0.80
To mandrel and stirrup	1.30
To tail screw	.80
To tightening bolts and nuts	.50
To crank shaft complete	1.10
To centers and nuts for same	.75
To bearing plates and butts	.93
To cast iron rest and stand	1.15
To bolts, screws, strap hinges, &c	.90
To crank connections	.25
Total cost	$8.48

This sum represents the actual amount expended on the lathe, except 11 cents for cord, which is not included in the original bill. The labor of framing and putting together the wood and iron work, I am informed, covered a little over three days, which at $2 per day would represent $6, which would bring up the total cost of the lathe to something less than $15; and I may say the work was performed after hours.

The owner is now an expert turner and some of his

marked at both ends, and the center prong of the pronged chuck must be forced into the end wood at the center, deep enough to give the wings of the prong a chance to enter the wood at least $\frac{1}{16}$ inch. The other or right hand end of the stick must receive the center of the tail screw, which must be forced into the stick by turning the screw until it has sufficient hold to bear the strain of being worked. This will soon regulate itself, as the operator will soon discover how much "hold" the tail screw must have to insure the work being held in the lathe while being wrought.

There are a dozen or more ways of finding the centers of the stuff to be turned, and I show one or two of the methods, all the young turner will ever be called upon to use until he undertakes to try his hand at fancy lathe work, when it may be necessary for him to turn his work from several centers. Suppose Fig. 13 to represent the end of a baluster, spindle or newel, or other similar work; draw diagonal lines from the corners, as shown by the dotted lines, then where these dotted lines intersect, as at *o*, will be the nearest possible line to the center of the stuff. Again, let Fig. 14 also represent the end of a piece of wood to be turned, set a common gauge to half the thickness of the stuff, and make gauge marks as shown; the central square will be the center of the stuff as near as possible. These two examples will suffice for the present.

WHAT BUILDERS ARE DOING.

THE builders in Albany, N. Y., are feeling that there is little hope of improvement in the amount of building being done before next season. In spite of the fact that there has been a considerable number of contracts under construction during the year, it is expected that the total will fall below the average of more recent years. A complication in the office of the Capitol Commissioner threatens to tie up all work on public buildings projected and in course of erection throughout the State. The cause of the disturbance is insufficient appropriation to provide for necessary draftsmen in the Commissioner's office. Commissioner Perry is quoted as saying that with his force so crippled, he cannot begin to do the State work now devolving upon him. In almost every county there is a public building of some kind, either being newly constructed or repaired. Necessarily, work on these must either stop altogether or be so hampered by the delay in waiting for plans and details as to make its progress practically amount to nothing. There are now under way in the State the 74th Regiment Armory at Buffalo, besides armories at Whitehall, Elmira, Auburn, Walton, and, in addition, work on the State Hospital at Ogdensburg, the new insane asylum at Central Islip, Long Island; the asylum at King's Farms, Long Island, and the asylum at Ward's Island, New York City.

Baltimore, Md.

There has been no change in the volume of building under way in Baltimore since the last issue of *Carpentry and Building*, and builders generally are not anticipating much improvement before next season.

The danger and onesidedness of signing a contract containing a penalty clause without a compensating premium clause is indicated by the experience of the contractor for the Mount Royal avenue pumping station. The engineers in charge have decided to enforce a penalty clause upon the contractor, subjecting him to a fine of $100 per day owing to the delay in the stone work. If the contractor had not been delayed and had completed the work at some time prior to the date set for the completion of the work, he would have derived no benefit for the time thus saved the city.

Secretary Miller writes that the Builders' Exchange is endeavoring to secure an extension of the courses taught in the Baltimore Polytechnic School to include the various branches of the building trade. The matter has been under consideration for some time, and notwithstanding the slowness with which the matter moves the exchange hopes to be successful in the end.

Boston, Mass.

General business conditions in Boston are becoming much more active than they have been at any time since hostilities with Spain were begun. Builders are looking forward to a marked increase in the volume of work, although there is much difference of opinion as to whether the increase will be felt before the beginning of next season. Real estate operations are steadily improving in number and magnitude, and it is believed that this condition alone is sufficient warrant for the assumption that an increase in the amount of building will be felt soon.

A peculiar accident resulting in the death of two workmen and severe injury to five others occurred in the South Boston district of the city about the 1st of August. A massive fire proof structure with a single story, but reaching fully 40 feet into the air, was in process of construction at the corner of L and First streets, known as the old shipyard of Harrison Loring. The contractors for the iron work, the Pennsylvania Steel Company, had practically finished, the girders were all in place, the frame work was intact and the fire proof brick were being put in place. The building covers perhaps 3 acres of ground and is divided by a brick wall into two sections, the east and west. The accident occurred in the northern end of the western section, the roof, with its heavy fire tiles and iron girders, falling with a crash upon the men who were working below. It has been exceedingly difficult to fix the responsibility for the accident, owing to the fact that there seems to have been no defect in either material, workmanship or design.

After nearly two years of effort, the Massachusetts State Board of Arbitration has been able to bring about a meeting between the master roofers and their workmen. The employers are unorganized, and for that reason the workmen have been unable to secure a conference with them until now. While there has been no serious stoppage of work, there have been frequent minor disturbances which have caused considerable annoyance. It is expected that some permanent agreement between the contractors and the workmen will now be established.

The Master Builders' Association is contemplating another outing similar in character to that given its members last year, which took the form of a trip through the White Mountains. Several trips of about a week's duration are under consideration, and a selection will be made in time to permit the outing to take place in September or early October.

Brookline, Mass.

The report of Building Inspector Melcher of Brookline shows that during the six months from February 1 to July 31, 1898, there were granted 23 permits for brick and stone buildings, the approximate value being $603,000. During the same period there were granted 62 permits for wood and frame buildings, the approximate value being $428,500; a total for the six months, of wood, brick and stone structures, of $1,031,500. The total value of wood and frame buildings erected during the corresponding months of 1896 was $752,350; in 1897, $638,350. The value of brick and stone buildings erected during the same months in 1896 was $425,500; in 1897, $814,000. It will thus be seen that while this year's total of $603,000 is about $200,000 less than in 1897, it is still about the same amount in excess of the value of similar structures erected in 1896.

The most of the building in Brookline is done by Boston contractors.

Butte City, Mont.

Early in August a strike of bricklayers caused a suspension of nearly all the brick work in the city. The trouble arose out of the fact that the rules of the bricklayers' union prohibited their working for any but recognized contractors, and the fact that the contractor for a new school house now in course of erection was not a regular mason contractor. The School Board declining to do anything in the matter, the workmen struck, the strike subsequently extending to nearly all other brick work under way in the city. The subletting of the sand contract to an "outsider" was also a source of objection by the workmen. A compromise was finally effected and the majority of the men returned to work. The amount of building now under way is considered fairly satisfactory, several large contracts, including a new 290-room hotel, being under way.

Buffalo, N. Y.

Buffalo builders are looking for an improvement in the volume of building during the month of September. It is reported that there are many plans of new work now in the hands of the architects, and that there is some prospect of new work before the ground freezes.

Secretary Almendinger announces that the Builders' Association Exchange will hold its annual outing on September 5, Labor Day, rain or shine. The steamer "Corona" has been chartered for an all day trip around Grand Island, including stops at the various resorts. Luncheon, dinner and supper will be served on board, and it is stated that the refreshments, both solid and liquid, will be of the best quality. The following are the names of the committee in charge: John W. Henrich, Charles Geiger and Peter Ginther.

Chicago, Ill.

Chicago contractors and architects are jointly considering the preparation of a form of contract for the use of owner and builder in Illinois. The new form is to be based largely on the uniform contract adopted some years ago by the American Institute of Architects and the National Association of Builders, and which has been growing into general use ever since. One of the changes, it is stated, will be the addition of a clause permitting the insertion of the names of the persons selected to arbitrate any differences that may arise under the contract, the laws of the State requiring that arbitrators be named when a contract is signed.

Owing to failure to pay the annual fee of $5 required by the new Illinois law for the licensing of architects, over 100 licenses throughout the State were revoked on July 1. The law provides that payment of the fee shall permit the renewal of a license, without which no architect can legally practice his profession.

The condition of the building business is about the same as that previously reported in this department in recent issues. There has been a very satisfactory degree of freedom from labor troubles for several months, and there is no present prospect of an unfavorable change.

Cincinnati, Ohio.

The architects of Cincinnati have recently submitted to the Board of Legislation of the city a draft of a proposed ordinance to govern the inspection of buildings, to take the place of the ordinance recently referred to in this column, which has since been declared unconstitutional by the courts. The proposed ordinance provides for the appointment of a Building Inspector by the Mayor, said inspector to receive $2500 per annum. He shall have eight assistants at a salary of $1500 each and one clerk at a salary of $1000, these to be appointed by the inspector and subject to confirmation by the Board of Legislation. It also provided for a board of reference to which appeal from the decision of the inspector could be taken, but this feature was finally withdrawn at a preliminary hearing before a committee of the Board of Legislation for fear it would prejudice the passage of the rest of the ordinance.

Harrisburg, Pa.

Builders in Harrisburg report business as being quiet, with little prospect of immediate improvement. It is said at the office of the Building Inspector that the volume of work done this year will be relatively small. It is estimated that the total amount of capital invested in building during the current year will probably fall several hundred thousand dollars short of the record of 1897, or even the smaller showing made in 1896.

Jersey City, N. J.

The Jersey City Corporation Counsel has recently stated that in his opinion a contractor under a contract containing a provision releasing the city from liability to liens for material furnished cannot bring an action against the city for withholding money due him when liens have been filed. The situation is indicated in the following extract from a letter written by the Corporation Counsel to the Mayor of the city:

The contractors erecting new school houses in this city having agreed to file with the Clerk of the Board of Education releases from all persons who have furnished materials, and all journeymen and laborers employed in the erection of such buildings, with an affidavit showing that their releases cover all claims for material furnished or work done, you have the authority to refuse payment to such contractors until this provision of the contract is complied with, and I advise you that a contractor cannot maintain an action against the city until he shall have filed such papers.

Kansas City, Mo.

The following is taken from the Kansas City *Star* of recent date: "Fourteen firms, members of the Master Builders' Exchange, will move some time between September 1 and 15 from the Builders and Traders' Exchange Building to the Postal Telegraph Building, now in course of construction at Eighth and Delaware streets.

"The Master Builders' Exchange is in no way allied to the Builders and Traders' Exchange. The latter is a corporation of Eastern men who own and let but do not occupy the Builders and Traders' Exchange Building. When the Master Builders' Exchange moves to its new quarters it will have the second and third stories reserved and specially fitted for itself. The exchange now numbers 90 members, but most of them have their offices scattered all over the city. The exchange will have a large meeting room in the new building, just as it had in the old one.

"The builders, about the first of the year, decided to move because they thought their present quarters at Seventh and Central streets too far from the center of town. There has been no trouble about the rents. The membership will be increased by 35, as soon as the move is made. The disposition of the old building is in doubt."

Lowell, Mass.

Secretary Conant of the Lowell Builders' Exchange writes that in spite of the fact that most of the members of his exchange have work on hand the amount of work being done is still comparatively small. Several Lowell contractors have work of considerable importance under way in other cities.

The members of the exchange have recently been required to act on the resignation of Secretary Conant. Mr. Conant has long been closely identified with the work of the exchange and has devoted much time to the welfare of the building interests of the city. His resignation is the result of his inability to continue to devote the required amount of time to the affairs of the organization without injuring his business. His resignation will take effect on the appointment of his successor.

The lathers have served notice on their employers that they want their wages increased from $1 to $1.75 per thousand. There seems to be good reason to expect that they will be successful, as the amount asked for was the prevailing rate of wages last year.

Minneapolis, Minn.

The improvement in the building business in Minneapolis for the second quarter of the year is shown by the report of the Building Inspector's office. The increase in the quarter mentioned over last year reaches nearly a half million dollars, the figures being $1,075,231 in 1898 and $620,890 in 1897.

New York City.

The figures for the first six months of the year show that in the several districts of New York City there were projected 1747 structures estimated to cost $38,293,350, these figures comparing with 2018 buildings projected in the first six months of 1897, estimated to cost $50,527,185. In the first six months of the present year there was an increase in the number and value of flats and tenements erected as compared with the same period a year ago, while in the case of office buildings, hotels, stores, &c., there was a falling off of fully 50 per cent. as compared with a year ago.

The number and estimated value of buildings begun in New York City during the month of July as compared with the same month in 1897 is shown in the following table, which includes a similar comparison in a number of other large cities which also show improvement:

	1897.		1898.	
	No.	Cost.	No.	Cost.
New York (boroughs of Manhattan and Bronx)	608	$5,478,419	402	$7,161,251
Chicago	414	1,570,900	370	1,803,525
Cleveland	247	506,825	278	585,700
St. Louis	277	630,220	197	543,625
Buffalo	183	295,148	157	484,295
Kansas City	185	144,180	226	481,910
Detroit	160	320,800	197	403,000
Pittsburgh	100	823,475	124	402,629

The brick makers' strike up the river at Haverstraw, which has lasted over two months and resulted in the loss of nearly half a million dollars to the local business interests, has been brought to an end by the laborers returning to work at the old rate.

Omaha, Neb.

Secretary W. S. Wedge of the Builders and Traders' Exchange reports that aside from the work connected with the Trans-Mississippi Exposition comparatively little building has been done in Omaha this year. Aside from the new Burlington station most of the other work was confined to repairs, alterations, &c. The number of permits issued in July was 33, representing an estimated outlay of $57,754, as against 49, $75,850, for 1897. Secretary Wedge states that in spite of the depressed condition of building the exchange has more than held its own and is now in excellent condition. As a matter of information he states that the uniform contract adopted by the American Institute of Architects and the National Association of Builders was used exclusively by the exposition authorities for all building work let by them.

Philadelphia, Pa.

The official report of the Bureau of Building Inspection for the month of July shows that 675 permits were issued authorizing 1300 operations which are estimated to cost $2,409,525. This is an increase over the amount estimated for June of $127,925, and over July of last year of $206,565, during which there were 250 operations less than there were last month. There was especial activity during the month just closed, considering the time of year, in the operative building world. There were 610 dwellings of all classes put under way at an estimated cost of $1,562,900, about five-eighths of the total cost of the work under way. This shows an increase of over half a million dollars in the estimated cost of such work over the same kind of work of July last year.

The record for the year up to August 1 shows a total of 4471 permits for 7982 operations estimated to cost $14,577,895.

A neat booklet has been prepared by the Master Builders' Exchange briefly describing the permanent free exhibition maintained by the organization at 18, 20, 22 and 24 South Seventh street. The exhibition has now been maintained for eight years, and has grown far beyond its original proportions. Nearly every modern improvement in any branch of the building trade is to be seen on exhibition, and to the uninitiated the number and variety of such improvements is most surprising. Many of the exhibitors have an attendant in charge who is as ready to explain as he is to sell goods. The architects have come to recognize the exhibition as an established and necessary place where they can see for themselves the kinds of materials they wish to use. The pamphlet issued by the Builders' Exchange explains briefly but concisely all these advantages and the character and scope of the exhibition.

Troy, N. Y.

A break between the mason contractors and the bricklayers has caused a suspension of work in Troy. For some time the workmen have been trying to prevent one of the contractors from employing non-union men, and finally threatened to strike on a certain day if the objectionable men were not discharged. At this stage the contractors joined forces and on the morning of the day set for the strike they all told their workmen that there was no work for them. About 250 men are out, and the fight promises to be stubborn.

Washington, D. C.

On August 9 John B. Brady, Inspector of Buildings of Washington, D. C., filed his annual report for the fiscal year ending June 30 last. It sets forth that 1869 building permits were issued during the year, involving the expenditure of $4,203,620.57 for 4227 buildings.

There was an increase of 19 new buildings over the record of 1897, of 229 in number of repairs, and decrease of 33 in number of dwellings constructed.

Comparative statement of valuation of building operations shows: 1897, $4,102,598.75; 1898, $4,203,620.57; increase, $101,021.82. Number of permits issued: 1897, 1622; 1898, 1869; increase, 247.

Law in the Building Trades.

LIABILITY FOR ABANDONMENT OF CONTRACT.

Contractors abandoned a building partly completed, and upon which there was a sum due them above what they had received. The owners, under the terms of the contract, completed the building and charged the expense above contract price to the contractors. The Court held that the contractors could not recover the amount due them at the time of the abandonment, if the amount above the contract price expended by the owners in completing the building, together with the damages for non-completion within the agreed time, exceeded the amount of the contractor's claim.—School Town of Winamac *vs.* Hess, Ind., 50 N. E. Rep.

BUILDING CONTRACT CANNOT BE VARIED BY VERBAL TESTIMONY.

A builder's contract, in writing, provided that the builder should erect a building for a certain sum, according to certain specifications and plans of the architect. The court held that in a suit it could not be shown by parol evidence that the sum agreed to be paid included an extra price for which he had made a verbal warranty that the architect's plans would be satisfactory, which was not a part of the written contract.—Hills *vs.* Town Farmington, Conn., 39 Atl. Rep.

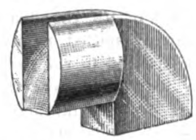
EQUIVALENT OF ARCHITECT'S CERTIFICATE.

A building contract provided that the final payment should be made only on a certificate of the architects that the work was completed to their satisfaction. Such certificate when issued was headed "Final recommendation," and stated: "We recommend, under the terms of the contract, &c., the payment demanded by the contractor," which the architects sent to the owner in a letter inclosing the contractor's bill. The court held that this was sufficient to inform the owner that the architects were satisfied, and in the absence of fraud or mistake should have been paid.—Tilden *vs.* Buffalo Office Building Co., 50 N. Y. Supp. Rep.

CORRESPONDENCE.

Glass Window Pulleys.

From L. S. H., *Fredonia, N. Y.*—In looking over my numbers of *Carpentry and Building* the other day I ran across one of the communications in regard to glass window pulleys, and I thought I would make a model of the one about which I wrote some years ago, and send it to the editor. This kind of pulley was in use nearly or quite 30 years ago. A block similar to the one under the piece representing the glass came with each pulley with holes all bored for the purpose of fastening it to the back of the jamb.



Glass Window Pulleys.—Fig. 1.—View of Glass Pulley.

Note.—From the wooden model furnished by our correspondent we have had the accompanying engravings prepared. Fig. 1 is a view of the glass pulley, while Fig. 2 represents it as it would appear in position for use.

A Steel Square Problem.

From V. L. S., *Westerly, R. I.*—I will try to answer the steel square problem from "Puzzled," presented in the August issue of the paper. It will not be necessary for me to send a diagram of explanation, as the points are all contained in the diagram in the August number. Lay the steel square on the corner of the box at O; take 12½ inches for the roof cut and 20¼ for the other from points O D and K; 12½ inches from the corner O for roof cut; points O E and H and 9½ the other. Square around the box from O to X. Make X 2 inches shorter from corner X, using 12½ for the roof cut from X A and H, and 15 for the other. Turn the square over; take 10 inches for the roof cut from points X B and Y, and 8½ inches for the other. On corner K take 2½ inches for roof cut; points K C and Y and 2 inches for the other. Cut to these marks and it will fit the roof. Of course it may need some trimming. I hope this will be plain to my brother chips.

Painting a Cement Floor.

From J. H., *Braidentown, Fla.*—I have a cement floor in my dining room and wish to paint it a brown color, but can find no receipt as to the method of procedure. Can you give me instruction in the next issue of *Carpentry and Building ?*

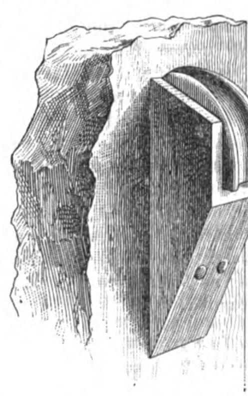


Fig. 2.—Appearance of Pulley in Position.

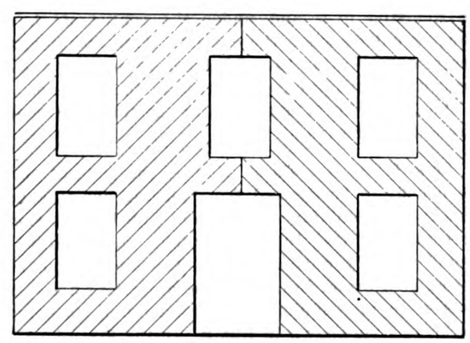
Note.—We suggest to our correspondent that he take a gallon of raw linseed oil and put in it 1 pint of liquid dryer. Stuff or saturate the floor with as much of this mixture as it will readily absorb, doing the work at one operation, or, in other words, going over the floor but once. Allow the floor to thoroughly dry and then give it two coats of F. W. Devoe's floor paints, proceeding as in the case of an ordinary floor. If any of our readers can suggest other methods we shall be very glad to hear from them for the benefit of the correspondent making the inquiry.

Design for a Self Supporting Roof.

From J. C. B., *Hickory Corners, Mich.*—On page 147 of the volume of the paper for this year "C. K. S.," Wayland, Iowa, asked some of the readers to furnish sketches of a self supporting roof for a hall 36 feet wide. I think the correspondent would obtain much more satisfactory solutions of the problem if he would furnish a definite description of the conditions of the case. The data which he presents is too meager to serve as the basis for a comprehensive reply.

Placing Sheeting Boards.

From C. W. B., *Hampton, Iowa.*—In the July issue "L. E. P.," Aiken, S. C., shows two methods of laying sheeting boards, and asks which is the stronger way. My opinion is that if he *must* place his boards diagonally, his second method is probably the stronger of the two, particularly so if there are not many openings. But is the diagonal method the best ? Has "L. E. P." tested the method and proven that a building is stronger when so sheeted ? I think not. During more than 40 years of active practice in building I have learned that some "things are not what they seem," and diagonal boarding is one of them. If there are no openings, perhaps the diagonal method may be the stronger, but in the common two-story house with openings every 4 or 6 feet, as is usual, there is no strength gained, while there is labor and lumber lost. I followed the plan about 12 years, more to satisfy public opinion than for any other reason, but quit it long ago, as have many others.



Placing Sheeting Boards.—Fig. 1.—Method Suggested by Ghequier & May.

A building properly sheeted with dry 10 or 12 inch matched boards placed horizontally, nailed with three and four 10d. wire nails at each bearing (every 16 inches), can be turned over and over by the wind and not rack the outer walls. Then why waste time and material in the vain attempt to strengthen what does not need strengthening ? The weak parts of a building are through the centers, therefore all partitions should be thoroughly braced. If there are no partitions then there should be diagonal braces cut into the second floor and ceiling joists to stiffen the walls. If the flooring is face nailed through both edges the bracing is unnecessary.

From GHEQUIER & MAY, *Baltimore, Md.*—In reply to the inquiry of "L. E. P." in the July number of *Carpentry and Building,* we would say that in our opinion the longer the sheeting boards the better. There are two uses for these boards:

1. As a protection. This use can be subserved in any way they are put on—diagonally or crosswise, broken at openings or not, so that the joints between the two sets of sheeting are not synonymous.

2. As a form of bracing. In these days when every stick of timber is saved, wind braces of scantling being often omitted entirely, it is the more necessary that dependence be placed on well nailed sheeting. It seems to us that boards laid diagonally from both ends, meeting in the center, prove decidedly more satisfactory than when laid in any other way. But as in everything else in life, there are so many contingencies that there cannot be positive cut and dried rules for all cases. The accompanying sketch, Fig. 1, will give an idea of our meaning. The middle nailing should be very thoroughly done. Besides the advantage of scientific bracing, this method is certainly cheaper than changing the direction of the boards over each window opening, entailing less waste and labor.

From B. F., *Allston, Mass.*—In reply to the question of "L. E. P.," with regard to sheeting around a window in the side of a house, I should in all cases put on the boards diagonally in the one direction only. The only case, in my opinion, warranting "giving the boards a double direction," and so making a continuous break on the stud over and under the center of the window, would be when there was a wide opening underneath, necessitating the additional strength of the truss formed by putting on the boards in that manner. This I should avoid, if possible, by getting the requisite strength in the frame itself.

From H. S., *Hutchinson, Kan.*—I can see but very little benefit to be derived from placing sheeting boards on a framed building as shown in Fig. 1 of the sketches presented in the July issue. The only feature that would possibly recommend itself would be the boards acting as a firmer brace, but the objections are so much greater in my opinion as to condemn it as compared with the style shown in Fig. 2. In the first place, there would be the cost of putting on, and, in the next place, it would tend to make the walls the weakest for resistance to wind pressure where they are already weak and where they should be strengthened if possible.

While I am on this subject I would like an opinion of the readers as to what is the best way of putting on the boards in accordance with the style shown in Fig. 2 of the July issue. Should they go entirely around the building or change at each corner, so as to have the ends come at each corner post, as shown in Fig. 1 of the correspondent's sketches? I claim that the latter would be the better way.

From O. L. McM., *Chicago, Ill.*—As to the best method of placing sheeting on the frame of a building, please allow me to state that my experience in the suburbs of Chicago leads to the belief that sheeting applied diagonally gives the best bracing to the frame work. I have found, too, that careful nailing—two 10d. nails to each bearing—means much.

From G. W., *Mobile, Ala.*—In answer to the question as to which is the best method for placing sheeting reasons: 1, It ties the studding thoroughly to the sills; reasons: 1. It ties the studding thoroughly to the sills; and, 2, the weather boarding will lay better than when the boards are set horizontally. The sheeting boards are very apt to warp outward at the edges, which, if a lap of the weather boards happens to meet there, will make crooked work.

From J. H. F., *Macomb, Ill.*—Of the two methods of placing sheeting boards shown in the article in the July issue of the paper, I would prefer to angle the boards one way instead of the two ways with the joint in the center. As far as strength is concerned, the angling of the boards might be of some advantage, provided there were no openings, which is not the case in dwelling houses. I think if we will all stick to the old method of sheeting the building horizontally and use ship lapped or plowed and grooved material, and see to it that it is thoroughly dry before it is put on, and also nail it well, it will make the strongest, best and most substantial building.

From M. S. S., *Shellman, Ga.*—As requested by "L. E. P." of Aiken, S. C., I will offer a few suggestions as to the best method of placing sheeting boards about window openings. It would seem to be decidedly the best to place them as indicated in Fig. 2 of the July issue, with one end of all the boards lapping on the wall plate and firmly nailed to it. Those below the window would be treated in the same manner as those above it, as they would lap over the sill of the house and nail fast to it. By this method of construction the boards would cross the short studs above and below the window and be firmly nailed to them and would be brought into line with the other wall studs, thus forming a straight and sturdy wall. It is easy to conceive that the joining of all the boards upon one stud, as indicated in Fig. 1 of the correspondent's diagrams, would not tie the wall together. It would not tie the short studs at the windows in line with the other wall studs so as to form a strong wall or plane surface. The wall would not be strong just above the window head, and strong wind pressure would be likely to cause it to shake so as to crack the plastering on the interior at that point. In my judgment, therefore, the placing of sheeting boards about windows in the manner illustrated in Fig. 1 would be erroneous, and the results of such a procedure would be very unsatisfactory in practice.

From ALOHA VIVARTTAS, *Savannah, Ga.*—Referring to the query in the July issue about laying sheeting boards, I should say lay them in the longest lengths possible, paying no attention to window frames. In other words, lay them after the manner shown in Fig. 2 of the sketches in the July number. If a butt joint interferes with a window I should then prefer to offset it, as indicated in Fig. 2 of the sketches accompanying this letter. The ship carpenters' custom, pointing to the strongest construction, is to make as few butts as possible on any one frame, they permitting no two butts to come within three planks or two frames of each other, as indicated in Fig. 3 of the sketches which I send. There is no advantage in reversing the lay of the sheeting where the boards will run long enough to reach across the entire side. I have reversed the lay, as in Fig. 1 of the July issue, for a herring bone effect, this being done some years ago for inside finish in passenger stations for the Peruvian railways. This was in an earthquake country where no lath or plaster was allowed, and the work was much commended by the engineer in charge, the late W. W. Evans, who not only admired it as looking well and stiffening the building, but also surprised me by saying that he had never before seen a building sheeted on the diagonal, or, as it used to be called in New England, "brace boarded."

From F. G., *Denver, Col.*—I consider the best and strongest method of placing sheet boards on the frame of a building is to put them on diagonally in two ways on each side.

Setting Up Stair Work.

From F. K. T., *Raleigh, N. C.*—I was interested in the way "Igno Ramus" of Lafayette, Ind., came out with his request for information in the August issue. I think the readers of *Carpentry and Building* should take particular pains to give "Igno" the desired information, for the reason that the name "Igno Ramus" would seem to imply that the information was greatly needed. I am surprised, however, that any one would need to ask for information on any subject after reading *Carpentry and Building* from its first appearance.

But to be serious: I do not remember having seen recently anything on stair building, so a few words may not be amiss with any of us. Most certainly the plastering should be finished and perfectly dry before any stair work or other interior finish is put up or even brought to the building. The grounds should be put up as for other finish so that the completed stair work will lap over the plastering half an inch or more. The hight of the grounds should be determined by the details for each particular stairway. Rough carriages are not necessary for ordinary closed string work, and are only useful to form a stairway for the workmen while the work is progressing. The wall and front string should be housed with risers plowed and treads let into them with ⅝-inch tongue or longer. The front string should be covered with paneled or plain face string, with cap to receive the foot of the balusters.

I find that the best and quickest way generally after the platforms are set the right hight is to put each flight together, wedge, glue and fit the same; then begin at the bottom, raise each flight and drop it into position. When this is done it is an easy matter to brace the newels and cut in hand rail and balusters. With an open stair this plan would be impracticable, as each tread and riser in this case would have to be put in separately after the rough carriage had been set to receive the face string and the wall string had been properly placed.

If the soffit is to be plastered then rough carriages will have to be put in place to carry the lath and plaster and sufficiently deep so that the housed string will clear them. I hope these bits of information will interest our Lafayette friend if not other readers.

Another thing right here while I have "my hand in." I notice in the August issue no less than eight requests for information on various topics, and only one reply to former inquiries. Now I, for one, would like to see the answers come out in the issue following the inquiry. In this way we can keep interested, and do not have to look up a back number to find the inquiry that is just being answered. I should like to know if I am alone in this respect.

Note.—The suggestion of our valued correspondent is a good one, and there would seem to be no reason why, with the hearty co-operation of the readers, interest in this department of the paper should not be materially increased. Any trade topic is a legitimate subject for discussion, as well as the inquiries which appear from month to month. We would urge that the readers promptly consider the questions as they appear in this department, and send in their comments as early as possible in order to insure their publication in the succeeding issue. The paper is made up between the 15th and 18th of each month, and communications received after the latter date, more especially when they are accompanied by sketches, are often carried to a subsequent issue, owing to the time required to prepare the necessary engravings.

We desire our readers to feel free to write at any time about matters in which they are personally interested, or which they think may prove of interest to others. No one need hesitate, as all communications are published, unless otherwise requested, under the initials of the writer only, or some *nom de plume*, so that his identification remains concealed. This course we take in deference to the requests of many who are evidently too modest to wish their names to appear in full.

We would emphasize the desirability, however, of every correspondent giving in his letter his full address so that the editor may communicate with him direct in case such a course becomes necessary. Now let us hear from the practical readers commenting on some at least of the many queries which have lately appeared in this department of the paper, to the end that good may result to all.

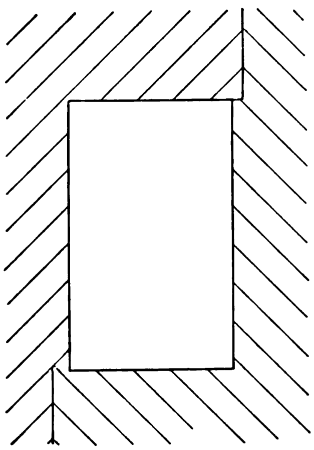


Fig. 2.—Showing Method Where a Butt Joint Would Interfere with a Window.

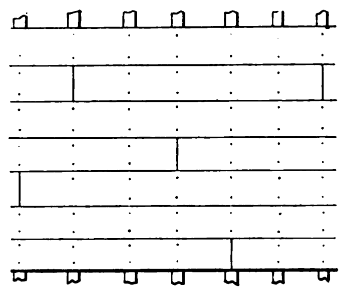


Fig. 3.—Ship Carpenters' Method of Breaking Joints.

Placing Sheeting Boards.—Sketches Accompanying Letter of Aloha Vivarttas.

Glass Surface for Schoolrooms.

From FRANK NIERNSEE, *Columbia, S. C.*—In answer to the inquiry of "R. H. D." in your June issue permit me to say that in designing many large and small school buildings I have obtained very satisfactory results from the data which are given below and based upon authorities in such matters. The three most important points to be considered in designing and constructing school houses are ventilation, heating and lighting or window space. I will not touch heating and only give a few general remarks on ventilation. It has been determined that the proportion which should exist between the amount of glass surface (in square feet) and the square surface of the floor is 1 to 4, or at least 1 to 5. In other words, for a room 20 feet square there should be from 70 to 80 square feet of glass, which amounts to between 500 and 600 square inches for each scholar, taking 20 scholars to the room.

Windows should always be arranged in such manner that sunlight enters from the side which is not hurtful to the eyes of the pupil, while at the same time it illuminates their work sufficiently. Skylights are most admirable in this respect, and in addition windows situated on the left of the pupil are advisable. If possible they should never be situated on the right, as in that case the hand casts a shadow on the portion of the paper which is to be written upon, consequently necessitates a close approach of the eye, which position is most favorable to short sight. A schoolroom is well lighted when the window space equals one-third or one fifth of the floor space. The best authorities say one-fifth is the minimum where the school house stands in a clear, open space. Thus a schoolroom for 50 pupils should be about 26 x 32 and there should not be less than six to eight windows, 4 x 10 feet. The windows should extend down to about the shoulder of the pupil in sitting position, and not further from the ceiling at top than 1 foot, or 6 inches would be better, as most of the light comes from above.

Another method to give the proper light, neither too much nor too little, is to multiply the length of the room by the breadth and that product by the hight, and out of this extract the square root, which will be the space to give the proper light for the room. This may be divided into as many windows as the room will allow. Suppose the room to be 22 x 18 feet, the product will be 396, and multiply by the hight, 11 feet, the product will be 4356, the square root of which is 66, which will be the area of light space of the room and may be divided into three windows of 22 feet each.

There are three methods of ventilation—viz., natural, mechanical and by aspiration. The natural is produced by unequal density of air, caused by the various conditions of temperature and barometric pressure. It is not reliable, as a change in the wind often produces a stopping of the flow of air. The mechanical is produced by the action of fans or other devices, creating an air movement, regular and unvarying, in stated volumes, removing foul air as fast as it is generated or becomes unfit for breathing and drawing in fresh pure air to take its place. By aspiration we mean a heated chimney or shaft for the removal of columns of vitiated air from occupied apartments. It is well known that heated air expands according to certain laws applicable to all gaseous bodies. The expansion is equal to one four hundred and eightieth of its volume for each degree of Fahrenheit that the temperature is raised from 32 to 212 degrees. This method of ventilation is much used and has given satisfactory results.

Now as to the size of fresh air inlets, outlets, ducts and shafts for successful ventilation of school buildings, halls, &c. Experience and careful observation has made clear the fact that it must be determined by the number of persons to whom the air is to be supplied and the maximum seating capacity of such occupied room or hall. Thus, take a schoolroom of 50 pupils The best authorities state that not less than 30 cubic feet of air per minute is required to each person to maintain a reasonable degree of purity. Taking this low standard for each individual, 50 persons would require 50 times 30 or 1500 cubic feet per minute. The dimensions of an ordinary schoolroom occupied by 50 pupils vary but slightly from length, 30 feet; width, 28 feet, and hight, 12 feet. The cubic contents, 10,080 feet. Dividing the sum by 1500, the amount of air required per minute by the occupants of the room, we find as the result less than seven, representing the number of minutes during which the air of such a room would retain a reasonable degree of purity without being changed by the renewal of pure air. Regardless of the size of room, we should supply to 50 persons occupying the same 1500 cubic feet of air per minute, which should be the minimum. In estimating the rate of air motion 5 feet per second should be the minimum, although if the foul air outlets be of ample size a much higher rate of inflowing air can be estimated. The number of square feet of the foul air outlets can be determined by dividing 1500, the amount of air required per minute for 50 persons, by the amount of air which will pass out of the room through an opening 1 foot square at the rate of 5 feet per second. Multiplying 5 by 60, as there are 60 seconds in a minute, we have 300 cubic feet, which is the amount of air that will pass through an opening 1 foot square. Now, by dividing 1500 by 300 it will give 5 feet as the size of the foul air outlet required for a room occupied by 50 persons. This means 5 feet of actual clear, unobstructed opening The positions of foul air and fresh air inlets are of much importance in the ventilation of school houses. I will not touch the matter of cross section and hight of chimney, nor size and revolution of fans per minute, as I have already taken too much space in your journal, but I trust the outline will assist " R. H. D."

From J. C. B., *Hickory Corners, Mich.*—In the June issue of the paper I notice the inquiry from " R. H. D.," Lancaster, Pa., relative to the area of glass surface required to properly light a schoolroom. Without going into the matter in detail, I would say that the square root of the length of the room multiplied by the width and the hight and the result multiplied by 1.5 will give the number of square feet of glass surface required. For examples I would refer him to page 234 of the volume of *Carpentry and Building* for 1893; also to page 252 of the volume for 1894 and to page 286 of the volume for 1897, all of which I think will prove interesting to him in this connection.

The Architect and the Builder.

From JOHN S. SEIBERT, *Cumberland, Md.*—In the article "Words for the Young Builder," appearing in the July issue of *Carpentry and Building*, the writer makes some remarks concerning the knowledge which an architect should in his opinion possess regarding the estimated cost of proposed buildings, which are rather startling to say the least. After introducing owner and architect to the reader, he says: " . . . He [the owner] thinks the architect should know pretty nearly the worth of the building, and so he should if competent. An architect ought at any rate to be able to figure out every foot of timber required to build a cottage, and he should know very nearly the cost of all the other items."

It is very evident that the writer of the words just quoted has never been through the trials which beset an architect from beginning to end when designing a dwelling for the average owner. The owner generally has a vague idea of what he wants and a very exaggerated notion of what he should obtain for his money. How easily Mr. Aimar gets the architect through the preparation of the drawings ! The owner leaves after his first consultation, the architect goes to work and, presto ! the work is done. Was there ever anything simpler ?

The true course of events is more likely to be this: The architect prepares the preliminary sketches in accordance with the owner's outlines, making every possible allowance for cost, and the sketches are submitted to the owner. Now comes the period during which the architect, in the owner's opinion (and likewise Mr. Aimar's), should know "everything." The owner does not like this or that feature and wants to substitute other items. On the spur of the moment the architect is expected to give the exact cost of items which can only be ascertained by a careful computation. He is supposed to carry price-lists and discount sheets by the score in his head and give all manner of information entirely foreign to his profession. The owner insists that he must have these things in his house, even if it does cost more—he will make it up on something else, he says —whereas, in fact, he is sure to add many other items before the house is done; and so the plans and specifications, after many changes and additions, are finally completed.

Now let us see what our friends the builders will do. According to Mr. Aimar the architect should be able to figure every stick of timber that goes into the building before even the idea of it is on paper, to say nothing of complete drawings and specifications, including sketch details of the main features, such as every architect who has any idea at all as to the difficulties of obtaining a close estimate furnishes. Armed with these instruments the builders go to work. They all base their bids on exactly the same data, the specifications are clear and any doubtful points are explained by the architect before the bids are turned in. When the bids are opened, what do we find ? The figures of the various bidders very nearly alike ? Surely, if the architect can tell "very closely," according to Mr. Aimar, the cost of the house without definite information, the builders, whose special business it is to make such estimates and who are all bidding along the same fixed lines, can tell to a cent what the house will cost. But so far from this being the case, their figures exhibit such a glaring difference that the owner is fairly staggered and is sorely tempted to throw aside all bids. At this point the architect should, and generally does, step in to advise the owner as to which bid to accept; for by the time the drawings and specifications are completed, and not before, the architect, if he is experienced, will have arrived at a reasonable approximation of the cost of the building and, if necessary, can figure it out exactly with the same meaning to that term exactly as it has for the builders. Let me illustrate a case or two from my own experience, and let me say first that the bidders on these houses were men of experience, two of them conducting extensive building operations in Washington and Baltimore.

Building No. 1, six bidders ranging as follows: $4050, $5280, $5300, $5387, $5943, $7704, a range of $3654 on a building that is now being completed at a good profit to the builder for about $5300. These were all local bidders, and I pity the architect who could not guess closer than some of the above bidders figured.

Building No. 2, $2200, $2278, $2302, $2750, $3150, a range of nearly $1000.

Building No. 3, $23,940, $25,000, $26,400, $29,490, $40,400. The bids on No. 3 were accompanied by certified checks, &c., so that they were all *bona fide*.

I might go on and cite other examples from my practice, illustrating the same thing in all classes of buildings costing from $1200 up, but I believe enough has been brought forward to show that I am justified in the stand I have taken regarding my clients, when I tell them at the start that I cannot give a fairly correct estimate of the cost of the proposed building before the drawings and specifications are "roughed in," as it were. All this talk of an architect or builder being able to estimate the cost of a proposed building with anything like an approach to accuracy from merely a verbal description is childish and sure to bring on trouble. People who live in glass houses should not throw stones, and as long as builders cannot figure the cost of a building within the limits of the profit, it is not fair to accuse others of incompetency for not achieving better results with much poorer data.

Staining a Pine Wood Floor.

From D. B., *Brooklyn, N. Y.*—I would consider it a favor if you would answer the following questions through the columns of the paper: I have a pine floor which I would like to stain. Please give me the method and tell with what to fill the cracks. Is there any other method of finishing the floor?

Note.—Our correspondent fails to tell whether the floor is of hard or soft pine, but we would suggest in case the floor is of soft pine to use an oil stain, and if the floor is of hard pine to employ the oil stain with a little varnish added to it. The cracks may be filled with a mixture of equal parts of white lead and putty. After the filling has become dry the floor can be gone over with the stain. With regard to other methods of finishing the floor, we would refer our correspondent to an article on page 264 of the issue for October, 1895. We shall also be very glad to hear from our practical readers regarding the questions raised by the correspondent above, as doubtless each has his own particular way of doing work of this kind.

Remodeling Defective Plumbing.

From H. C. T., *Piermont, N. Y.*—While the subject of faulty plumbing may not be strictly within the province of the Correspondence department, I have no doubt there

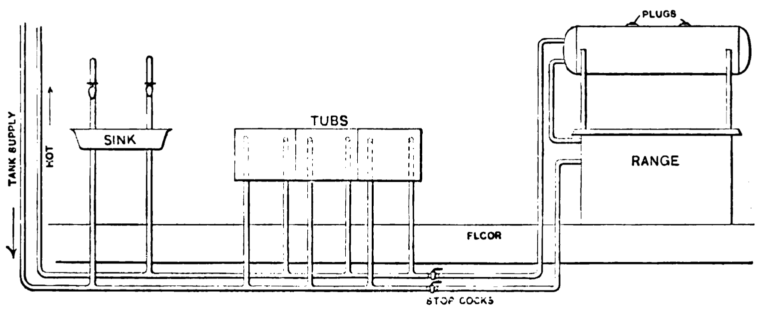


Fig. 1.—The Work as Originally Done.

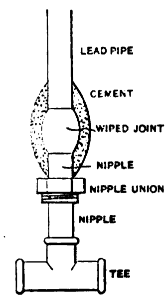


Fig. 2.—The Amateur Connection.

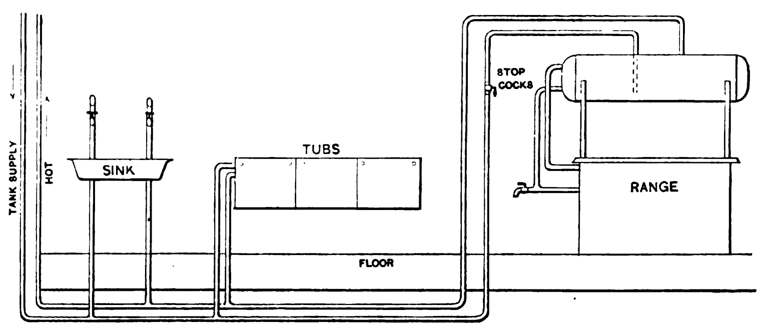


Fig. 3.—The Work as Remodeled.

Remodeling Defective Plumbing.

are many readers of the paper who will be interested in a brief description of how a job of defective work was remodeled, and I therefore send sketches of it herewith. Fig. 1 shows the work as I found it, Fig. 2 representing one of the joints used by the would be plumber, while Fig. 3 shows the work as remodeled and now in satisfactory service. You will notice that in the original work the supply for cold water entered the water back at the lower connection and the hot water from the water back entered the boiler at the bottom connection. Also that there are stop cocks on both the hot and cold water supply between the boiler and the fixtures. The cold water inlet and the hot water outlet on the top of the boiler were plugged. I think it is unnecessary to explain the joint shown in Fig. 2, as the sketch is sufficient. However, it may be of interest to say that an attempt was made to connect the lead pipe with an iron nipple by means of a wipe joint, and the attempt being unsuccessful the entire joint was covered with cement, and yet it leaked. The nipple was screwed into a union for making the final connection with the iron pipe. Fig. 3 needs no further remarks than that it now works all right. If there is any better way of doing the work I should be glad to know it.

THE QUALITY OF MORTAR.

NEARLY all of our modern masonry constructions, and certainly all brick work, is built on the assumption that the individual blocks, whether brick or stone, are to be imbedded in a matrix of mortar, uniting the whole into a homogeneous mass. As a matter of fact, says the *Brickbuilder*, this assumption is rarely perfectly correct, for the reason that the mortar, though forming the key to the strength of the whole wall or pier, and, consequently, of extreme importance as a factor in building operations, very often fails to receive the proper care, and a scientific knowledge of the properties of the material is often sadly lacking on the part of our builders. It is, however, encouraging to notice how much advance has been made in a comparatively few years in the uniformity of the product which is used in our more important buildings. The old fashioned way of preparing mortar was to burn the lime in a more or less crudely constructed kiln, and to mix the materials as they were required on the job in small batches, the lime being partly slaked and then being immediately covered with a blanket of sand, theoretically to keep the heat in, but practically checking the thorough slaking of the particles. Then the mortar whether with lime or cement as a base, was worked over by hand on a board close to the wall, and the brick work was laid up with very little attention to anything except to get the material in place.

Machine Mixed Mortar.

The necessities of modern building operations, no less than the scientific study which a few of our best builders have devoted to the subject, have resulted in a modern compound specifically known as machine mixed mortar, which is so far ahead of the average product which we were formerly obliged to depend upon that, though it has not achieved perfection, and the results are not as good as were brought about by the Roman methods of centuries ago, it is a vast improvement over the average hand mixed mortar. Unfortunately this machine mixed mortar cannot be obtained in all cities. It has been used a great deal in New York, and to a certain extent, we believe, in the other large cities, but as far as we know it has not been found practicable to ship it to any great distance without increasing the cost over hand mixed mortar; though if considerations of the quality of the work were to be put above a matter of a few cents per cubic yard in cost, it would be far better for the builders in our small towns to have the machine mixed mortar shipped to them. The cost is claimed to be some 25 cents per 1000 bricks less than the average cost of hand mixed mortar, while it is claimed that an additional saving of 22 cents a thousand can be effected in the labor of laying the brick.

Economical Construction.

It is extremely satisfactory to feel that a good material, which is a decided improvement upon old methods, results not only in a better construction, but in a distinct saving of money. We should be inclined to look upon it another way and urge that even if the cost were 30 or 40 cents per 1000 bricks, it would be well worth the difference to use machine mixed mortar. This, of course, is on the assumption that the quality of the mortar is uniform and is kept up to high standard. It is much easier to do this mechanically than by trusting to manual labor. Any one who has watched the ordinary laborer mix mortar will undoubtedly appreciate how very variable the quality is. A bricklayer will try to judge of the mortar by the way it feels under the trowel. We know of one instance where an attempt was made to ascertain how much value could be placed upon such means of judgment. Three mixtures were made, one with 2 parts of sand to 1 part of Rosendale cement, the second with 3 parts of sand to 1 of cement and half a portion of ordinary loam; the third mixture was 1 part cement, 1 part of loam and 4 parts of sand. The color of the mortar in each was so nearly the same as to be difficult to distinguish. Three bricklayers, to whom these batches of mortar were submitted, united in declaring that the one with equal parts of cement and loam was the best, their judgment being based simply upon the smoothness with which the mortar could be laid in the wall. There is no question but that if the utmost care were taken to thoroughly slake the binding material and to properly proportion the sand, giving plenty of time to the whole operation, hand mixed mortar would be perfectly satisfactory in every respect; but such conditions rarely obtain in a large building, and by mixing machine mixed mortar by the ton it is perfectly easy to maintain exact proportions, to have the binder equally strong in each case and to have the intimate mixture of the components perfectly uniform.

Use of Hot Brick.

There is another factor entering into the use of mortar, or perhaps more properly into the construction of masonry, which is liable to be overlooked. There is a saying among what we sometimes call the old fashioned builders to the effect that a wet building makes a dry house, or, in other words, that in a masonry construction, if plenty of water is used throughout, the bricks kept well wet, the joints thoroughly grouted, the result in the set of the mortar will be vastly superior to what one would expect from opposite conditions. This is, of course, especially true of work laid up with cement mortar, but it applies with very considerable force, also, to lime mortar work. It is a common belief that in cold weather bricks should be heated before being set. We are not sure that this is the correct assumption. We have noticed a number of times that where bricks have been used hot the mortar, after a few months, is dry and crumbly under the hand and has the appearance of having been frozen. It seems to stand to reason that hydraulic cement which requires a very considerable excess of water to set properly would have the life all drawn out of it by being set in bricks which not only are free from water, but are heated so that they would absorb all the free water from the cement. It, of course, is not always practicable, on account of the cold, to wet bricks in winter time, but from personal experience we should be inclined to say that a wall would stand better if the bricks were laid up cold in winter than if the bricks were first heated. And certainly for any work in ordinary weather the liability is that it will be kept too dry rather than too wet.

Liberal Use of Water.

We had occasion to notice a while ago an instance of the efficacy of the liberal use of water in this connection. In a certain prominent building in this city the door trim and the dado work were all constructed of Portland cement applied directly to fire proof partition blocks. After the work had been run there came a spell of quite dry, hot weather, and the building was left open, with the result that when the cement work had the appearance of being dried out it was so soft and porous that it could be brushed away with a broom, and there was hardly any surface to it. The builder was shrewd enough to try some experiments before going to the expense of removing the whole. He stationed a number of laborers around the building with pails of water and big sponges, and instructions to wet the cement work down thoroughly and keep it wet. This treatment was continued for, if we remember rightly, some 10 or 12 days, when the cement began to harden, and in a few days more it had set up in a perfectly satisfactory manner, and ultimately proved to be an exceptionally strong piece of work. We have no doubt that much of the poor mortar that is encountered in taking down old buildings owes its friability and seemingly poor texture to the fact that not enough water was used in the construction.

THE CARPENTER SHOP GRINDSTONE.

BY G. D. RICE.

ALTHOUGH one of the most important devices in the carpenter shop, the grindstone is frequently set up in a crude frame, as in Fig. 1, the bearing untrue, a part of the stone always rotting in the water box and the whole affair generally shaky. Oftentimes the stone is worn to an angle, as at A, Fig. 2. Stones as badly out of condition as shown at B of the same figure are also seen. The most skilled carpenter cannot grind effectively on stones in these conditions. Possibly the stone itself is of good grade, in which case I would methodically undertake to put it into shape, first truing it. I do this in a turning lathe, fastening the stone to the chuck on a mandrel, G, Fig. 3, revolving the stone in the direction of the arrow at slowest speed against the cutting tool D. After getting the angled, grooved or scored face of the stone to a level, I round the edges in the usual way with a piece of pipe. Next I true the stone on its shaft by using a home made try square, C, as in Fig. 4. This square is provided with a wrought iron piece, B, forged to fit over the shaft A and lap on to the square at B, where two bolts hold it. The bolts being in slots, the square may be adjusted to various diameters.

I hang the shaft in pivot centers and drive thin wedges until the stone is perfectly true on the shaft, then tighten it up and adjust it to the frame. The old frame, or stand, I consign to the junk pile, and make one of good, stout hardwood, bolting the parts and providing the stone with a water box that keeps the stone wet only when in use. A section of such a stand is shown in Fig. 5. The water box A is sheet iron and fixed to the top of the rod B. The latter is studded to the foot lever C. The foot can be pressed upon this lever, raising the water supply to the revolving stone during the grinding, and it drops back from the stone as soon as the pressure is removed. F is a tool rest while grinding, and can be so made as to be adjustable to any angle and hight by using set bolts. The stone can be driven by power or foot. If by foot, remove the weight of the treadle after using, otherwise the stone will always stop with same part down, and oil from bearings may work down, in time softening the stone at that part. I always favor a stone of medium diameter. A large stone will grind faster than a smaller running at the same rate, but the overheating of the steel which often occurs on high speeded large stones deprives the tool of its good qualities. On the other hand, the concavity on the surface of some of the tools used in our modern carpenter shops requires stones of certain diameter, regardless of other conditions. An 8-inch stone, Fig. 6, would give a corresponding concavity to the blade A, yielding a keener edge than would be possible to obtain on a 16-inch stone, in which A also represents the tool. On a 24-inch stone, Fig. 6, the tool A would, of course, be concaved still less, for the larger the diameter the less convex the stone and the less concave will be the tool ground upon it.

Next in importance for sharpening tools is a good oil stone. Select one with a good grit and that will produce a keen edge quickly. Keep it covered when not in use. Leather straps, &c., are first-class for finishing tool edges, but I like to resort to power appliances as much as possible. With a wood and a leather wheel I can in a few minutes get a better finish on the edges of my tools than I formerly could in half an hour with hand straps. A wood wheel is shown in Fig. 7. About a dozen pieces of wood cut so that the face of the wheel will be entirely the end grain of the wood should be blocked between iron flanges. Walnut, birch, mahogany and oak make good woods for this purpose. Turn the face smooth in a lathe. Polish on this with emery cake. A leather wheel can be made by cutting about a dozen rings, as in Fig. 8, from a hide and blocking them as in Fig. 9. This wheel takes the place of the hand strap. Run the wheels by power in bearings. A stone chip hammer can be made with a cold chisel, A, wrapped twice with rope, as in Fig. 10, the ends of the rope being wrapped tight with copper wire at B, B, B, forming the handle.

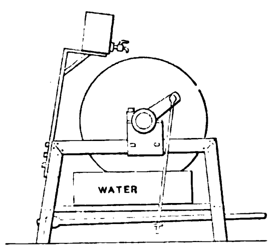


Fig. 1.—Stone as Frequently Set in Wooden Frame.

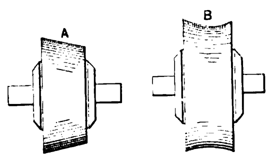


Fig. 2.—Examples of Worn Stones.

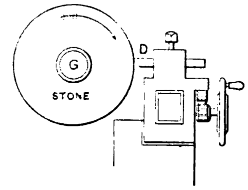


Fig. 3.—Stone in Truing Lathe.

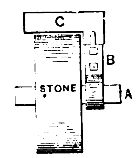


Fig. 4.—Method of Truing Stone on its Own Shaft.

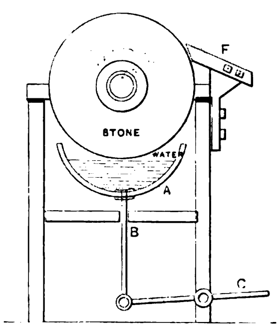


Fig. 5.—Section of a Good Stand for Grindstone.

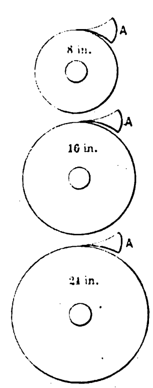


Fig. 6.—Stones of Varying Diameters.

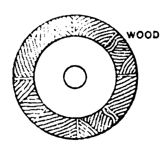


Fig. 7.—A Wooden Wheel.

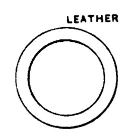


Fig. 8.—A Leather Ring.

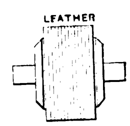


Fig. 9.—View of a Leather Wheel.

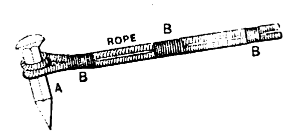


Fig. 10.—Stone Chip Hammer.

The Carpenter Shop Grindstone.

A HINT which may be useful when painting a sign on a brick wall is thoroughly clean the surface to be painted before applying the first coat. The best priming coat for this work consists of glue size and Venetian red mixed in the proportions of ten to one. Oxide of iron paint mixed with boiled linseed oil also forms a good priming coat and a little drier can also be added to this.

A Unique Machine Shop Building.

A building of rather unique design and possessing interesting features of construction is the new machine shop which has been erected by the Veeder Mfg. Company of Hartford, Conn., for the production of cyclometers. The manufacture of these goods requires the best of light in all the operations. As shown in the engravings, the three stories of the building are almost completely inclosed in glass, the only obstructions being formed by the necessary columns. The supporting frame work is entirely of steel. The structure is 30 feet in width, 110 feet in length, the three floors giving nearly 10,000 square feet of floor surface, every foot of which, owing to the well diffused light, can be utilized. Fig. 2 shows the supporting columns of the third floor and the truss work forming the supports for the sides of the building. The interior is heated by hot air forced into the interior of the building from an adjoining boiler room by means of ducts located and made a part of the supporting columns of the building, the outlets being at the base of the columns, as indicated in Fig. 2. This peculiar feature of the building was designed by C. H. Veeder, the president of the company. The sides of the building, which are made almost entirely of glass, are arranged in sections so that they can be easily opened, and closed, thus securing plenty of fresh air. The roof trusses are of sufficient strength to support not only the roof loads but also the hangers, shafting, &c. The new building was designed and erected by the Berlin Iron Bridge Company of East Berlin, Conn.

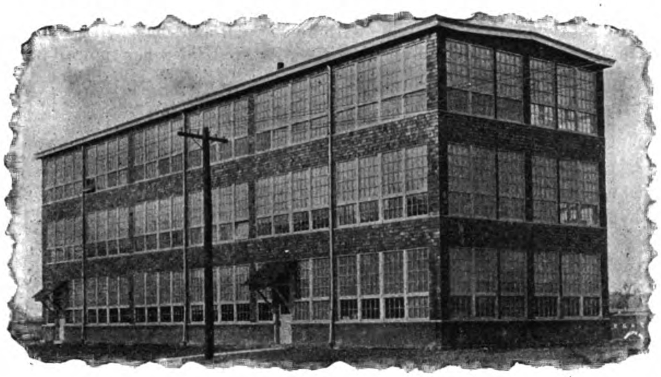


Fig. 1.—Exterior View of the Building.

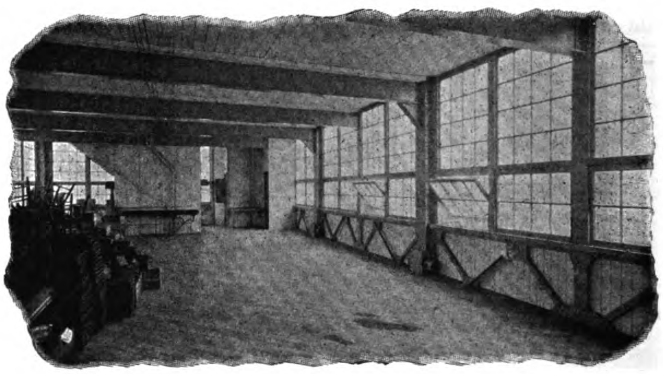


Fig. 2.—Interior, Showing Hot Air Inlet through Column.

A Unique Machine Shop Building.

Stained Glass in Houses.

The exact period when stained glass was first introduced into the houses of kings and nobles cannot be ascertained. Chaucer, in one of his poems, describes the story of the siege of Troy as painted on the windows of his own house, and it may be inferred that such embellishments were sometimes seen in the structures of the fourteenth century which were not merely ecclesiastical. Charles V of France, Chaucer's contemporary, ornamented not only his chapels but apartments in his castle with stained glass. At Aston Hall, near Birmingham, England, is a series of armed portraits with tabards and the armor of the age of Edward III. There are nine figures, to represent two earls of Mercia and seven of Chester. They were first set up in the great hall at Brereton, Cheshire.

Cracks in Plastering.

Haste is one of the drawbacks to good construction, and the results of hurry manifest themselves in nearly every department of building. The cracking of plaster cannot be blamed entirely to the shrinkage of wood or settlement of the foundations, for a certain kind of cracking in all lime mortar is due solely to haste in preparing the material. Lime mortar hardens by a species of absorption and a drying process quite distinct from the action of hydraulic cement. In order that the drying shall be uniform throughout the mass of lime mortar, it is essential not only that the lime be slaked for a long period before it is mixed with the sand, but also that the mortar should be mixed a considerable time before it is to be used, and that it be thoroughly manipulated, so that the particles of lime are evenly distributed and the mixture perfectly homogeneous. Of course, says the *Brickbuilder*, this is on the assumption that the lime is good to start with, which, unfortunately, is not always the case. Plasterers pay little attention to preparing mortar; this is usually left to the cheapest kind of labor, and if any one watches the average mechanic mixing mortar it is evident that such a thing as a careful proportioning of materials received very little thought. We often find mortar which has stood for generations and is thoroughly hard, comparing very favorably with cement, but this is in the old buildings, and is a result of the care which was at times expended upon such work. It was formerly the custom to not only mix the mortar and sand together in the bed, but also to work it over carefully on a stone slab, thoroughly kneading it and mixing it before applying to the wall, securing thereby a perfect uniformity of composition which would insure a gradual drying of the plastering.

Colors Used on Drawings.

Those who wish to know the colors to employ in order to designate different materials in architectural drawings will be interested in the following:

Materials	Colors to represent them.
Brass	Gamboge.
Brick work (in section)	Crimson lake.
Brick work (in elevation)	Crimson lake, mixed with burnt sienna.
Cement	Sepia
Concrete	Sepia, mottled with burnt umber.
Copper	Crimson lake, mixed with gamboge.
Glass	Cobalt (mottled).
Iron (wrought)	Prussian blue
Iron (cast)	Payne's gray.
Lead	Indigo.
Leather	Vandyke brown.
Plaster	Sepia.
Slate	Indigo, mixed with crimson lake.
Steel	Crimson lake, mixed with Prussian blue.
Stone	Burnt umber.
Tiles	Indian red.
Wood	Burnt sienna.

The Builders' Exchange

Directory and Official Announcements of the National Association of Builders.

Officers for 1897-8.

President,
Thos. R. Bentley of Milwaukee, Wis.
First Vice-President,
Wm. H. Alsip of Chicago, Ill.
Second Vice-President,
Stacy Reeves of Philadelphia, Pa.
Secretary,
Wm. H. Sayward of Boston, Mass.
Treasurer,
George Tapper of Chicago, Ill.

Directors.

Baltimore, Md.	S. B. Sexton, Jr.
Boston, Mass.	C. Everett Clark.
Buffalo, N. Y.	Charles A. Rupp.
Chicago, Ill.	Wm. M. Crilly.
Detroit, Mich.	John Finn.
Lowell, Mass.	Wm. H. Kimball.
Milwaukee, Wis.	W. S. Wallschlaeger.
New York City	Chas A. Cowen.
Philadelphia, Pa.	Geo. Watson.
Portland	George Smith.
Rochester, N. Y.	John Luther.
St. Louis	P. J. Moynahan.
Worcester	John H. Pickford.

General and Sub-Contractor.

One of the subjects to be brought up for consideration at the next convention of the National Association of Builders is the relationship between general and sub-contractor, and the preparation of some form of agreement which shall serve as a basis for the creation of a contract adequate to the needs of the two. At present there being no recognized form of contract for use between general and sub-contractors in existence, complications are constantly arising out of an effort to make forms of contract intended for use between owner and contractor serve a double purpose.

In perhaps a majority of jobs no contract exists between general and sub-contractor beyond the bid of the sub-contractor for the work; which is, however, generally worded in the form of an agreement to perform the work for a certain sum of money. Such a practice, notwithstanding the extent of its prevalence, is dangerous and places the sub-contractor at a disadvantage; for while he has agreed to do certain work for the general contractor, the general contractor has agreed to nothing in return.

There should be an agreement between general and sub-contractor just as there should be an agreement between an owner and a general contractor, and the stipulations of such an agreement should be as carefully drawn as are those between the owner and the general contractor. The lack of such a form of contract is continually felt, and contractors generally recognize the need of some well drawn form which may serve not only for actual use but as a basis for drawing agreements between the two in unusual or peculiar cases.

The National Secretary is in frequent receipt of requests for advice or suggestions in regard to what stipulations should be made between general and sub-contractor, and is often asked to recommend some form of contract for use between the two. It being obvious that such a form of contract is needed, the secretaries of the constituent bodies of the National Association are urged to bear the matter constantly in mind between now and the date of the next convention, and to forward to the National Secretary any and all suggestions that may be offered.

Unaffiliated Exchanges and the National Association.

The attitude of many builders' exchanges throughout the country, which have been frequent recipients of advice, printed matter, &c., from the National Association of Builders is well indicated by the following extract from a letter recently received by the national secretary: "We are very proud of the National Association and will do all we can to forward its interests." This quotation is taken from a letter written by the secretary of a certain exchange in reply to a solicitation by the national secretary that the exchange mentioned join the National Association. All requests for information or assistance received from whatever source, whether from exchanges already in existence or from builders contemplating organization, are invariably given as complete attention as is in the power of the national secretary, regardless of the fact that those making requests are not, or may not intend to become, members of the association. The work of the association is actuated by the belief that the improvement of the conditions in any given city strengthens the position of the fraternity as a whole and tends to increase its ability to protect itself against conditions which constantly menace the safety and general welfare of the building business. The association recognizes that the builders themselves are largely if not entirely the cause of the conditions which are hurtful to their welfare, and seeks every opportunity for the further extension of the principles upon which it believes safety and improvement are dependent. Proceeding from this point of view, it has always been the custom of the association to urge exchanges which have demonstrated their appreciation of the value of organization, by availing themselves of whatever information and help the National Association could give, to join in its work and assist its progress both by their moral support and by their money. The exchange above mentioned offers a good example of the experience of the association in this direction. That its members understood the value of organization is self-evident from the fact that they were members of the exchange; and that they recognized the value of national organization is equally self-evident from the fact that they sought such help from the National Association as it could give. The expressions above referred to may be assumed to represent the opinion of at least some part of the members, and to indicate their belief that the association is worthy of commendation.

Extension of Membership.

This is not an isolated case; it is the one that is most frequently met by the association in its effort to extend its membership; and it seems to indicate that the members of such exchanges are willing to take all the help they can get from the exchanges which form the association but are not willing to lend their support in order that other exchanges may also be given help. The position of such an exchange seems to be equivalent to a statement that its members feel that they are entitled to all the help they can get, but that no other exchange is entitled to the same. Of course, if the National Association of Builders still continues to exist there would be no objection to its extending whatever assistance it can to new exchanges, but if such further assistance to protection and welfare depended upon help from the exchange that has received and acknowledged help, the whole work might go to the wall. No voluntary return is made, and apparently there is no recognition of the fact that other exchanges need help, and that in order to be able to continue to give that help the association must be maintained.

The motives of the members of such an exchange as that mentioned are not as selfish as they appear; the situation is simply the result of a lack of appreciation of the real condition of affairs. The fact that the real welfare of the building business is in any way connected with its welfare in any other city or throughout the country generally does not seem to be understood; and builders generally feel that they are doing their full share when they support an organization limited in its work to the city in which they live. They do not realize that builders in any given city are benefited by being able to draw upon the experience of builders in other cities for assistance in formulating methods of protection, or that the National Association, as the only means by which their experience can be collected, formulated and disseminated, should be supported.

Gas Tied Up in Red Tape.

A Paris correspondent of the New York *Sun* describes the experiences of a Chicago woman and her two daughters who lived in the Americans' paradise for a winter, and among other things tells of the obstacles they overcame in getting the gas turned on in their apartments :

They wanted gas, so Mrs. Brown went herself to the company's office to subscribe for it and to say that she wanted it immediately.

"You shall have it within the fortnight, madame," said the clerk.

"Can't I have it before that ?"

"Not a day, madame. We have to obtain permission from the city before we can consider your application. Then we must also have another permit to put it in. These things require time, madame."

The following day the comptroller of the gas mains in that *arrondissement* made a call, with a portfolio full of papers to sign. An hour after he was gone the deputy comptroller arrived with three workmen, examined all the gas fixtures, called for pen and ink, sat down and wrote out his official report of the inspection, which he signed and called upon Mrs. Brown to sign. Then he took his workmen away. The same afternoon a boss plumber, notified by the gas company, came with two more workmen and made another inspection. Mrs. Brown signed an application for this plumber to examine the gas burners and pipes to see that there was no leak, and the next day three workmen came and spent the afternoon doing this. They wrote out a certificate to the effect that there was no leak, and gave Mrs. Brown a copy of it. There was an interval of two days; then the deputy comptroller arrived, alone, with another copy of the certificate and proceeded to check the work of the plumbers ; he also made out a paper stating that there was no leak. On the same afternoon the boss plumber came back and checked the work once more. Again there was an interval, this time for a whole week, but bright and early on the eighth day the original comptroller made his appearance, his portfolio bulging with papers, and very important. He spread out before Mrs. Brown nine separate documents, stamped, sealed, red-taped and covered with official signatures ; some were white, some pink, some yellow; some consisted of but a single sheet, while others were small pamphlets ; all however, bore the common brand of a Government revenue stamp, the denominations of which were from 2 cents to 50 cents. Mrs. Brown's total indebtedness for fees, including plumbing work, was 86 francs.

"Forty francs of this, however," the comptroller assured her, "you will get back when your subscription expires. It is merely a deposit."

"A deposit for what ?" asked Mrs. Brown faintly.

"Why, for the approximate amount of your first month's bill, of course," said the comptroller. "The deposit is always graduated according to the number of burners in the apartment."

Mrs. Brown counted out the 86 francs. Then the comptroller, seeing that she had never subscribed for gas in Paris before, good-naturedly explained :

"When your bill comes in at the end of the month you will have no trouble at all, because all the charges are tabulated. The first amount on the bill will be for the gas, the second for the amount of the Government stamp for the receipt, the third the rent of the meter, the fourth the charge for the maintenance of the street mains, the fifth that for the house main, the sixth that for the stop cock in the hall, the seventh that for the stop cock in the apartment, and so on. It is really very simple."

Three days after the appearance of this man two others arrived with the meter ; following them was a plasterer to place it, and shortly afterward a plumber to make the connections. The meter was still locked and sealed with a leaden seal. Two days intervened, and Mrs. Brown was about to notify the main office, because she was tired of using lamps, and, anyhow, the two weeks had elapsed. On the next day a man arrived with a book in which the inspector was to write down the record of the monthly consumption. Then in the afternoon, resplendent in gold lace, an entirely new man came on the scene. With a dramatic flourish he broke the leaden seal with a chisel, and the gas was officially on !

It is said that there is a large quarry on the Newfoundland coast about 50 miles from St. John's, the capital, where kind nature, during some convulsion, has hewn the granite into rectangular blocks of different sizes, so conveniently assorted that schooner loads of selected stones have been brought to St. John's and used in some of the public buildings and warehouses with little or no hand dressing by masons. The new post office and custom house are partially constructed of these granite stones hewn by nature.

CONTENTS.

CARPENTRY AND BUILDING

WITH WHICH IS INCORPORATED
THE BUILDERS' EXCHANGE.

DAVID WILLIAMS COMPANY, - PUBLISHERS AND PROPRIETORS.
232-238 WILLIAM STREET, NEW YORK.

OCTOBER, 1898.

The True Architect.

The true architect should be both an artist and a builder, for he should know how to lay down the general lines of a building which should be perfectly adapted to the uses for which it is intended, and which should be strong enough to stand for more than a merely short period under all circumstances and conditions of wind and weather, while at the same time he should be able to give each building character or distinctive appearance by grouping its leading masses by some law or laws which shall be appreciated by all, although not perhaps understood by all, each element or part of the structure being perfectly adapted in itself to the purpose for which it is intended, and the whole seeming to have been made for just such purposes as are assigned to it. The spaces out of which the entire building is made up should be in such number, of such size and in such relative arrangement with respect to one another that there shall be no inconsistency, no clashing. Each part, perfectly adapted to performing some function, should properly blend with the others, just as in a tree we have leaves and branches, stem and roots, each having and fulfilling its own purpose and yet each belonging perfectly to all the others without detracting from its worth or beauty. The first thing that an architect must consider is order, which is Heaven's first law. In this there is included proportion. It may not always be perfectly defined and it may not always be possible to perfectly define it, just as in a human body the exact proportions among the various members may not be laid down in integral figures, but the proportions must be there and must have some reason for being there. We look upon a man or a woman and decide that he is too tall or too broad; some one member seems to have been given undue prominence or proportion, to the detriment of the whole effect. Just so in a building, any one member may too strongly dominate or too slightly assert itself, or be out of proportion or out of relation with the rest. In the single room or in a single column, there are certain proportions which are recognized as proper and the following of which will result in beauty, fitness and appreciation. A building may have too few or too many rooms, columns or other members; they may be improperly or unsymmetrically disposed laterally or vertically; all what might at first seem but little things combine to produce beauty and fitness or conspire to cause ugliness or unsuitability.

Symmetry and Fitness.

Up to a certain point, symmetry should be a leading desideratum; but fitness, of course, is the first principle which should dominate in laying down order and rule. A tree is only to a certain extent symmetrical; perhaps not symmetrical just where we might expect to find it so; yet there is balance, which is carried out just as far as it may be permitted to do without sacrificing strength, vitality and beauty. Just as considerations of light, air and moisture influence a tree in turning from the perfect symmetry which characterizes the first slender shoots which proceed from the seed, so considerations of utility must govern the architect in the matter of the extent to which symmetry should impose obligations and govern design. Few trees are so desirably placed as to be able to grow and thrive equally well in every direction; few indeed have all the conditions favorable to perfect hold upon the soil, to perfect oxygenation by the sun and air, to perfect irrigation of roots, perfect wetting of the leaves; and so it is with regard to buildings; the conditions imposed by position and neighbors must influence the amount of symmetry and the character of the departure therefrom; for sometimes indeed vertical symmetry may be obtained where a lateral balance would be impossible. Up to a certain point, also, the element of time should be considered in architectural design; for just as a young tree would seem weird, and strange and unpleasing, if covered with moss and lichen, so the artificial production of the appearance of age in a new building, which may be seen from its very surroundings and use to be a new appearance, is foreign of success in architecture. The architect has usually to inclose spaces, to separate them and to cover them, as well as to arrange them with respect to each other and to outside spaces or channels of communication, and to give the whole such external form as shall be at once appropriate and pleasing. In most countries he is favored in that he has use of a wide choice of materials, of widely differing physical and artistic characteristics; each suited to a particular treatment and suitable for certain purposes. The rock of which Nature piles up the mountain mass, the elastic hickory which forms the slender and swaying tree, each is a material suitable for some certain purpose and for no other. The stout, bony frame work suits its purposes, just as the elastic muscles and the protective covering of hair or fur serve others. The architect should in this take a lesson from Nature, in upholding weights with the hard and heavy materials, in covering with lighter substances, while all the time providing against the destruction by time, considered merely as time, by fire and water, and by the friction and contact with moving objects.

Proportion and Decoration.

While the architect with his buildings, like the sculptor and the painter with their faces and figures, cannot have hard and fast laws about proportion, yet there is one widespread law which he has, and that is the division of every whole structure, be it monument or dwelling, into three parts which shall not be equal in dimensions and shall differ also in uses. In these, usually the middle one is the principal and is characteristic of the purposes for which the structure is intended; the lower, or base, bringing this into relation and harmony with the foundation on which it rests, while the upper either brings the middle into relation or harmony with some other thing above it, or serves as a fitting terminal. To this there is but one exception, the Grecian Doric column, which lacks its base, but relies, however, on the beauty of the material from which it is made, and the delightful proportions of its shaft and capital. In Nature structure is the first consideration after design, and ornamentation the next, and so it is in architecture. True art calls rather for the ornamentation of the structure than for the structure of an ornament. The architect should shape, vary and beautify members and surfaces, rather than endeavor to uphold structural and ornamental design. It is apart from all structural considerations in properly employing or omitting, as well as in choosing and placing an ornament, that he may make or mar the success of his design. The laws of gravity and of the tensile and compressive strength of materials, &c., may in construction limit him in combinations and dimensions, but in decoration he is much less hampered. He may draw from pure geometry the lines which he wishes to employ in ornamentation; he may copy or conventionalize the forms of plants or their parts, and even of animals; and he may draw upon almost all the subjects which surround him; all this, let it be understood, only so long as he doesn't choose unfitting objects or combine fitting ones inharmoniously. In this matter of decoration color comes in to aid form; and in this he may choose between or among natural colors, or he may employ those which are artificial, either for the whole mass or to accentuate the decoration.

Moving Four Double Brick Flats.

We have in the past made mention in these columns of a number of interesting pieces of work in connection with the moving of buildings, both large and small, but the latest to attract attention is the moving at one time of four five-story double brick flats, 100 x 75 feet in size. The work was commenced the early part of September and the houses moved about 6 feet per day, the work requiring nearly 300,000 feet of 12 x 15 inch yellow pine. The buildings are to be moved 75 feet in one direction and 35 feet in another.

The operations are being carried on at Willis avenue and 134th street, New York City, the contractor being Frederick Damm. In doing the work the outside and party foundation walls were torn away at intervals to allow the erecting of cribs, the east and west walls resting on sills which are lapped and stepped to conform to the four levels of the houses. The sills rest on the timbers, which form the 24 cribs and which run completely under the building, east and west. A series of 14 run north and south under the building and interlace with the others to form a complete frame. Owing to the building being about 5 feet lower at the south side than at the north, the supporting frame is stepped off in four great steps each about 15 inches high, at the north the frame being seven timbers high, while at the south it is only four. After this frame was built 325 ordinary 4-inch jack screws were placed under it at regular intervals. The buildings were then jacked up and the remaining walls removed. The tracks, 14 in number, were wedged up to the timbers and the jacks removed. The tracks are lubricated with a very greasy soap, which has body enough to keep the sliding timbers from actual contact with each other. The houses are moved by 20 of the jacks, which are set in timbers and buckled to the tracks by chains. They are distributed regularly throughout the frame and are operated simultaneously by signal. The buildings when properly situated will be lowered by jacks a distance of 3 feet, and the new foundation walls will be built up and wedged.

A BUILDING contractor, so the story goes, being of an investigating turn of mind, last spring tried the experiment of mixing a little sawdust with the meal he fed his chickens. He was so pleased with the experiment that he determined to give up feeding his hens cornmeal, and instead kept filling them up on sawdust. Shortly after he set a hen with 13 eggs. Last week she came off with a curious lot of chicks. Twelve of them had wooden legs, and the other was a woodpecker.

Convention of Carpenters and Joiners.

As the forms of this issue of the paper are being made ready for the press the United Brotherhood of Carpenters and Joiners of America are holding their tenth annual convention in this city. The first session was held on Monday, September 19, in the assembly hall of the United Charities Building, there being present about 150 delegates, representing 107 local unions. The opening address was made by P. W. Burke of the Brooklyn branch of the Brotherhood, who suggested that carpenters take up, in addition to the questions outlined for discussion, those of municipal ownership of gas and electric plants, street railroads and similar enterprises, as well as independent political action.

The delegates were welcomed to New York in the name of organized labor by Patrick Grimes of the Plasterers' Union, president of the Building Trades Council, who recommended that organized carpenters establish a fund for opening co-operative shops for the purpose of giving employment to members out of work. He expressed the opinion that if each member contributed the sum of $1 it would give ample funds to start a number of such shops. Henry Lloyd of Boston, the General President of the Brotherhood, urged the agitation of a shorter working day, suggesting that it be not restricted to eight hours or even seven hours, but should be so shortened that every man willing to work could have employment.

The afternoon session was devoted to the reception of reports and the appointing of committees. The convention was to continue through the week, and a number of important subjects bearing upon the question of labor were to be considered.

Rendering Wood Fire Proof.

One of the processes of rendering wood fire proof consists essentially of removing the natural juices of the wood and replacing them with certain substances which not only make it fire proof but also have antiseptic properties that prevent decay. The operation is effected in retorts or cylinders, the largest of which are 105 feet long by 7 feet in diameter. The wood having been run in on trolleys, the air tight door is closed and the contents subjected to heat and the action of a high vacuum. This treatment is continued till the volatile and fermentable constituents have been withdrawn, the time required to attain this result varying with the character of the wood. The next step is to fill the cylinder with the fire proofing solution, the exact composition of which is kept secret, and force it into the wood under hydraulic pressure, the amount of which again differs for different woods, but may reach 150 pounds to the square inch or more. When thoroughly impregnated with the salts the timber is taken out of the cylinders, restacked on the trolleys and put into the drying kiln—a room through which hot air is continually circulated by powerful fans, and which is fitted with apparatus to condense the vapor given off by the wood. Here it remains till it is thoroughly dried, in the case of a load of average thickness about a month. It is then ready for delivery and use. This is said to be the process by which the wood used in some of the United States war vessels was treated.

LABOR troubles are again becoming a feature of daily news. Under existing conditions they are to be regarded as one of the indications of improving trade. Workmen are either dissatisfied with the continuance of old rates of wages when they see evidences of a revival in business, or else refuse to accept a reduction because the impression prevails that times are better in every line. If opposite conditions prevailed in general business strikes would, on the other hand, be an indication of approaching worse times. They are like boils, which are produced by precisely opposite causes, either overfeeding or underfeeding. They are also like boils in being irritating and unpleasant for the body politic, and should be avoided if the proper treatment can be devised in time.

FRAME COTTAGE OF MR. GWIN VAN METER, AT BUTLER, MO.

GEO. W. PAYNE & SON, ARCHITECTS.

SUPPLEMENT CARPENTRY AND BUILDING, OCTOBER, 1898.

FRAME COTTAGE AT BUTLER, MO.

THE illustrations which are presented upon this and the following pages relate to a frame cottage erected not long since at Butler, Mo., for Gwin Ven Meter, in accordance with plans prepared by George W. Payne & Son, architects, of Carthage, Ill. A good idea of the completed structure may be gained from the half-tone plate which is made from a photograph of the building. An inspection of the floor plans shows six rooms and bath arranged in such a way as to reduce hall and stair space to a minimum. On the first floor are parlor, sitting room, dining room and kitchen, while on the second floor are two sleeping rooms and a bath. A noticeable feature is the absence of a hall on the first floor, the stairs rising from the parlor, but as they are neatly finished they make a rather attractive feature of that room. A sliding door is placed at the first platform landing, thus shutting off the upper flight.

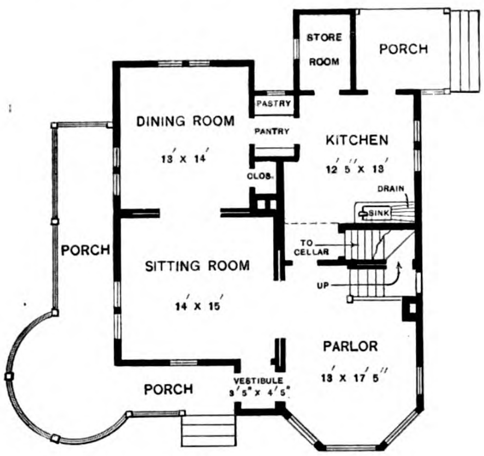
Front Elevation.—Scale, 1/8 Inch to the Foot.

Frame Cottage at Butler, Mo.—George W. Payne & Son, Architects, Carthage, Ill.

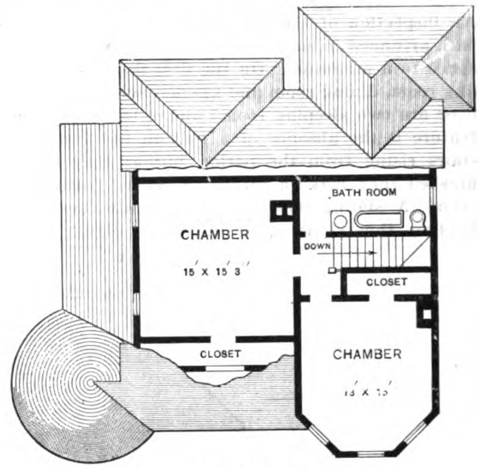
There is a cellar 7 feet deep under the entire building, the cellar walls being of stone. The frame of the cottage is of pine, covered with ship lap and building paper. It is finished with clear ½-inch pine siding for the first story and with redwood shingles for the second. The roof is covered with 1 x 6 inch sheathing boards spaced 9 inches from centers, on which are shingles laid 4½ inches to the weather. The sills of the building are 6 x 8 inches, joist 2 x 8 for the first floor and 2 x 10 for the second floor, and studding and rafters 2 x 4 inches, all spaced 16 inches from centers. The house was designed to face south and has been provided with a porch extending well around on the west side. The porch columns are 6-inch, turned, with square base and top. The porch floors are 1¼ x 4 inch white pine laid with painted edges. The inside of the house is plastered three coats and is trimmed with natural finished woods. The outside and sliding doors are 1¾ inches and all other inside doors 1⅜ inches thick. While the cottage is heated with stoves it could easily be arranged to use a furnace for this purpose. The plumbing provides for hot and cold water in the bathroom and at the kitchen sink, while the water closet is supplied with city water and there is a supply tank in the attic for soft water. The total cost of the house was $1750, which includes everything except the heating.

Color in Modern Architecture.

The lack of color in our modern architecture is often commented on, and we frequently hear expressed the hope that a more consistent and general use of color might prevail in our street architecture. Color is, however, almost a closed book to many architects, and the reason for this, we believe, says the *Brickbuilder*, is very largely timidity and a fear of spoiling the particular building which engages the attention. Timidity, however, never built great monuments nor led the way to any advance, and if we are to do color we must stop talking about it and get to work and do it. It is not every one who has a distinct eye for color, and it is not always possible to reason out in advance a scheme of applied color which will be successful. In this connection we are reminded of a most excellent designer whose chief title to fame was his ability to work out an uncomfortable corner or to straighten out an entangled bit of design. Indeed, it used to be said that he never could do a thing right until he had done it wrong first and got it all snarled up. Now that kind of reasoning applied to color is illogical, we admit, and of doubtful success as compared with the spontaneous conceptions of the true colorist, but for the average practitioner it is far better to plunge in boldly, make a mistake in his colors and then by using a little reason to try and straighten them out, rather than to yield to the timidity which would lead him to abandon striking combinations entirely and adhere to the commonplace. For instance, let one of these timid designers some day try an experiment. Suppose he has a terra-cotta front, let him somehow put a great blotch of green right in the center. As he has got it there he has got to make it good looking, so the next step might be to put right alongside of it a brownish yellow; and if the green is a bright emerald green hue such as we sometimes get in the terra-cottas, let him put just a faint dash of purple between the yellow and the green and he will have a combination which he will have to use his wits to get out of. The chances are that it will be thoroughly bad; but by remembering the simple fundamental laws of harmony and contrast in color, remembering that in a general way red complements the green, and purple the yellow, and blue the orange, and by making a few studies in pastels, it would be very strange if he couldn't pull himself out of that combination with a result which ought to yield some very interesting and, after a few trials, valuable color



First Floor.



Second Floor.

Scale, 1-16 Inch to the Foot.

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

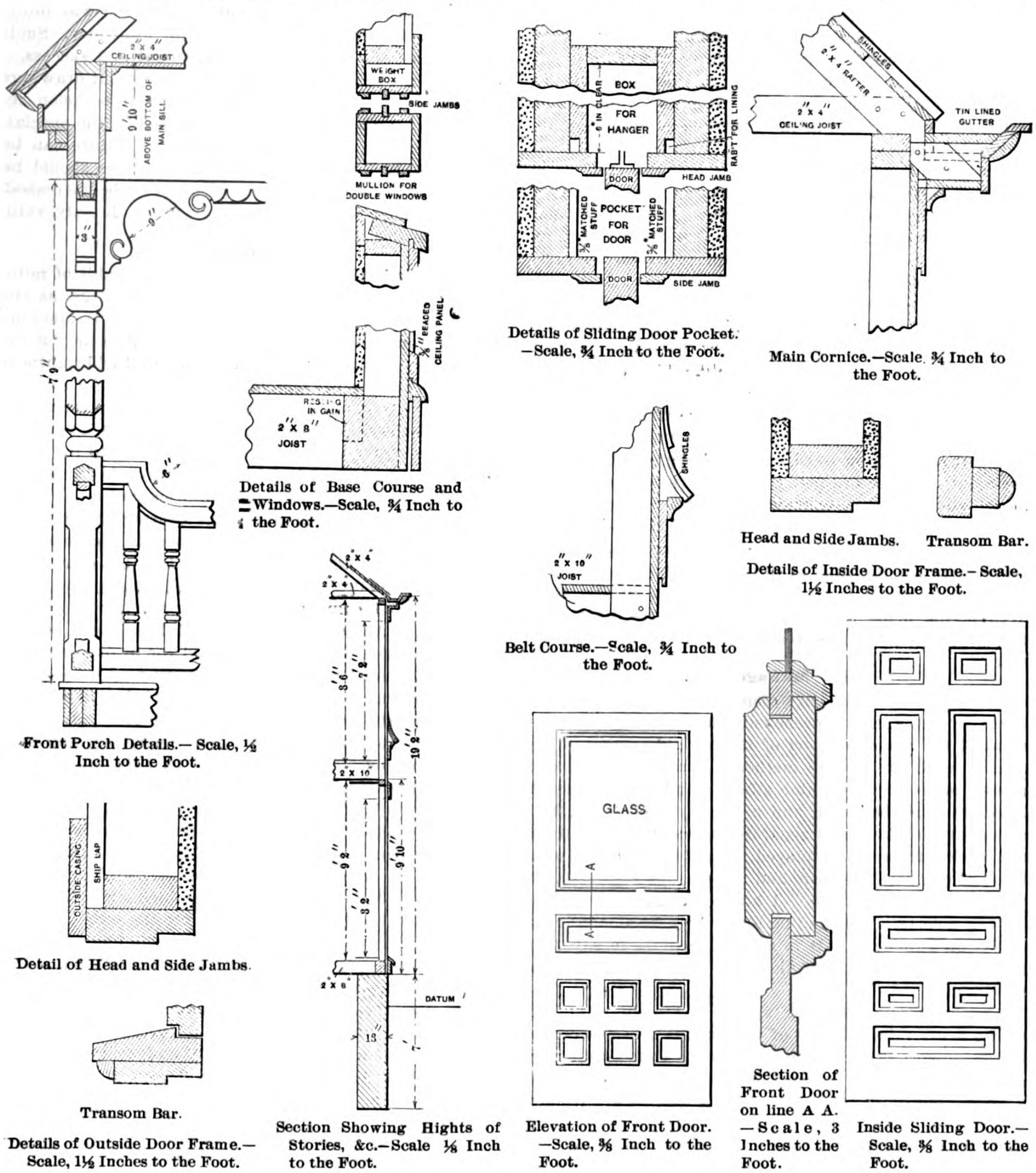
Frame Cottage at Butler, Mo.—Floor Plans and Side Elevation.

effects. At any rate, after a man has done this once or twice his worst enemies would never accuse him of timidity, and if he didn't succeed in making a success of the combination he can, at least, console himself with the feeling that some other wayfarer, seeing his failure, might take heart, try again and do it better, all of which may not be particularly consoling to the owner who has employed the essayist, but it would be a step toward what we are all looking for, color in our buildings. If any one should undertake to analyze most any of the really successful architectural color effects, such, for instance, as the Della Robbia frieze on the Pistoja Hospital, it would be seen that the very colors which we have enumerated here are used in juxtaposition and that the unity is brought about by what is added after these had been thrown in; and though, as was said before, the best way is to feel the color in the beginning, to do it naturally and let it be *sui generis*, he who has not that endowment need not, therefore, content himself with the commonplace monotones. A friend of ours taught his son to swim by tying a rope around his waist and throwing him into the Mississippi from the deck of a steamboat. The boy learned to swim very promptly. A similar treatment of self-immolation on the part of our timid designers would very speedily give us, at least, the prospects of some strong colorists.

A German court has recently decided that electricity cannot be stolen. A man was arrested on the charge of having stolen several thousand amperes of current by tapping a lighting company's main and using it to run a motor. The judge ruled that "only a movable material object" could be stolen, which electricity was not, and ordered the acquittal of the accused.

Bookcases of the Ancients.

Every monastery in Greece, says Ricaut, has its library of books, which are kept in a lofty tower; and this fashion, possibly very ancient, was certainly adopted here from superior seclusion. Libraries existed in Egypt contemporary with the Trojan war, and one was formed at Athens by Pisistratus, long before the time of Aristotle, who, Strabo says, was the first Greek who made a library. The Romans borrowed the fashion from the Greeks, and the former had superb libraries, adorned with portraits of deceased *literati;* cases reaching to the roof, called "loculamenta," with shelves ("pegmata") and holes for the rolls ("nidi,") the walls between the cases being incrusted with plates of ivory and colored glass. The cases and desks were made of ebony and cedar. The pavements were of marble and there were porticoes for readers. Duplicates of books were called "fratres," and all the works of an author were put, with his portrait, in the same place. These, however, were superb structures, belonging to the public or the great. The room at Herculaneum in which the rolls (not less than a thousand) were found was a mere closet, and Juvenal says that the poor poet Codrus kept his books in an old chest. But we hear of cabinets for books, which cabinets were numbered, stood in the vestibule, and were charged with ornaments repeated on the envelopes of the books. A library found in a ruined villa under the wood belonging to the church of the Augustines, near Portici, was adorned with presses inlaid with different sorts of wood, disposed in rows, at the top of which were cornices as in our own times. Among the Egyptian monks the books were kept in a window, by which we suppose is meant an arched cupboard in the wall, the depository among the Britons, and apparently the Anglo-Saxon "boc-hord," for it appears in the frontispiece of Trivet's "Annals," engraved from the ancient illumination. The famous Godiva gave the monks of Worcester a bookcase divided into two parts, and we find elsewhere painted presses, chests, shelves and versatile desks called "rotæ." A very elegant one consists of a tall post or stand upon claw feet, surmounted by a large eagle. The shaft is cut into a screw for raising or lowering a round desk which encircles it.



Front Porch Details.—Scale, ½ Inch to the Foot.

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

Details of Sliding Door Pocket.—Scale, ¾ Inch to the Foot.

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

Belt Course.—Scale, ¾ Inch to the Foot.

Head and Side Jambs. Transom Bar.

Details of Inside Door Frame.—Scale, 1½ Inches to the Foot.

Detail of Head and Side Jambs.

Transom Bar.

Details of Outside Door Frame.—Scale, 1½ Inches to the Foot.

Section Showing Hights of Stories, &c.—Scale ⅛ Inch to the Foot.

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

Section of Front Door on line A A.—Scale, 3 Inches to the Foot.

Inside Sliding Door.—Scale, ⅜ Inch to the Foot.

Miscellaneous Constructive Details of Frame Cottage at Butler, Mo.

THE CONTRACTOR AND BUILDER.*

SOME years ago, while sitting in the cloisters at Windsor Castle, my attention was attracted by an old man who was resting and enjoying the play of a little girl not far from him. I approached and entered into conversation, and gradually, finding I was an architect from America, interested in all I saw and heard, he warmed up over the subject of good carpentry. I found he had, as he said, made one of the side doors to Saint George's Chapel with his own hands. He took me to see it, and the way he expatiated on the fineness of the moldings, joints, miters, &c., did my heart good. He was a simple artisan, ignorant of many things, but proud of his work, and in the affectionate doing of it he had found the secret of all good work, and at the same time a joy that made his life bright and cheerful. It is true that there are many things that work counter to a continuous enthusiasm and interest. The competition system, good in some respects, causes such low contracts that it is hard not to skimp and squeeze; then the difficult task of controling all the doings of sub-contractors. But in spite of all drawbacks an ideal can certainly be aimed at and worked for. An old builder who had in his time done much good and large work once told me that he started, as a mere lad, with the one idea that everything he did should be as perfect as he could make it. He soon built up a reputation for entire trustworthiness, and succeeded in securing both money and the satisfaction that comes from conscientious doing of what seems one's duty. There are many men who would, especially in private work, pay considerable extra money for the sake of having undoubted care taken. I have found such in my own experience; one client I recall gave over $4000 more for the sake of obtaining a builder whom I told him he could put perfect confidence in. So that, even laying aside all the other advantages, cold cash may eventually be the result of careful handling of work.

Slack Management.

Besides the lack of care displayed in the work itself there is often a most reprehensible laxity in the management of the monetary part of it. A rigid system of accounts, with up to date methods, is a *sine qua non* if money is to be made and affairs conducted properly. Receipts must be taken and given for everything, balances struck often, and separate statements kept of all the varied interests employed. In addition to these a table of comparative costs and the reasons for variation will prove of great value. I knew a contractor who in July of a certain year had no idea where he stood, financially, on January 1. It is almost needless to say that failure was not long in following such absence of common sense.

Carelessness in keeping appointments, in attending to the many minor details of the business, in answering letters, in correcting promptly any little things that may go wrong after the contract is completed, in the thousand and one daily items that require looking after, all go to swell the list and stamp the contractor in the client's and, what is generally more important to have, the architect's eyes. It would be well if every human being would remember that order and system are the two great laws of the universe, giving a certainty to our lives, and that the more these obtain in our daily actions the nearer we approach ideal business men.

Ignorance.

There is little excuse for ignorance. After the first principles of reading, writing and arithmetic are learned, perseverance and labor will accomplish the rest. One need not, perhaps, be such a devotee to learning—unless, indeed, he means to be a scholar, which is not in our category—as to spend three or four hours on hot summer nights under a gas light, stripped to an undershirt, studying, as did an architect of my acquaintance. Yet he was on the right track, only intemperate. I once had a boy in my office who, after he left me, determined to take up building, his talent not being of a professional kind. He secured a place with a contractor on some work about four miles from his home. He arose every day at 4 o'clock, made his own breakfast, and from 7 a.m. to 5 p.m. was at his work. Three nights in the week he attended drawing school to study a special course. Nor did he loaf on Sundays, for he was interested in some church work that kept him busy. Such a person as this deserves encouragement and success.

Contractors should certainly know all about drawings and be able to make explanatory ones if occasion requires. They should also be well versed in the specialties of the day. If a limited amount of culture can be added, so much the better. No opportunities should be allowed to pass whereby knowledge can be increased, especially such knowledge as may prove directly valuable in business.

Stupidity.

Stupidity I should characterize as that habit of mind that causes blindness in its possessor to things, as the saying is, further than the end of his nose. It takes no lessons from the past, it does not glance into the future. It may be combined with a certain amount of brightness of intellect and quickness of perception, but for all that it is eternally standing in the way of advancement. It is apt to be both pig headed and knavish, but it is easily lived down by one who makes up his mind to it. Some years ago a building I had in hand had reached the stage of formation of a rather elaborate brick cornice. I heard one day from a hidden corner the contractor explain to the head bricklayer how to do the work. He could not or would not understand. "Wait," said the contractor; "I will get the drawing." "Oh, d—— the drawing," was the reply. "I came here to lay brick, not to look at drawings." Again, a chimney had been built on the roof of a house, and was to be paid for at once on completion. It had been skimped in every way, and a gale arose as it was finished. "Do you think it will stand?" said one of the bricklayers. "Oh, prop it up as well as you can. I will go down and get the money and then whistle for you. Then let her rip," said the other. They were both examples of stupidity—the latter might be given even a harder name.

I cannot close these desultory remarks without writing a few words on the dignity of labor. It is the great factor in the advance of civilization. Indeed, it is more than that. It is the fulcrum on which rests the lever that moves the world. Money is only the direct product of labor, but by a strange mischance it has taken the foremost place in the imagination of mankind. Our republican institutions, good as they are, are apt to foster discontent and dissatisfaction with the humble lot, and attempts are made to get higher, not by striving to better the work, but by shady endeavors to secure money. Most happy is he who, while seeking perfection in all he does, is yet content. Schiller has charmingly written:

"Labor is the freeman's glory;
Blessed be honest toil and free.
Kingly names may shine in story;
Honored shall the workman be."

And in times of discouragement it is wise to reflect that an idle life is a useless one, and that the highest duty is only fulfilled by doing cheerfully and honestly the tasks that lie plainly in view. The wise Solomon wrote, "Seest thou a man diligent in his business; he shall stand before kings." He might have written "presidents" in place of "kings" had he lived now, but he certainly would not have written "millionaires."

As proof of the usefulness of the Cuban forest trees it is stated that a house can be built without the use of a single nail, and strong enough to stand up against any wind. The beams and rafters are tied together with several species of liana, which are found in abundance in the woods.

* Continued from page 215, September issue.

THE ART OF WOOD TURNING.—III.

By Fred. T. Hodgson.

THE next important matter in hand is the choice of tools with which to perform the work, and, as the art of wood turning, like every other, must be reached step by step, a few simple tools will suffice for the first efforts. These may consist of a few gouges and chisels, similar to those shown in Figs. 15 and 16. These are made purposely for the work and may be purchased from any well equipped hardware store, or sets of turning tools may be obtained consisting of 12 or 15 different tools. For the present two gouges and two chisels will serve the purpose. One gouge may be 1½ inches and the other ¾ inch. The chisels may be about the same size. Both gouges and chisels should be fitted into good solid handles in about the proportion shown in the illustrations. Gouges should be well rounded on the cutting edge and should be ground at an acute angle. The chisels are ground with bevel on both sides and at an angle of about 35 degrees to their edges. The basil or bevel should be even all its length and not made more obtuse as it approaches the cutting edge. This is a point that is very important and one the beginner should not fail of attending to, as on a correct shape of the gouge or chisel depends the quality of the work. The best of turners find it difficult to make good work by the employment of tools that are not properly ground, and this being the case how much more difficult must it be for the inexperienced to make even a passable job if the tools are in a bad condition? The shape of cutting edge of chisel is shown in Fig. 17.

Gouges and chisels should be kept quite sharp by being honed on an oilstone of some kind, and a slip should be employed to rub up the concave edge of the gouge, taking care to hold the slip on a line with the face of the gouge.

The gouges and chisels being in order, we will now proceed to execute a piece of work. Let us take a stick of birch about 2 feet long and 3 x 3 inches in section. Center the stick at both ends by either of the methods shown in Figs. 13 and 14. Place the end to your left against the pronged chuck, with the center point against the center "tit" of the prong, and force the wood on to the chuck until the wings of the prong get a good grip; hold the right hand end of the stick in the left hand, and turn the tail screw until the central point is forced well into the end of the wood, but make sure the point enters the wood at the center of the stick. Drop a little oil at this center, as the wood revolves while the center remains stationary, and a little oil or grease of some kind will reduce the friction considerably. It is a good plan to make a recess in the wood to be turned with a center punch, and then insert a little mutton tallow in the cavity before putting the stick in the lathe.

Fig. 18 shows the work in the lathe after it has been "roughed" off with the gouge and made cylindrical by having the corners taken off. If we suppose the work to be intended for a towel roller—which is perhaps among the simplest useful articles that can be made in a lathe, the proper length of the roller may be measured off as shown in the illustration, the wavy parts showing the extra lengths required for the pins of the roller. The ends may be first shouldered by the gouge, as in Fig. 19, and squared in with the point of the chisel, as shown at B and A, Fig. 20, after which the pins, as shown in Fig. 21, may be finished to the proper size, but not before the cylinder has been made parallel and smooth from end to end.

In order to rough off the square stick the gouge should be grasped firmly near the ferrule in the left hand, the knuckles of the fingers being uppermost, as represented in Fig. 22, and placed on the rest, the right hand holding firmly the end of the handle and resting lightly against the right breast. The convex or rounded side of the gouge is downward and bears on the rest. It must be gradually and cautiously advanced toward the revolving wood on the angle, as shown in Fig. 23, which is called "tangential." When the gouge first touches the wood in this tangential position it will be found that the tool will not cut, so the handle of the tool must be slightly and gradually elevated until the cutting takes place. The turner then must move his tool along the top edge of the rest backward and forward, keeping it cutting all the time, until the square stick has been reduced to a rough cylinder. The matter of holding the tool steadily during the operation is of the utmost importance, as there is a constant and uniform tendency, caused by the rotation of the work, to force up the right hand of the operator and cause the cutting edge of the tool to dig into the wood and destroy the work. This tendency of the tool to dig in must be counteracted and controlled by the will of the operator, he keeping his right hand down and holding the tool at its proper angle. The rough cylinder will necessarily be covered by a series of shallow grooves or channels having slight ridges between them, but this is of no consequence, as the work is to be further manipulated.

The operator must now ascertain whether he has re-

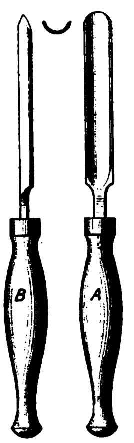


Fig. 15.—Front and Side Views of a Gouge.

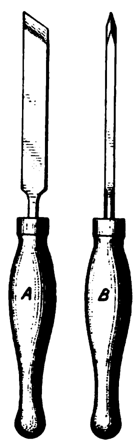


Fig. 16.—Two Views of a Chisel.

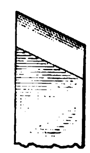


Fig. 17.—Cutting edge of a Chisel.

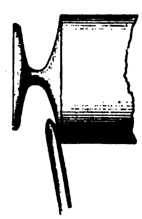


Fig. 19.—Shouldering with a Gouge.

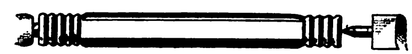


Fig. 18.—Appearance of Work in the Lathe.

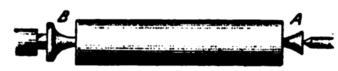


Fig. 20.—Turning the Ends.

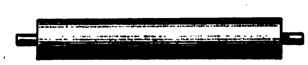


Fig. 21.—View of Roller Completed

The Art of Wood Turning.—Tools and Some of the Work Which Can be Done With Them.

duced the work to the size required. If this has not been accomplished, and the cylinder is still too large to admit of being finished off with the chisel, he must go over the work again with the gouge, taking off so much of a shaving only as in his judgment will be required to admit of it being properly finished. This may be discovered by using a pair of calipers, such as carpenters generally carry in their "kit," and which are shown in application in Fig. 24. The distance between the points of the calipers may be a little greater than the diameter of the cylinder when finished, so as to admit of its being finished with a chisel. After the cylinder is reduced to the dimension desired by the gouge the calipers may be set to the exact diameter, which will be the gauge to work by when using the chisel. In applying the calipers to the work care must be taken to hold the tool square—that is, at right angles to the axis of the cylinder, as shown at A, Fig. 25. If this is not done, and the calipers are applied as shown at B, the work will not be exact or of the proper size. This will not be of much moment in the making of a towel roller, but in ornamental turning, and particularly in pattern making, it will be of the utmost importance that the work be made the exact dimensions intended, and the operator should accustom himself to apply the calipers properly at the start, so that when he gets to be able to turn out difficult work he will not be obliged to unlearn or correct faulty methods.

It will now be necessary to make use of the chisel, and as this tool requires more care and skill in its proper use I will endeavor to explain clearly how the tool may be used successfully, though it may be stated that, after everything is said that possibly can be said in describing the methods of using the chisel, there will always present itself from time to time a great deal to be learned, and which will have to be met by the ingenuity of the operator; but I apprehend no difficulty in the matter after he has had a little practice in turning, as he will soon discover the means to meet every emergency as it arises.

The turner's chisel is grasped in the same manner as the gouge. It is held tangentially to the work, as shown in Fig. 26, with the lower corner of the obtuse angle on the rest. It is then tilted carefully in such a manner as to bring the central portion of the cutting edge against the work, both the corners being free. This precaution is necessary, for if the whole edge was permitted to come in contact with the revolving material the corners would dig in, and the work would consequently be spoiled. The edge of the tool must be kept lying obliquely to the axis of the work, as illustrated in Fig. 27, and the chisel is traversed or slid along the rest with the bottom edge in advance, being held steadily meanwhile so as to insure that the shaving taken off is of one uniform thickness along its entire course. The thickness of the shaving will depend upon the elevation given to the handle of the chisel, precisely as it does when using the gouge. The cut can be taken from either end, according to which of the two corners of the tool is laid upon the rest. When the ridges left by the gouge have all disappeared the truth of the work must be again tested by means of the calipers, and by applying the edge of the blade of a steel square or other straight edge along its surface parallel with its axis, and any protuberances removed with the chisel, and the whole surface smoothed carefully with the same tool. With the use of the chisel the difficulties of the beginner may be said to commence, and "these difficulties," says an excellent authority, "may be classed under three heads: First, turning a true cylinder; second, turning a flat surface, an operation which is usually termed 'facing;' and, third, working accurately to measurements." These difficulties, however, may be overcome by an ordinary amount of care, those included under the first and second classes being rendered evident by a due application of the straight edge, which will show at once what parts want turning down, while the correction of the work, as regards dimensions, is proved by a proper application of compasses and calipers; or, in case of work having an undulating outline, by templates, which may be made of sheet metal or other suitable material cut out in the form of a counterpart to the profile of the object to be turned; thus the template of a sphere or ball would be made as shown in Fig. 28. It is evident that if the edge of this template be chalked, blackened or otherwise marked with a coloring matter, and held against the object to be operated upon with sufficient force while the work is revolving in the lathe, the prominent portions of the object will be marked, thus showing the parts which require to be reduced in order to make the work correspond with the template. The application of the colored template must be frequently repeated until the work becomes colored equally all over the whole surface, and when this takes place the work may be considered fairly accurate.

In the work under notice it is supposed that the rest is long enough to admit of the gouge and chisel traversing the whole length of the stuff revolving in the lathe. The rest may be metal or of hardwood—preferably maple—with a strip of iron or steel screwed on the face of it, so that the edge of the metal is in such a position that the cutting tool may rest on it during the operation of cutting. The hardwood rest will answer without the metal facing, but it is much better to have the facing; although for short or ornamental work the best rest is one made from cast iron.


Fig. 22.—Manner of Holding a Gouge.

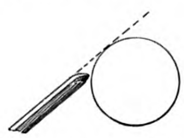


Fig. 23.—Angle for Starting Work with a Gouge.


Fig. 24.—Calipering.

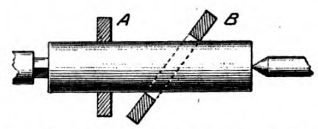


Fig. 25.—Views Showing Correct and Incorrect Calipering.


Fig. 26.—First Position of Chisel.

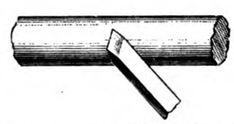


Fig. 27.—Side Position of Chisel

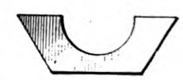


Fig. 28.—Template for Sphere.

The Art of Wood Turning.—Tools and the Methods of Holding Them.

THE durability of wood does not, as some suppose, depend on its weight. Larch, one of the lightest woods, and locust, one of the heaviest, are alike almost indestructible.

HEATING AND VENTILATING A CHURCH.

THE church erected by the Sixth United Presbyterian Congregation at Sixty-second street and Woodland avenue, Chicago, Ill., from plans furnished by Wald & Cranford, Ashland Block, of that city, is a building of masonry of pleasing architectural appearance and provided with all the conveniences for the congregation that have been found necessary in modern church structures. There are several features of the heating system which are of interest, including, as it does, a system of ventilation in connection therewith. The church fronts west on Woodland avenue, and the southern exposure is on Sixty-second street. In Fig. 1 a plan of the basement is presented, showing the location of the furnaces, the church parlor, the primary class room and the kitchen, all of which are heated. The plan of the main floor of the church is given in Fig. 2, the partition being arranged so that the Sabbath school room at the left and the gallery above, which is shown in Fig. 3, can be made a part of the church proper when desired.

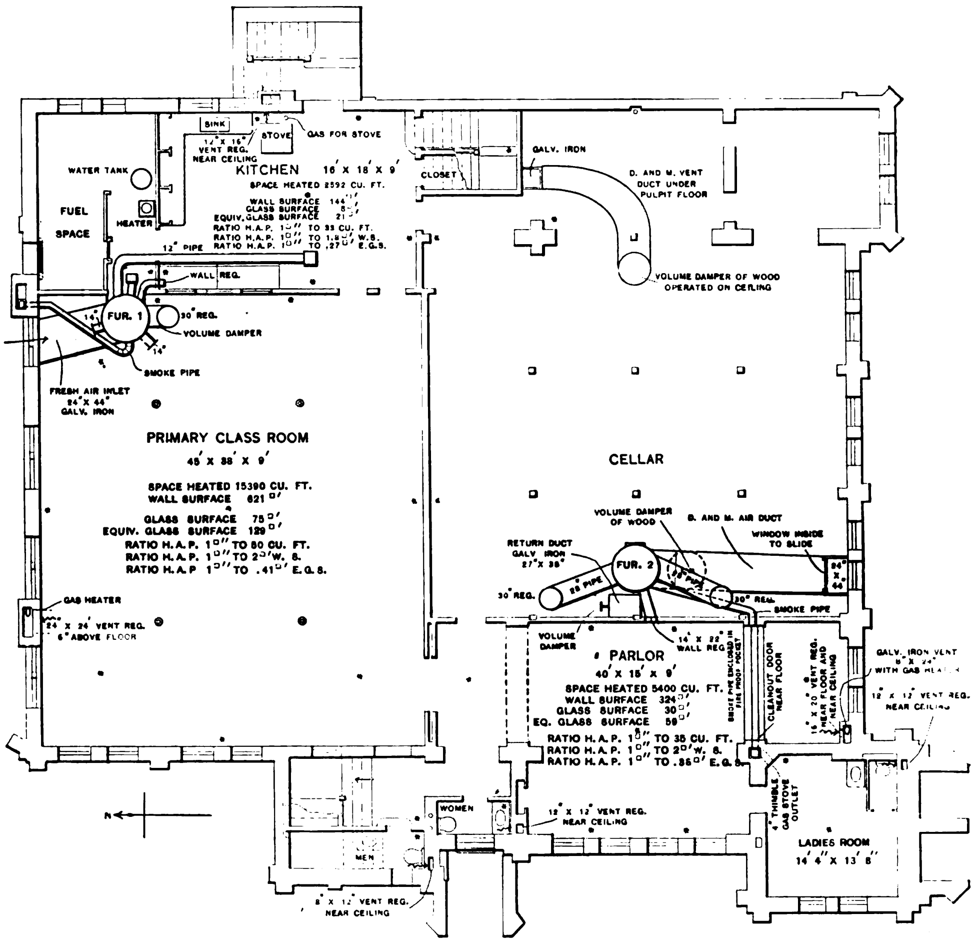


Fig. 1.—Plan of Basement.

Heating and Ventilating a Church.

The amount of heating to be done, and the proportions existing between the different parts of the system, can be followed by the plans and the data presented in connection therewith. Two furnaces were employed, one of them being located a little west of the center of the main church building. It is supplied with cold air from outside by means of a 24 x 44 inch cold air duct. This duct is provided with a slide so that it can be entirely or partially closed as desired. A damper is also placed in this duct near the furnace so that the volume of air taken from out of doors may be controlled for use in connection with a 27 x 38 inch exhaust duct connected with a register face, 30 x 42 inches in size, placed in the floor of the main audience room. A 14-inch hot air pipe leads from the top of this furnace to the side wall of the parlor, in the basement of the church, on the same level with the furnace. Two 28-inch pipes leading from the furnace to 30-inch round registers placed in the aisles of the main church. A 10-inch smoke pipe is carried from the furnace across the ceiling of the parlor to a 12 x 12 inch chimney running up in the tower of the church. Another furnace is finished with a Russia iron casing, and is located in the rear of the primary class room and so arranged that all attention to the fire can be given from the room in the rear of the class room, the surface of the furnace being exposed to aid in heating the class room. In addition to the heat derived from this surface, there are two 14-inch pipes with 14-inch registers attached to them arranged to discharge warm air into this room, registers being provided so that the hot air can be shut off when desired for use in other parts of the building. A 10-inch pipe runs from the top of the furnace to the side wall of the kitchen to aid in heating that room when it is used without operating the stove in it for heating. A 14-inch pipe leads to a 14 x 22 inch register in the floor of the bible class room, and a 12-inch pipe is carried to a 12 x 15 inch register in the floor of the room provided for the secretary.

A special feature of the system is the free circulation of the warmed air by means of specially constructed and arranged ventilators. Instead of doing this by means of a fan, it has been accomplished with the aid of small gas heaters placed at the bottom of the ventilating shafts. These are located as shown on the plans, one at the base of the flue in the primary class room in Fig. 1, one at the base of the flue ventilating the parlor on the south side of the church, one at the rear of the Sabbath school room in Fig. 2, and two in the flues at the front end of the church proper, and another at the base of a 20 x 24 inch flue, which is connected with a large register in the front of the pulpit platform and runs underneath the floor, as shown in Fig. 1. The construction of these gas heaters is shown in Fig. 4. They are made of sheet copper, and in the

The furnaces used in the work are the Palace Queen tubular construction No. 268. These are provided with deep ash pits, the grates being 30 inches in diameter, and the fire pots 14 inches deep and 34 inches in diameter at the top. On the top of the fire pot rests the base for the tubular radiator, the outer shell of this radiator being 62 inches in diameter. The space between the opening for the fire pot and the outer shell is utilized for placing about 17 tubes, 7 inches in diameter, connected with a head at the top, and around these tubes the products of combustion play. By this means a considerable amount of surface is presented for heating air. The space between the tubes is so arranged that the fire travel through the furnace is somewhat indirect, and by this means the heat is thoroughly extracted be-

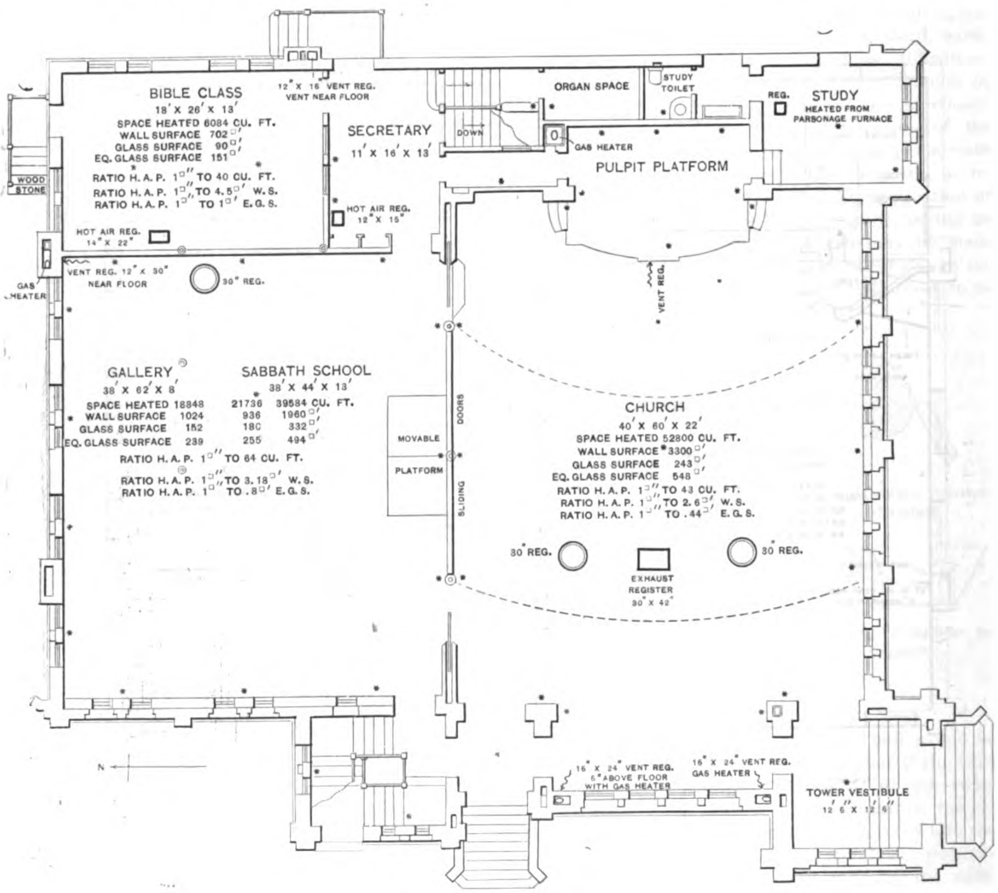


Fig. 2.—Plan of Main Floor.

Heating and Ventilating a Church.

bottom of each heater an ordinary gas jet is placed as shown, back of a small door in which mica is put so that the flame may be seen. The bottom of the heater is perforated for the admission of the gas pipe, and all around the bottom of the body perforations are made for the entrance of the air to be removed from the building. This copper cylinder is made oval, 8 inches in largest diameter, and inside of it is another copper cylinder 4 inches in largest diameter, connected as shown with an oval pipe running down outside the heater below the bottom so as to provide for an additional flow of air to pass through it. By this means it will be seen that a large surface is exposed for contact with the air, and it is stated that the gas flame is sufficient to provide a temperature to insure a strong current. The flow of air upward through the ventilating shaft is very strong, making a direct pull on the furnaces and accomplishing a very satisfactory ventilation of the various rooms in the church edifice.

fore the gases enter the smoke pipe. The furnace proper is inclosed in a casing 68 inches in diameter, and is rated by the manufacturers to have a capacity for heating from 50,000 to 80,000 cubic feet.

In order that a comparison may be made between the heating apparatus and the work to be done, we have found that the space heated amounts to 122,138 cubic feet. The wall surface amounts to 7194 square feet, the glass surface to 792 square feet, and the equivalent glass surface to 1429 square feet. This has been arrived at by calculating that 10 square feet of wall surface are equivalent to 1 square foot of glass. Owing to the thickness of the wall and the fact that the building is said to be well built, a more liberal allowance might be made here, but as the windows are leaded it is quite probable that the leakage of air will offset any error that may have been made in this calculation. Each grate has an area of 702 square inches, or 4.9 square feet. This makes a proportion of 1 square inch of grate area to 1 square foot of equivalent glass surface, to 5.1 square feet of wall surface and to 87 cubic feet of space. It is a proportion of 1 square foot of grate surface to 26¾ square feet of heating surface, the furnaces exposing very nearly 131 square feet of surface each. In comparing this heating surface with the work to be done, it is found that 1 square foot of heating surface is provided for every 5.45 square feet of equivalent glass surface, 27 square feet of wall surface and 470 cubic feet of space.

It will be noted that one furnace has hot air outlets amounting to 1384 and the other to 1268 square inches, and that the cold air supply from out of doors amounts to 1056 square inches, or a proportion of three-fourths. The furnace near the Sabbath school side of the church has hot air outlets amounting to 1268 square inches and has a cold air duct 24 x 44 inches with an air capacity the air must flow to supply this area of hot air outlets. By calculating the size of the outer casing we find it has an area of 3632 inches, and that the radiator has an area of 3019 inches, leaving a difference of 613 square inches, and adding this to the area of the 17 7-inch pipes, which amounts to 654 square inches, we find the total air space in the furnace amounts to 1267 square inches. This very nearly equals the outlet of the Sabbath school furnace and, as the furnace under the church is seldom used for heating the parlor at the same time the church is heated, it is in excess of the area of the two 28-inch pipes. It is probable, however, that there would be no difficulty in filling all of the pipes connected with either furnace through the space provided in the furnaces.

It is interesting to add after the various proportions of this heating system have been considered that the

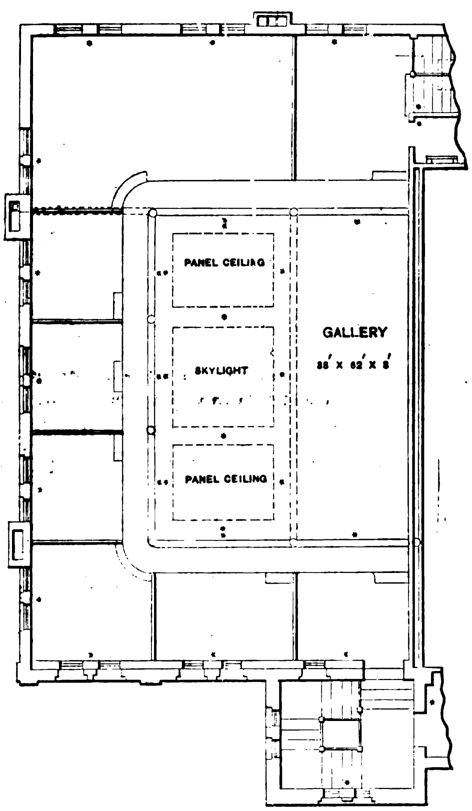


Fig. 3.—Plan of Gallery Over Sabbath School.

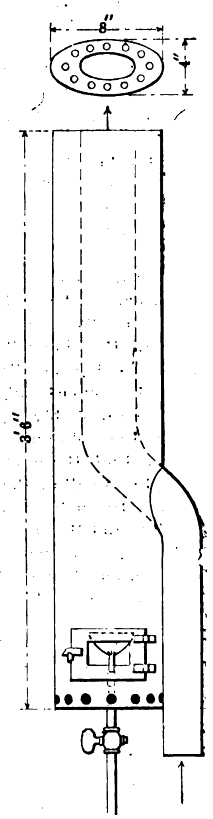


Fig. 4.—The Gas Ventilating Heater.

Heating and Ventilating a Church.

of 1056 square inches, the proportion of cold air to hot air outlets being somewhat more liberal in this instance. It will be noticed also that in heating the primary class room the Russia body of the furnace is an important factor. If a proportion of 30 cubic feet for each square inch of hot air outlet is taken care of by the two 14-inch pipes, 6100 cubic feet of space will be left to be heated by the furnace casing. Owing to the fact that a large proportion of the furnace is not exposed in the class room we have estimated that about 75 square feet is available for heating air, and that each square foot of this sheet iron surface takes care of about 80 cubic feet. It will also be noticed that comparing the total amount of hot air outlets with the total amount of space heated, 1 square inch of hot air outlet takes care of 46 cubic feet of space and about ½ square foot of equivalent glass surface. It will be seen that the furnaces have hot air outlets of 1268 and 1384 square inches, and it will be interesting to note the amount of space in the most restricted part of the furnaces through which church has been heated by this system through the past winter to the entire satisfaction of the congregation, and that the ventilating system has shown an efficiency that has added materially to the comfort of the congregation and to the operation of the furnaces.

The system was installed by March R. Story & Sons, the Western agents for Russel Wheeler & Son of Utica, N. Y.

How Stucco Is Made.

Stucco is made by diluting very fine newly baked plaster in a hot solution of white Flemish glue, so as to make a soft paste. Various coloring substances are added to the paste to imitate marble. These colors, says *Science Francaise*, are the same as those employed for painting houses. When the mixture is dry it is polished with pumice stone and then with whetstone and tripoli. A final polish is given by rubbing it with a piece of felt and soap suds and then with oil. With this imitation marble pillars, floorings and children's toy marbles are made.

Steel Construction in America and England.

AN interesting contrast between the systems of steel construction as employed in America and England is drawn by C. V. Childs in an article contributed to the *Engineering Magazine*. Among other things he says:

The steel work in an American building begins a few inches above the foundations, and consists of layers of steel beams, embedded in concrete, to form the piers on which the steel bases of the columns rest. The bottom layer is so designed that the load is distributed to the ground at an allowable pressure of 2 or 3 tons per square foot. This pressure being the same for all piers, any settlement would be uniform throughout the building. In the next layer the beams rest on those below, at right angles to them, and their length is equal to the breadth of the lower layer. The ends of the beams of each successive layer project and act as cantilevers, their sizes being determined by the intensity of pressure on their cantilever ends. Anchor rods are embedded in the concrete and bolt the column bases to the flanges of the uppermost layer. By this method the hight of the pier is considerably lessened, effecting a saving in excavation and concrete. The tops of the piers are kept just below the basement floor level, in order to economize room. The English architect depends on concrete alone for his foundations, and where buildings have been pulled down utilizes the old bricks for this purpose.

In America the space under the sidewalks, being the property of the owner of the building, is made a part of the basement floor. The outside walls are carried on lintels just below the sidewalk level; as each floor is carried on girders independently of the other floors, these lintels have to support only the weight of the ground floor walls and probably a portion of the ground floor load. Where the columns carry party walls it frequently happens that there is not sufficient space inside the building line to allow the column bases to rest fairly on the piers. In such cases the piers are built inside the party line, and the bases of the columns rest on strong cantilever girders bearing on the piers, the other ends of the girders being either counterbalanced by the internal columns or anchored down to a mass of concrete.

In English buildings, on the other hand, the stanchions carrying bressummers usually rest on blue brick piers, built up to within 1 foot of the ground floor level, and the bases of the stanchions are bolted to York stone plinths. Frequently a sheet of lead is laid between the steel base and the stone. Mention is made of this because experiments have shown that the practice is harmful; the crushing strength of the stone is thereby diminished, the supposition being that the lead flows into any unevenness in the stone and acts as a wedge.

Hight of Columns.

The columns in American practice are two stories in hight and the connections are made to break joint alternately at each floor. All connections of columns to columns, girders to columns and cross joists to girders are riveted, the riveting gang following after the erection gang and carefully plumbing each column before riveting it to the one below. The steel skeleton is thus as much a structure in itself as in the case of a bridge. The London building laws read as follows: "At each end of every metallic bressummer a space shall be left equal to ¼ inch for every 10 feet, and also for every fractional part of 10 feet of the length of such bressummer, to allow for expansion." Consequently, where bressummers rest on stanchions built into brick piers slotted holes have to be provided for the bolts.

This theory of expansion, however, is sometimes carried to lengths so extreme that the anchorage of the outside walls to the rest of the building has in some cases been sacrificed. In buildings, especially where the outside walls are carried on bressummers at the first floor level, this is of far greater importance than is provision for expansion. If expansion were to take place to the extent allowed for as above serious cracks would undoubtedly show in the brick work. The facts that bricks also expand to a limited extent, and that the steel work is in almost all cases protected from the outside temperature, should be taken into consideration. The friction between the steel and the brick work probably equalizes their difference of expansion.

The question of wind bracing does not enter into the English construction, but is an important factor in American high buildings. In the Carnegie Building gusset plates are used. The diagonal struts are merely temporary timbers to prevent any possible distortion until the brick work is built. The usual practice, however, is to connect four columns with lateral bracing, so as to form a tower extending from the bottom to the top of the building. It is questionable whether there is sufficient stiffness or breadth of base for this to be of any practical use. In calculating the strains due to wind pressure, the building itself may be considered as a cantilever. The columns in the outside walls, therefore, should be sufficiently strengthened to take up what would correspond to the flange strains in a girder, and, no doubt, the brick work of the outside walls acts as the web or counteracts the shear. The brick work, therefore, should be carefully built round the steel work and be of sufficient strength to withstand the diagonal pressure, or, in other words, the tendency to distortion which is caused by the shear.

Spacing the Floor Beams.

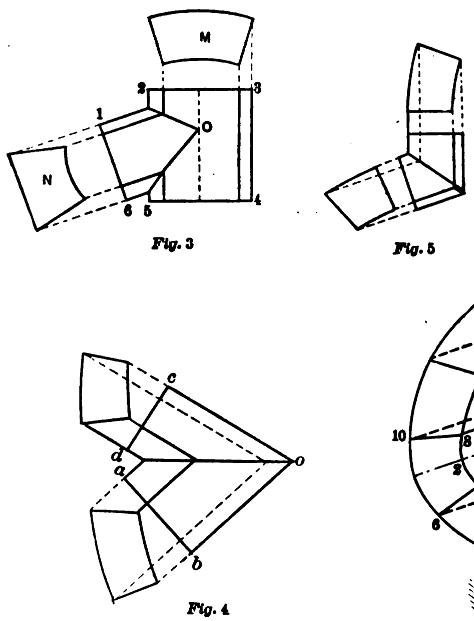
The almost universal practice in America is to space the floor beams 6 feet apart and to brace them with rows of ¾-inch tie rods; the space between the beams is then filled in with hollow flat arches made of fire brick. It is usual in England to space the cross joists 2 or 3 feet apart and fill in solid with concrete; or, in order to economize weight and the trouble of centering, to use one of the many patented floor constructions. The method of connecting the cross joists to the girders depends on the distance between the cross joists. If this spacing is only 2 or 3 feet it is more economical to rivet a continuous shelf angle to the web of the girder. This forms a bearing to the cross joists and also a support to the concrete filling. Where the cross joists are spaced further apart it is more economical to rivet them separately to the girders by means of connection angles.

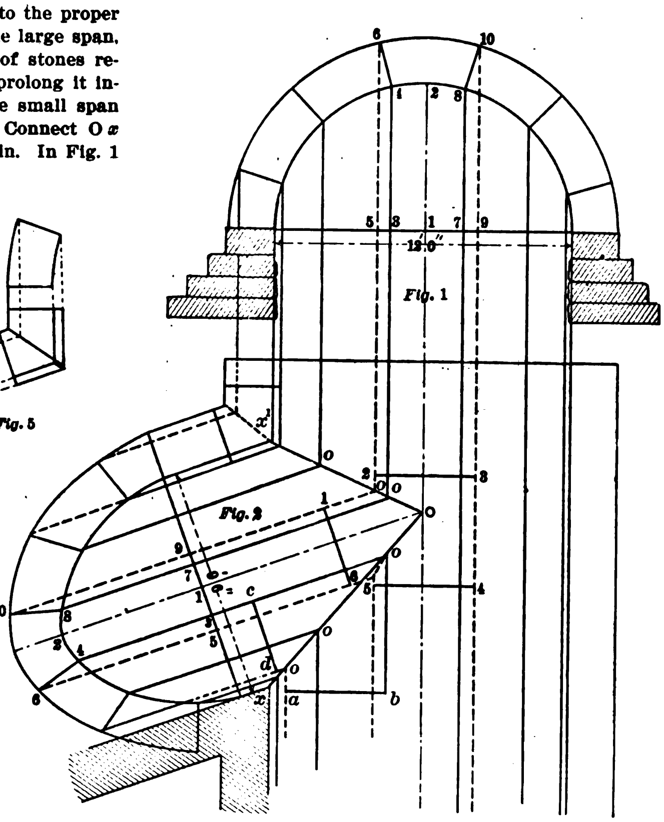
Slight differences, or rather preferences, prevail in regard to the cross sections generally in use for joists, girders or stanchions, but these are not very pronounced. The English sections of steel joists are, in most cases, heavier than American ones of equal depth. In designing the girders for a floor, provided there were no limitations as regards their depth, American sections would be found somewhat more economical in weight than if English ones were used. If the depth of the girders were limited, as is usually the case, this difference would probably vanish. On the other hand, the English sections, being wider in the flanges, are better adapted to use for riveted girders and stanchions. As regards larger girders, compound—*i.e.*, girders made up of joists and flange plates—are more extensively used in England than in America. This is partly due to the greater concentration of the loads in an English building, requiring heavier girders than are required in an American building, where the girders usually carry the loads of one story only. There also seems to be a preference among English architects for compounds rather than for two or more joists bolted together side by side.

CORRESPONDENCE.

The Intersection of Vaults.

From D. F., *Philadelphia, Pa.*—A correspondent writes to me asking how to solve a question relating to the intersection of vaults, as shown in the accompanying drawings, the spans being different but of the same hight. He also asks how to raise or make the arch over the small span equal the hight of the 12-foot span. I would say to this correspondent that if he will study thoroughly the articles on groins in the March and April numbers of the paper for this year he will find that no matter what the plan, the method of obtaining the size of spans and making the patterns is similar—that is, by inclosing each stone by lines in the plan. It will be seen by referring to the diagrams which I send that the large vault is of 12-foot span, while the small one is 9 feet 6 inches. Having laid out the plan to the proper size and shape we make an elevation of the large span, as in Fig. 1, dividing it into the number of stones required. From the center drop a line and prolong it indefinitely. Next, through the center of the small span draw a line meeting the first one at O. Connect O *x* and O *x*¹, which will be the plan of the groin. In Fig. 1 the soffit lines are represented solid and the top ones by dotted lines. From the soffit and top drop lines to touch O *x* and O *x*¹ at the points *o*, *o*, *o*, &c. Now from these points draw lines parallel to the side of the small span. Then take the distances 1 2, 3 4, 5 6, &c., from Fig. 1 and transfer them to Fig. 2, as shown. In this operation we have taken only one stone, but the whole arch can be numbered for points, and through them draw a curve; also the joints. As this arch cannot be drawn with compasses, the more the points into which the basis arch, Fig. 1, is divided the truer will be Fig. 2.





The Intersection of Vaults.—Diagrams Accompanying Letter of " D. F." of Phildelphia, Pa.

In order to cut the stones the method is the same as explained in articles previously published. We will, however, go over it rapidly for the sake of making the matter complete in itself. Referring to Fig. 3, let 1 2, 3 4, 5 6 be the pattern for the key. Work the joints 1 6, 2 3 and 4 5. Mark the molds M and N on the joints, run the soffit through and draw a center line, as shown. Next run the soffit N, forming a miter and meeting at O. Work the beds last. Fig. 4 represents one of the groin stones, *a b o c d* corresponding to the letters on the plan, Fig. 2. In Fig. 5 is represented the springer stone, marked *x*¹. Notice the difference in the plan of the springer opposite. The diagrams explain the method of working so clearly that further comment would seem to be unnecessary.

Words for the Young Builder.

From L. J. AIMAR, *Port Richmond, N. Y.*—It was with mixed feelings that I read the criticism of John S. Siebert, Cumberland, Md., appearing in the September issue of the paper, and for the present I should like to say to him that I do not consider some of his points well taken. Although he has quoted me correctly in each case, he has done so in a manner similar to an old story concerning a barber and the different meanings the words upon his sign may have been made to take upon themselves. In the near future I will make an effort to answer him and will endeavor to make my meaning clear upon every point. I think strongly of doing this from an architect's point of view, drawing upon my own experience of 19 years in the business, both as an architect and builder. In the meantime why not let us hear from some of the young builders in whose cause I have drawn the fire of the Maryland battery. I presume the columns are open to them providing they write to the point, not forgetting that brevity counts for much—instance the dispatch with which, according to Mr. Siebert, I complete the business between the owner and architect in " Words for the Young Builder."

Note.—Our columns are open to the young builders of the country, and we trust they will feel free to come forward with expressions of opinion concerning the subject indicated above.

From E. J. O., *St. Martinville, La.*—I am very much interested in the "Words for the Young Builder," presented in previous issues of the paper, and would like Mr. Aimar to name what, in his opinion, are the best books on the steel square. I think if we could get a few words every month from him it would prove of great benefit to us young builders. The paper is more and more valuable to me every month.

Painting Brick Work.

From J. C. B., *Hickory Corners, Mich.*—I think if E. J. Oliver, St. Martinville, La., will carefully read the excellent article by Arthur S. Jennings, on page 92 of the volume for 1894, he will obtain just the information that he desires relative to the painting of his brick walls. There is also an article touching upon the case on page 152 of the volume for this year.

Finding Treads and Risers with a Steel Square.

From E. J. O., *St. Martinville, La.*—I would like to hear from some of my brother carpenters who can tell how to find with the steel square the treads and risers of a stair when the space is limited, such, for example, as might be represented by a triangle the base of which is 11 feet 4 inches, the hight 11 feet 3 inches, and the hypotenuse 16 feet.

Lessons in Pattern Making.

From C. E. G., *Frederick, Md.*—In looking over the issues of *Carpentry and Building* for the past five or six years I notice numerous inquiries relative to pattern making, and that very little, if anything, has yet been said by way of instruction on this subject. Permit me to say that I, too, am in accord with those brothers who have made previous requests, and would like very much to see a series of instructions published in the paper. I would like to see the subject commenced at the beginning as if we did not know anything about it. I feel that our good editor will give the space in the paper if some one will be kind enough to take up the matter and thoroughly discuss it. We all know there were a great many requests concerning wood carving, and that it was some little time before a volunteer stepped forward to champion the cause. Finally in 1895 the subject was taken in hand, and the manner in which it was treated has caused numbers of us to revere the names of Charles J. Woodsend and *Carpentry and Building*. Now let us have pattern making—and the kind I prefer to see is machine patterns.

Note.—We shall be very glad to give the necessary space for the consideration of the subject of pattern making, and trust that those who are experienced in the art and science will take up the suggestion of our correspondent and furnish a series of articles for publication. We realize that the field is a broad one, and while the subject may not be treated exhaustively, enough may be given in reply to direct inquiries for patterns of specific articles to render the contributions very interesting and instructive. We lay the matter before them in the hope that they will give it the attention which its importance would seem to deserve.

Bracing Frame Buildings

From J. P. B., *Princeton, Ill.*—Sometimes the rough under floor of a building is laid diagonally with a view, I am told, of stiffening the joist more than when laid square across. How it can help the joist is a mystery to me. Still where a building is weak it, no doubt, assists in stiffening it in case of a severe wind. Sometimes several boards of the top floor fastened to one wide board underneath will be pulled together by the shrinkage of the latter, especially if the nails are rather short, and the result is a wide crack. This would be obviated by laying the under boards diagonally, as in this way a top board would not be nailed to any one board its entire length, and the shrinkage would therefore be more evenly distributed. There is often much work wasted in buildings in attempts to brace or truss them, for the reason that the structures do not answer the purpose for which they were intended, and from which much more satisfactory results would be accomplished if a little expense had been added in securing heavier timber. Among other attempts of this kind I have seen 1 x 6 inch boards nailed on each side of 2 x 12 joist 26 feet long, so as to form a very flat truss, if it may be so called, with the idea of stiffening the joist, when 2 x 14 inch joist would have proven much stronger.

The one thing that is weak in the average house is the partitions. No one carpenter in 20 exercises the care he should in order to see that the partitions are properly supported or braced. In order to build a strong house heavy stud and joist should be used; all openings should have double studs and should be trussed; the sheathing should be nailed well at the corners, and if the partitions are well constructed diagonal sheathing will not be necessary.

Setting Up Stair Work.

From IGNO RAMUS, *Lafayette, Ind.*—The September number came to hand this morning, in which I see that "F. K. T." of Raleigh, N. C., replies to my request in regard to setting up stair work. "F. K. T." seems surprised that any one could be so dull and stupid as to propound such a question. Therefore allow me to give my reasons for seeking the information. Not long ago the writer of this letter came in contact with an expert and got into trouble in this wise: The writer had worked out strings, newels, steps and risers complete for a neat and pretty staircase, to be placed in a dwelling house, the cost of which was about $3000. I worked after details furnished by an architect which called for a front string 1⅝ inches thick and 12 inches wide, housed to receive steps and risers, and a ½-inch strip planted on outside to form the panels. All the work was completed at the shop, ready to be put in place at the building, which latter work was performed by the aforesaid expert, and which he accomplished in this manner: He placed his wall string in position and nailed on the steps and risers. Then came the front string, which wouldn't go on, and he cursed and swore until he was tired. Moreover, he had put up rough carriages of 2 x 12 joist, and he now for the first time learned that the 12-inch string would not cover the rough timbers and also receive the soffit panel, so here was a dilemma. I argued that the rough timbering was entirely superfluous, for there was no plastering about the staircase except the side walls, and the whole could have been neatly constructed plenty strong enough, or the rough timbers could have been placed in afterward. My expert, however, said that housing the front string was not good practice. What he would do would be to throw away the string I had made and I should furnish him a plain board 15 inches wide and ⅞ inch thick, and he would line the ends of the steps and risers, saw them off true, nail on the ⅞ piece for a string and put on the panels afterward. In this way he said he would make his joints around the newels easier and in this manner the end was accomplished. I afterward learned that the expert's "boss" had to pay for the string which he rejected.

I am perfectly familiar with the method given by "F. K. T.," and have been for the last 25 years, but I was greatly puzzled to know whether I had become a back number or not; hence my query in *Carpentry and Building*. Since the above occurrence, I have investigated things and find the method used by our expert to be the prevailing one in this community. In my opinion it is extremely crude in form; hence I would like to see it fully discussed in the columns of *Carpentry and Building*.

Coal Tar on Roof.

From T. H. S., *Madison, Maine.*—I wish to know whether or not it would be advisable to paint an iron roof with coal tar. The building is near an acid tower of a pulp mill and is rusting badly.

Note.—The question of using coal tar on metal roofs is one about which a great deal has been written, but the testimony is so conflicting as to leave the advisability of its use very much in doubt. There are those who state that coal tar is destructive to a roof, while during the past 10 or 15 years others have borne testimony to the preserving quality of tar. It is safe to say, however, that a sufficient number of layers of tar or any other water proof material will make a rain proof roof of itself, and obviate the need of any other impervious coating. Some years ago a correspondent, writing on the subject of tar paint for roofs, said that he had been informed that a good paint could be made by mixing a barrel of tar with a bushel of fresh slaked lime, boiled together and applied hot to the roof. The claim was made that the lime neutralizes the acid in the tar and also prevents it from running in hot weather. In this connection it may be of interest to refer to a series of paint tests made for the Great Northern Railroad by Dr. Conradson, and published in the "Journal of the Association of Engineering Societies." The following passage, which is quoted from the report, refers to conditions such as those with which our correspondent has to cope: "There are certain parts of steel or iron bridges, viaducts or tunnels that should have an additional (third) coat of paint. These include such places or parts of structures as are directly opposed to the steam fumes and gases from passing engines. For such a coat some cheaper asphalt paints, applied very thoroughly over the coats above recommended, would be all sufficient. Such a coat would protect the underlying primary coats for many years, preserving their natural toughness and elasticity, and preventing atmospheric action on the structure." The asphalt paints referred to are made by dissolving asphalt in benzine.

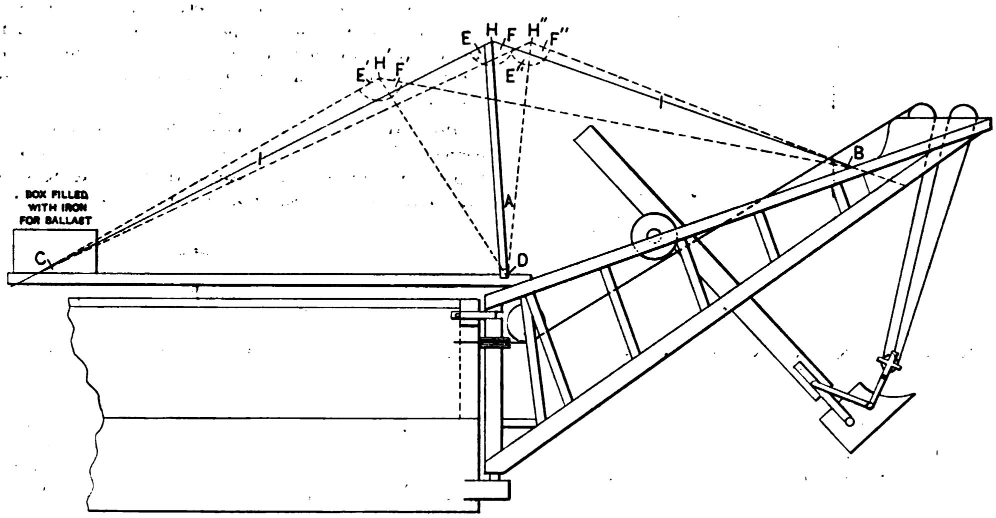
Coloring Copper Work.

From B., *Greenville, S. C.*—We are building a store and are to use a lot of copper cornices, and would like to know what will give the cornice work an antique color—that is, we want to learn of something that will color it in a few days.

Answer.—If the cornice work is carefully cleaned so that it is the same color all over it may be a considerable time before any dark color appears. After this dark color does appear it is not an uncommon practice to preserve the color by a coating of boiled linseed oil to which a little drier has been added, applied with a paint brush. A dark green color can be secured quickly by a solution of sal ammoniac and water, about 1 pound of powdered sal ammoniac being dissolved in 5 gallons of water. It should be dissolved thoroughly, and it should stand for 24 hours at least before being put on the copper. It should be applied with a brush just the same as paint, care being taken to cover every place. After the coating has been on the work for about one day it should be sprinkled lightly with water, the splashing being done carefully, for if the water is put on too freely it will run the color and streak it. After this has been done, in about 24 hours the color will resemble that of a roof that has been exposed for half a century. The same effect can be produced by the use of vinegar and salt instead of sal ammoniac, using ½ pound of salt to 2 gallons of vinegar. The question may arise as to the effect of rain on the coloring, but no fear need be felt on this account, for the more it rains the more firmly will the color be fixed. It may look as though it has been washed off for a while, but as soon as it stops raining the color will come back and look better than ever before, and in a short time it will not be affected by the rain.

Truss for Dredge Boat Crane.

From F. O., *Amana, Iowa.*—Will some of the readers of the paper be kind enough to help me out of a quandary? I send a sketch of a truss for a dredge boat crane, in which A may be said to represent the king post and B the balance beam. The points C, D and B are fixed, as is also the hight of the king or truss posts A. The wire guy ropes are represented by I I. Now if the truss posts A have an incline as at H, the angles E and F are equal, but if the truss posts are inclined to H' or H" the angles F' E' and F" E" are unequal. Now I can find the right incline of the truss posts A only by trial, and what I want to know is if there is a rule by geometry or by the steel square by which I can determine the incline of these posts, or what is the same, determine the point H.



Truss for Dredge Boat Crane.

Note.—This is a simple problem in geometry, and we shall be glad to have an expression of opinion from our practical readers, as a letter from each cannot fail to make the discussion interesting.

Acoustics of Buildings.

From W. C. M., *Wilmerding, Pa.*—I would be pleased to hear from some of the readers of *Carpentry and Building* on the theory of sounds, as it is something that is pretty generally overlooked. In public buildings we often hear it remarked, "I can hear the speaker, but I cannot understand him;" or, "That is not a good musical instrument," when at the same time it is the fault of the hall. About one-half of the public halls in the country towns in which I have ever been are a failure as to acoustics. There has been a great deal said on heating, ventilating, &c., but nothing on acoustics.

Note.—The subject to which our correspondent refers is one of prime importance to members of the building fraternity, and we shall be very glad to have expressions of opinion from those who have had practical experience in this line. We have no doubt that our correspondent will find much that is valuable in the way of suggestions in the article entitled "Acoustics of Buildings," published in the current volume for February and March.

Placing Sheathing Boards.

From BUILDING ENGINEER, *Ione, Cal.*—In reply to the inquiry as to the best method of placing sheathing boards on the outside of a frame building, I would say that Fig. 2 of the July issue is correct for small structures. If it is a very large building, and it may be necessary to reverse the angle for bracing, I would suggest doing it in the manner shown in the sketch which I inclose, Fig. 1, cutting in a row of bracing to receive the ends of the boards. The sketch designated as Fig. 1 in the July issue is erroneous, as the braces would be cut to rob the building of the bracing to which it is entitled when the sheathing is put on properly.

The term "sheeting" is a misnomer, or a corruption of the word "sheathing." Sheeting is the term applied to planking of bulkheads; also used in shipbuilding. The term "sheathing" is usually applied to the first covering of boards on the outside walls of a house; also on roofs. The term "sheeting" is so very commonly used to designate "sheathing" that it may be possible that some of the latest publications may have adopted one, as it is built on the double diagonal, while Fig. 2 is on the single diagonal. In regard to using either of the two methods, I would suggest that shown in Fig. 1 of the July number in places where severe wind storms are frequent as the one better able to resist the distorting effect of wind. In general practice the method shown in Fig. 2 of the July issue is about as good as any, since it strengthens the frame and keeps out both the heat and the cold, the true objects of its use. I might add that the general practice here is the single diagonal method.

From D. F. V.—In my opinion the method shown in Fig. 2 of the July issue of the paper is by far the best for putting on sheathing boards, as the less cuts in the boards and the less joints the stronger the work. There are other advantages in putting on as shown in Fig. 2, but as strength is the only consideration asked for by the correspondent it is unnecessary to say more.

From A. B., *Urbana, Ill.*—Referring to the method of applying sheathing to the frame of a building, as mentioned in the July issue, I would say that I am entirely unfamiliar with the method shown in Fig. 1 of the sketches there presented and can think of no arguments in its favor. I would like to see them as applied to the modern house, with openings placed without reference to symmetry. In my opinion the second method is better, though but little used here. The architects and builders prefer the simple, inexpensive horizontal method, and the owners seem to be satisfied with it. I believe it to be fully as strong as either of the ways shown.

From W. W. Y., *Washington, D. C.*—In reply to the correspondent who inquired in the July issue of the paper with regard to the best method of placing sheathing boards, I would say that sometimes they are put on horizontally, but generally diagonally, and seldom as suggested in Fig. 1 of the sketches accompanying the letter of "L. E. P.," Aiken, S. C. In my opinion there is nothing to gain but expense, which usually is not desirable, in cutting the sheathing boards over and under the openings. Placing sheathing horizontally is, according to my way of thinking, about the worst way to put it. The diagonal method is probably the best, because when well fastened to the posts and studs, and then covered with weather boarding, it is nearly as strong one way as another. If it were covered with shingles it would still be as good as shown in Fig. 1 of the correspondent's sketches and somewhat cheaper. If we consider the single opening alone, the plan shown in his Fig. 1 is probably the best, but when we consider the whole frame, together with other possible openings, and also the fact that sheathing is not put on to bridge openings alone which occur in the wall, it will not be hard to see that diagonal sheathing is to be preferred.

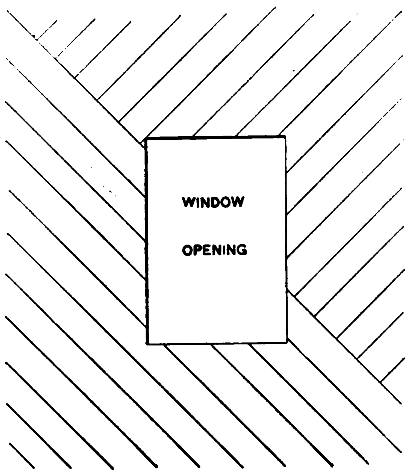


Fig. 1.—Method Suggested by "Building Engineer.

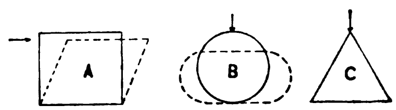


Fig. 2.—Diagrams Accompanying Letter of R. S. Soulé.

Placing Sheathing Boards.

it as correct. Will Mr. Editor please look up the matter in his library and enlighten us ?

Note.—Our correspondent is correct in all that he says, and by way of explanation we would state that years ago the first covering of boards for the frame of a building was so generally designated as "sheeting," although spelled "sheathing," that we adopted this scheme of spelling. The word is yet called "sheeting" in many sections, although the majority seems to be on the side of "sheathing," and now that the question of spelling has arisen we are quite willing to adopt the views of the majority.

From R. S. SOULE, *New Orleans, La.*—In answer to "L. E. P." of Aiken, S. C., I beg leave to offer the following remarks: Both are good methods and vastly superior to the horizontal nailing of the sheathing, because they are designed on the truss principle—that is, the triangle—the only figure that cannot be distorted, as any attempt in that direction results in its giving away or breaking. This distortion is seen plainly in the square and the circle A and B upon the application of a side force. The solid lines of the diagram, Fig. 2, represent the outlines before force was applied, while the dotted lines show the shape assumed after the force was applied. In the case of the triangle C it will be noticed that it maintains its shape until the force applied becomes so great as to break its component parts. Since Figs. 1 and 2 of the July issue are designed on the above mentioned principle, it naturally follows that the one which most closely approaches the triangle is the more perfect and hence the strongest. Fig. 1 is this

From B. ALLEN BROWN, *San Francisco, Cal.*—I would say in answer to "L. E. P.," Aiken, S. C., that neither of the methods which he shows in the July issue of the paper is correct. If there is any merit in one above the other I would say his Fig. 2 has the advantage. It has been demonstrated years ago that diagonal sheathing does not strengthen a building. If it did dry goods boxes would have been made that way long ago. Horizontal sheathing makes a building just as strong and saves time and labor, which is a big item in construction. The extra time of sawing and taking measurements is also overcome.

From H. W. TOMLINSON, *Chicago, Ill.*—The question as to which is the stronger way to lay on the sheathing boards about window openings, which was raised by "L. E. P." of Aiken, S. C., in the July issue, seems one of simple solution. The primary object in "balloon" construction of laying the sheathing boards on the diagonal is to do away with the extra bracing which is necessary in the old fashioned "framed in" house, or in balloon construction where the sheathing is laid on horizontally—that is, at right angles to the studding. By sheathing diagonally and then covering with clapboards or studding the three members—studding, sheathing and siding—produce triangles. The triangle is the polygon, no side of which can be changed without affecting the length of some other side as well as making a change in the degree of the angles.

In the first example—namely, with the line of joints directly above and below the window opening—the very object of the diagonal sheathing is defeated. That is, instead of making the whole surface one solid piece, like a sheet of cardboard with a hole cut out for the window, it is made in two pieces, which are held together at the joint, which is in line with the middle of the opening, only by the nails at the ends of the sheathing boards (always a weak place) and, of course, by the "tie" afforded by the clapboards or siding. Any settlement whatever is liable to produce an opening at that joint and a distortion of the window opening. Therefore I should say that the method shown in Fig. 2 of the July issue, with no joint at the opening, is by far the better way.

Apropos of the subject of sheathing, I would say that a method which I have used, and which has given excellent satisfaction in some country houses where they were very much exposed to strong winds, being situated on an elevation, is this: Instead of using 1-inch boards covered with paper and then clapboarded, I had the sheathing sawed in two. On the studding was put first a ½-inch (7-16) board, well nailed diagonally; then the paper, then the other ½-inch board, then paper again, and, lastly, the clapboards.

From W. F. F., *New Orleans, La.*—In reply to the inquiry regarding the best method of placing sheathing boards on a building, would say that Fig. 2, shown in the July issue, is decidedly the best, as there is no decided advantage in placing the boards in opposite angles, as in the manner of two braces. The nailing is too close together on the studding to work to advantage. In my opinion it is not necessary to place the boards in opposite positions, as it has the disadvantage of all the small cuts and extra labor required when they are placed as shown in Fig. 1 of the correspondent's sketches.

From H. C. D., *Leadville, Col.*—I consider the method illustrated by means of Fig. 2 on page 171 of the July issue of *Carpentry and Building* the better way for placing sheathing boards on a building, as it takes less labor and less nails.

From C. A. S., *Eufala, Ala.*—I will say in regard to the application of sheathing boards on the sides of frame buildings that I fully agree with "L. E. P.," Aiken, S. C. There should be no question on this point in the minds of practical men. Some of the reasons for my opinion are:

1. The boards below and above windows join and nail to a cripple.

2. The double quantity of nails driven into this cripple—a 2 x 4—would possibly split and detract from the holding power of the nails.

3. It would make no stronger building, if as strong, than it would applied as in Fig. 2 of the July issue, which I deem the most effective way sheathing can be placed on a frame.

4. The boards are used in longer lengths in the style shown in Fig. 2 of the issue named.

5. The boards can be put on faster. Two men would cover more surface putting on sheathing as shown in Fig. 2 than they would put on the style shown in Fig. 1, which is important to any contractor, and would have a decidedly stronger frame.

The Architect and the Builder.

From ARCHITECT, *New London, Conn.*—In the correspondence columns of the paper for this month (September) is an article entitled "The Architect and the Builder," criticising the remarks in the letter contributed by Mr. Aimar in the July number of the paper. I have read the letters contributed by Mr. Aimar, and can truthfully say that I do not think he has overdrawn the matter in the least. He states that a competent architect should be able to figure every foot of timber in a building, also should he be able to give his client an approximate price for the proposed work before receiving estimates from builders.

In this I think he is correct. An experienced architect should be able to tell from his preliminary plans, before he begins to prepare the general drawings, &c., within a very small margin, what the building should cost, also be able to give his client an approximate price for any little changes that may be required. This could be done by any practical builder, and come very near the mark, by comparing with work that he had at some time or other performed; and it would be a very easy matter for a practical architect, by comparing his plans with those of buildings that have been built from his designs, to arrive at nearly the cost.

I know of an instance where a man went to an architect with a small cut of a house that had taken his fancy, and stated that he would like to have plans for just such a house, if it would not cost over a certain amount. The architect took the cut and made the remark that a house like that would not cost over $8000. The client made the reply that if that was the case he guessed he could afford to add a little more to it, but not to have it cost over $13,000. The architect prepared the preliminary sketches and submitted them to the owner for his approval, at the same time stating that the house could be built for the amount he wanted to pay. The owner looked them over and found that they suited him, but did not seem satisfied that they could be executed for the amount. He took them to some of his builder friends for their opinion, and the lowest approximate estimate he could get was a great deal higher than he wanted to pay. He returned them to the architect and told him what he had done, but the architect still insisted that the building could be built as he estimated. The general drawings, specifications, &c., were prepared and bids from builders invited, but when they were opened it was found that the lowest estimate was over $15,000. Then came the shaving down, disappointed owner, builders' time wasted and new plans prepared for estimates. I know of another instance where the architect could not come nearer than $60,000 for a $40,000 building. This can be taken as a fair sample of some architects' estimating.

The trouble with a great many architects is the self belief of their own importance. They try to give you the impression that they know it all, and that no builder is able to show them anything, but at the same time they will make mistakes that they cannot get out of, trust to the genius of the builder to pull them through, then try to make the owner believe that it was the fault of the builder because he had not found it out before the building had got so far along, or lay it to the draftsman. This I know of being done time and time again. One of their chief hobbies is to design something that they cannot execute themselves—or any one else, for that matter—call it one of their special features, grind the builder down to the lowest price in trying to squeeze it within the appropriation, then make the owner think he has got more than his money's worth by employing him.

The reason of varying estimates from most builders can be easily explained. Some builders make a practice of giving a very low figure with the expectation of getting considerable extra work, standing in with the architect to do so, and from this make up the difference in their bid. Others give a higher figure for the reason that perhaps it is the first time they have ever estimated from the architect's plans, and do not understand them as well as they might; others bid still higher because they do not stand in with the architect and are afraid he will "roast" them, perhaps having put in a bid at the request of the owner. Cases of this kind I know to be a fact. Without being personal or exaggerating, I think I have stated both sides of the case fairly, as I have been on both sides of the fence myself.

Ventilating a Cistern.

From EICKY, *Woodstock, Ill.*—In the issue of the paper for August the idea of "F. I. P.," Coleman Station, N. Y., of having two ventilating pipes extend into the cistern from opposite directions is good, but to secure a positive circulation of air one of the pipes should be extended above the roof, and all of the exposed pipes should be not less than 5 inches in diameter. The conductor pipe should also extend a few feet below the water level with an elbow at the bottom end parallel with the side of the cistern, so as to give a rotary motion to the entire body of the water, thus liberating some of the gases which make "dead" water unpleasant. Have a vent hole in the conductor pipe above the water level to avoid the gurgling sounds when the water is running in, as shown in Fig. 1. Another way is to pump fresh air to the bottom of the cistern and let it bubble up through the water and escape up through the conductor pipes. Pumps can be made from a piece of brass tubing, as shown in Fig. 2, using two rubber seat check valves made for such work, with a solid plunger moved by the action of the cistern pump or in any other way best suited to the place. A much used door, for which any mechanic can readily devise apparatus, will also answer for operating the piston if properly connected.

From SANITAS, *New York.*—Answering inquirer "F.I.P.," Coleman's Station, N.Y., in the issue for August would say, the amount of ventilation possible by the arrangement proposed by him will not restore the water in the cistern to its proper condition for use; nor is 3 inch pipe sufficient to keep the water in good order if the cistern is cleaned out and a fresh supply caught. If a larger pipe, say 5 inch, can be put in and carried directly to the top of the house with a revolving funnel kept open to the wind by a vane it will be the best means of ventilation. This will not sweeten the foul water now in the cistern. For this purpose it should be cleaned out. An air pump with sufficient pressure to blow air to near the bottom of the cistern, with perforated pipe to distribute the air in small bubbles, is the most efficient method of keeping the water in good condition. A few minutes' work at the pump every other day will keep the cistern in good order. Better still, build a new cistern outside the house. A cistern under a house holds more dangers than foul water.

From W. H. G., *Albion, N. Y.*—I would suggest to "F. I. P.," Coleman's Station, N.Y., to overcome the ba smell of water in cistern caused by poor ventilation to carry the inlet pipes all down into the cistern within a couple of inches of the bottom, so that all the water from the conductors will go first to the bottom and rise up from that point fresn through the old water already in the cistern. He will find as the fresh water rushes through the pipes to the bottom of the cistern a good deal of fresh air will go down with it and will have to come up through the water to escape, and will make the old water pure. Another good reslt will be if any water goes to waste by overflow it will be the old and impure water that will waste and not the fresh water last in. When the water pours in on top it stirs up the whole mass and makes it worse, and if the cistern is full the sweet and pure water will run off and leave the old in the bottom. I have fixed many cisterns in this way and with best results. I have a cistern I have used ten years and it is still pure and sweet.

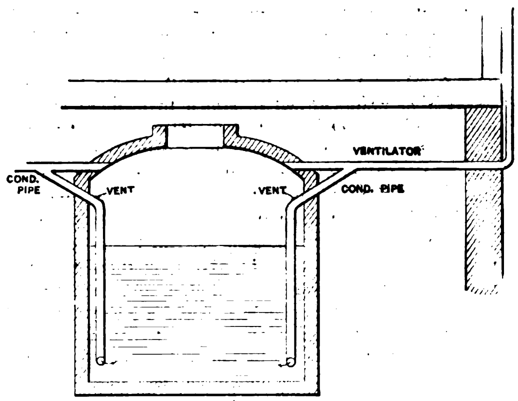


Fig. 1.—Method of Connecting Pipes.

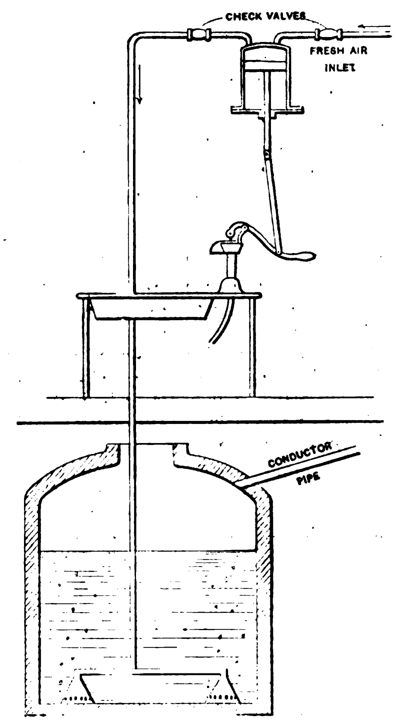


Fig. 2.—Pumping Air into Cistern.

Ventilating a Cistern

An Eight-Room House for the Tropics.

From J. R. B., *Helena, Mont.*—Will some one furnish for publication a plan of an eight-room house, to be built in a succession of rooms around a 30 x 30 open court, the design to be suitable for Hawaii, Cuba or Porto Rico? It is to be built of matched flooring, battened without and finished within with matting or some such material suitable for a house in the tropics, no plumbing or heating to be included. There is so much interest in the West in colonizing schemes that designs of such a house would be of great benefit just at this time.

WHAT BUILDERS ARE DOING.

THE general tendency of building seems to be upward and the feeling among builders is that the indications visible now point to a satisfactory opening of the coming season. The volume of work undertaken has grown steadily as the season has advanced, and greater confidence is manifest among investors than was apparent earlier in the year. The ending of the war is regarded as a beneficial condition, and the general trend of thought and action seems to be toward greater business activity. The condition in nearly every large city east of the Rocky Mountains is better than it was a year ago, so far as building is concerned, but there seems still to be a continuance of the dullness of the past few years in the Pacific Coast cities.

Albany, N. Y.

There has been no change in the amount of work under way from that reported last month, and contractors in Albany and vicinity are looking for little improvement during the remainder of the season. Operations on a large factory building which is being erected at Watervliet were suspended last month because of a difference between the hodcarriers and the contractor over the use of an elevator for hoisting masons' materials. The workmen struck and work was stopped, but the masons refused to support the position of the hodcarriers and the strikers were forced to compromise. As a result of the strike an arrangement has been made for the reference of future differences between the mason contractors and their workmen to an arbitration committee before the workmen are ordered to strike.

Baltimore, Md.

The Baltimore Builders' Exchange is doing all in its power to push forward the movement looking to the extension of the manufacturing interests of the city. Secretary E. D. Miller states that the position taken by the exchange in the matter is as follows:

It must be remembered that we are not contemplating the erection and operation of a single factory. We are studying means and methods for the general expansion of Baltimore's manufacturing and varied industrial progress. We are laboring to conceive plans by which this city can and will maintain her merited rank as one of the foremost and busiest centers of trade in the country.

It is a realization of the nature of the task before us which has convinced all our people of the need of united action. By first combining all of the diverse and unrelated movements into a general and central one, all of the essentials needed for desired success can be secured. Our sister cities are on the alert, and all are in action, each to promote its business interests. Surely, Baltimore would be foolish to remain inert. In fact, such a policy would be more than injurious.

It is for that reason that the Builders' Exchange hopes to push forward the scheme which will so confederate all interests that when a plan is eventually formulated it will be reinforced so substantially as to enable its ultimate consummation. Perhaps we may succeed in eliciting the support of the municipality, thus accomplishing the appointment of a commission, which will become an active future factor in promoting the very ideas we have in view. Other cities have had recourse to that policy, and with most excellent success. One thing is certain—Baltimore must not suffer herself to lag behind.

Birmingham, Ala.

There is an unusual amount of building being done in Birmingham for this season of the year. The majority of the work is of a good, substantial character. The proportion of brick and stone building under way is so large and unexpected that a lime famine was experienced during the latter part of August. Contractors generally are well pleased with the situation and are looking forward to a resumption of the better conditions of the year immediately preceding the panic.

Boston, Mass.

The outlook for building in Boston and vicinity continues to look favorable, and there seems to be little reasonable doubt that the opening of the coming season will show a satisfactory activity. Already there are signs which point to the erection of numerous large buildings for business and warehouse purposes, and the prospects for large building in the residence parts of the city are good. The erection of the new Union Station will materially change the character of business conducted in its immediate neighborhood, causing a large amount of alterations and repairs. The leather interests, which were formerly centered near the site of the station, are moving to South Boston, thus requiring the erection of new buildings for their accommodation.

There has been comparative freedom from labor troubles for some time, and at present there seems to be little prospect of any disturbance of existing conditions.

At the time this was being written the members of the Master Builders' Association were preparing for an outing in the form of an excursion to Saratoga, Lakes George and Champlain, Au Sable Chasm, Montreal and Quebec. The trip was to extend over six days, and it was expected that over 100 of the members and their families would participate. Special trains had been provided for all railroad travel and special steamboats where the route included trips on the water. Last year's outing in the White Mountains proved so delightful that all were anticipating a most enjoyable time.

Brooklyn, N. Y.

The official report of the Department of Buildings for Brooklyn, covering the second quarter of the fiscal year—March 31 to June 30—which was issued about September 1, shows a very satisfactory state of business. The record shows that during the three months mentioned 578 plans for 879 buildings were filed, the total estimated cost of which is $3,246,079. In addition, there were recorded 619 permits for alterations, involving an expenditure of $482,141 more. The general feeling among builders leans to the belief that the coming year will prove a profitable one. The tendency of labor unions to establish more amicable relations with the employers seems to promise a beneficial change from the constant interruptions to work which have resulted from conditions existing heretofore.

The Board of Delegates of Brooklyn is at present endeavoring to persuade the Board of Education to require contractors erecting school houses to pay the full union wages. The Board of Delegates is also seeking to prevent the performance of carpenter and other similar work upon police stations by patrolmen and others in the city employ, on the ground that they are not employed for such work by the city, and that workmen are by this means deprived of legitimate opportunity for work.

Buffalo, N. Y.

As stated last month, the prospects for building in Buffalo seem to be improving. In spite of the fact that the amount of work now under way is not as great as has been recorded in the past, a very considerable number of important contracts are being carried on.

The new post office, the most expensive building now under construction and which will cost $2,000,000 with the site, or $1,500,000 exclusive of it, is to be roofed in by the time snow flies.

The Seventy-fourth Regiment Armory is "walking right along" under the energetic work of the contractors, Charles Berrick's Sons. This is a large building, 570 feet long and 270 feet wide, faced outside with rock faced red Medina sandstone. It will require from 8,000,000 to 10,000,000 brick in its construction, a great number of men being employed. The armory will cost $400,000. The next largest public building now under way is the conservatory at South Park, George P. Wurtz having the general contract. It will be built of stone, brick and glass, and will cost $100,000.

Alterations and additions to three school houses will provide work for builders, amounting in all to nearly $90,000. Three new Catholic churches and a new hotel are in prospect.

Chicago, Ill.

Building operations in Chicago, as reported by the Department of Buildings, for the month of August show a material increase over the amount recorded in the same month of 1897. The number of permits issued during August, 1897, was 490, representing a cost of $1,734,260; in August, 1898, 326, costing $2,133,550.

The following, taken from a Chicago contemporary, shows the magnitude of the foundation of the new post office, which is now nearing completion: "Some idea of the labor involved in the construction of this foundation, which cost about $210,000, may be obtained from a statement of the amount of materials used. The number of 50-foot piles driven was 5087. Upon the tops of these piles were laid 14 x 14 oak timbers, covered with a solid floor of oak beams, 12 x 12, the total amount of lumber used being 796,852 feet, B. M. A layer of concrete 3 feet in thickness required 5122 cubic yards. The dimension stone used in the foundation amounted to 284,144 cubic feet, and 31,327 cubic feet of rubble stone were required for the curb wall. The quarrying of the granite for the superstructure was begun at Mount Waldo, Maine, about two months since, and the contractor for the superstructure will probably commence work early in October. The contract price for the superstructure is $1,987,000."

Detroit, Mich.

Union laborers in Detroit have struck for an increase of wages from 16 to 18 cents per hour, and in all cases where the demand has not been granted they have quit work. The largest job affected is the new County Building, Contractor Carew having refused to grant the advance.

The August showing made by the number of building operations recorded is an improvement on that of last year, the figures being 170 permits, representing an investment of $243,600, for 1897, and 174, $336,300, for 1898.

Denver, Col.

While builders in Denver generally feel that the volume of business is too small to be satisfactory, they also feel more hopeful that better times are in sight. The records of the Building Department show that in August, 1897, 83 permits for buildings, to cost $125,900, were issued, while in the same month of this year the number of permits was 94 and the proposed investment $160,000. No labor disturbances of a serious nature have occurred recently.

Indianapolis, Ind.

Building still continues dull in Indianapolis, the amount of new work undertaken during August representing a cost of only about $115,000. This amount is approximately the same as the amount done last year in the same month, the increase being less than $10,000.

Louisville, Ky.

General building conditions are better in Louisville than they were a year ago at this time. The record of new building shows a marked improvement, the figures for August showing a gain over the same month in 1897 of nearly $100,000. The total for August of this year is $234,665, and the work is generally distributed throughout the city, the larger part being residences.

Milwaukee, Wis.

The feeling among the business men of Milwaukee that the depression of the past few years is steadily yielding to better conditions is reflected by the builders, a much more hopeful tendency being manifest. Last month's building was perceptibly better than at the same time last year, and indications point to an increase during September, notwithstanding the lateness of the season. Contractors are feeling a trifle uncertain as to the effect of a difference between the Federated Trades Council and the Building Trades Council, which has resulted in the withdrawal of the latter from the former. It is feared that trouble between the two may develop to such an extent as will hinder the progress of work.

Kansas City, Mo.

The amount of building recorded during August was nearly double the amount undertaken during the same month of last year, the number of jobs reported for August, 1898, being 306, to cost $344,160; in 1897, 169, to cost $151,940.

Minneapolis and St. Paul, Minn.

Improvement in the volume of building is felt in St. Paul and Minneapolis, statistics showing more work in both cities than was under way last year at this time. There appears to be more work actually being begun at this late season in Minneapolis than there is in St. Paul, but builders in both cities are looking forward to a still further improvement at the opening of the coming season. The amount of new work undertaken in St. Paul in August was estimated to cost about $137,000, in Minneapolis about $290,000.

New Castle, Pa

The New Castle *Courant* of recent date shows the condition of the building business in that city by the following: "The building boom which New Castle has experienced this season is so scattered that one would hardly believe that several hundred new buildings are in the course of construction in the city. The town is rapidly growing and the contractors have their hands full at present. So busy are the most of them that they hardly have time to figure on new contracts. A prominent citizen who contemplates putting up a residence for himself requested six contractors to figure on the job, the bids to be in on or before a certain date. Only two so far have submitted bids, and the time is up."

New York City.

The second quarterly report of the Department of Buildings, which was printed in the *City Record* of New York just prior to September 1, shows that there were filed and acted upon in the three months between March 31 and June 30 1368 plans for 2078 new buildings, the estimated cost of which was $22,610,466. By far the largest percentage of cost was upon buildings to be erected in Manhattan and the Bronx, where 473 plans for 804 buildings were filed, to cost $18,036,450. The report also shows the record of new buildings and alterations in the Greater New York.

There seems to be a marked tendency toward closer and better relations between employers and workmen in the building trades, and also to a reduction of the friction between organizations of workmen. The two central bodies of workmen the Board of Delegates and the Building Trades Council, are reported to be willing to meet each other half way in an effort to adjust the differences previously referred to in this column. A series of conferences are being held by the representatives of all the principal builders and contractors in the city and the Board of Delegates, and there is every indication that an entirely new method of conducting affairs will, before long, be inaugurated which it is hoped will do away with general sympathetic strikes.

The United Order of American Carpenters and Joiners and the United Carpenters and Joiners of New York have amalgamated under the title of the New York City Carpenters' Union.

Omaha, Neb.

Building still continues very dull in Omaha, very little new work coming into the market. It is the general opinion that the building done prior to the opening of the Trans-Mississippi Exposition has anticipated the immediate demand and that little change for the better can be hoped for before next season. The amount of work recorded for August was a trifle over $80,000, as against about $150,000 in the same month of 1897.

Philadelphia, Pa.

Philadelphia builders feel that there is a steady gain in the volume of building, the records for August showing an important advance over August of last year, the report of the Department of Buildings showing 649 operations, estimated to cost $2,133,550. It is reported that a building is to be erected on the south side of Chestnut street, extending from Juniper street to the new building now being built for the Real Estate Trust Company. This building is to be one of the largest of its character in the city and will take the place of several buildings that occupy the site at present.

The Master Builders' Exchange has recently issued two very neat little pamphlets, one descriptive of its permanent exhibit of building materials and the other setting forth the benefits of the exchange to the building fraternity. The former contains about 20 pages of very flattering testimonials from various architects in the city as to the practical usefulness of the exhibit and its value to them as an assistance to their business. The second pamphlet describes the nature of the exchange and its methods of operation, and contains also a list of its members. Both are neatly bound in paper and are printed in an attractive and effective type.

Rochester, N. Y.

An attempt was recently made to repeal the building ordinance of Rochester and to abolish the office of fire marshal, on the ground that the laws relating to building were being evaded. Considerable stir was made in the Council, but the matter was finally disposed of without any alteration of existing conditions.

Building is reported as being quiet, with little prospect of marked increase in activity before next season.

Seattle, Wash.

It is reported that many Seattle workmen have been going to Vancouver under the impression that there was plenty of work to be had in the latter city. Many have found employment, but the Vancouver workmen say there are more applications for work than can be accepted, in spite of the fact that more building than usual at this season is being done. Building in Seattle is reported as being quiet.

St. Louis, Mo.

During the latter part of August a strike was declared by the Building Trades Council of St. Louis against the employment of non-union workmen on the Lincoln Trust Building. After several conferences between the contractors and the representatives of the Council the former conceded the demand of the workmen and work was resumed with none but union men.

The records of the Building Department show a falling off for August of about $200,000 from the records of August, 1897.

Toledo, Ohio.

Toledo master painters are moving in the direction of providing for a class in painting in the manual training school of that city. The Master Painters' Association has petitioned the School Board in the matter and has offered to provide the teachers and materials free of cost if the matter is favorably considered.

Toronto, Ont.

Building is reported as being in a very satisfactory condition in Toronto, there being a steady and healthy increase in the amount and character of the work being done. It is estimated that the total value of building for the year will approximate $1,500,000, which is the best record since the boom years which culminated in 1892. The value of building recorded up to August 25 was over $1,100,000, which represents over $200,000 more than the total for 1897.

The String Course.

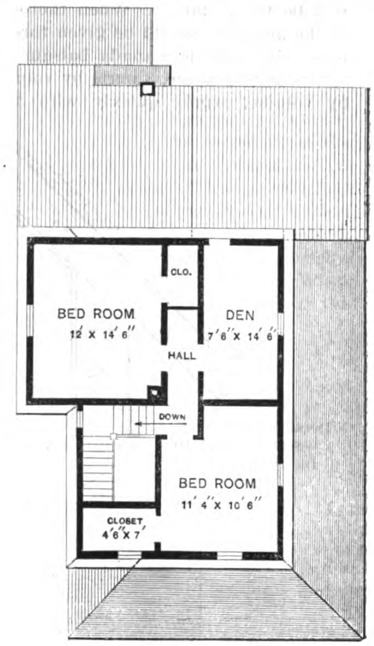
String courses admit of great variety, and contribute very much to decoration, while they are in themselves essential members, inasmuch as they serve to define the internal division of the building, corresponding with the floors of the several stories; and by separating one tier of windows from another, to mark each as a distinct portion of the general composition, complete as regards itself, though secondary to the other. While they separate they serve also to connect and combine the successive stages of a building, and to produce a due mixture of horizontal with perpendicular lines. In Gothic architecture the upper surface of a string course is almost invariably splayed or sloped in order to shoot off rain, the projection being usually such that the wet would else lodge upon it. The string course itself consists sometimes of only a few narrow and plain moldings, at others of a variety of them separated by one or more considerable hollows. In the later or perpendicular style of Gothic the string course is frequently made a broad tablet, not only richly molded, but ornamented with sculptured blocks, heads of animals, shields, &c., placed at intervals in the principal cavetto or hollow, besides which, additional carved ornament is occasionally introduced on the surfaces between the other moldings. In some instances the string course is so enlarged as to become a sort of frieze or horizontal panel filled up with a pattern of tracery, or with lesser panels, &c., carved on it. In Italian architecture the string course (*fascia*, Italian; *cordon*, French; *band*, German) is either quite plain or more or less decorated, according to the character of the floor to which it belongs. That which crowns a basement floor is seldom more than a plat band or plain surface, while the upper ones form ornamental fascias, enriched with guilloches, frets, &c., either with or without moldings.

A Low Cost Frame Cottage.

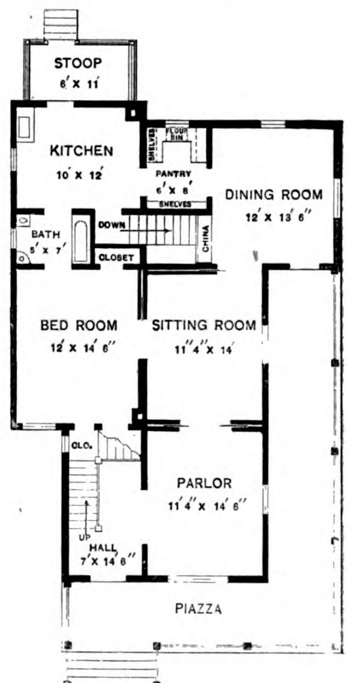
We have pleasure in laying before our readers the elevations, floor plans and a few constructive details of a frame cottage which was lately erected at Lapeer, Mich., in accordance with plans drawn by Charles W. Fortune, architect, of that place. The author of the design states the cost of the cottage to have been $1000, and while the exterior is necessarily somewhat plain in appearance, the arrangement is regarded by him as good for a building of its size. There is a cellar under the whole house so as to afford ample storage facilities. The ceiling of the first story is 9 feet, and that of the second story 8½ feet. The sills and first-floor joist are 2 x 10 inches; the second-floor joist 2 x 8 inches, and the attic joist 2 x 6 inches. The outside of the frame is sheathed with hemlock and covered with paper, on which is laid pine siding and shingles, as indicated in the elevations. The floor of the first story is double, the finished floor being hard maple. The other floors are of pine. All the first story except the kitchen is finished in ash, the kitchen and the second story being finished in white pine, natural. The architect states that while the finish of both interior and exterior is not elaborate, yet it is as much as can be expected on a house of its cost. It will be noticed from the details that the manner of placing the O G trough on the eaves does away with a crown molding and looks very well when finished.

Front Elevation.—Scale, ⅛ Inch to the Foot.

A Low Cost Frame Cottage—Charles W. Fortune, Architect, Lapeer, Mich.



Secon Floor,



First Floor.

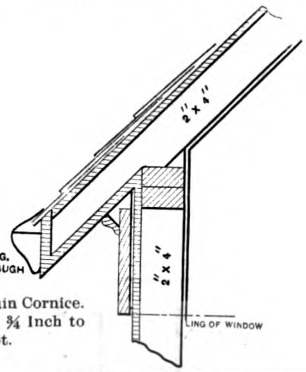
Scale, 1-16 Inch to the Foot.

A Simple Positive Blue Print Process.

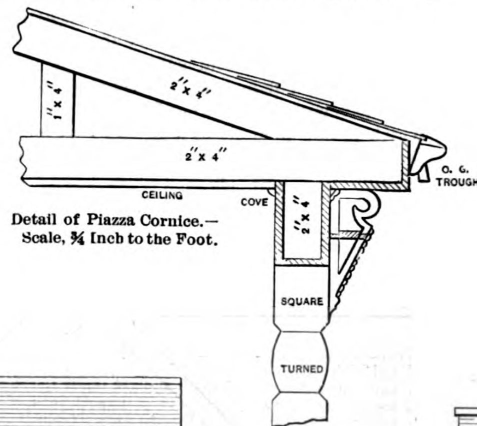
In a letter to *Engineering News*, John D. Isaacs of the Southern Pacific Railway Company, San Francisco, Cal., describes a simple and practical process for making positive blue prints—that is, prints having blue lines upon a white ground, which is used in the drafting rooms of that company. Such prints are very desirable where plotting or coloring is to be added.

The process is thus described: The tracings are made with strong black lines, using Higgins' American White Label India ink. A paper negative is first made on ordinary photographic silver printing out paper, such as Solio or Kloro paper. The paper used is the Victor Special brand, which can be had in rolls 25 inches by 30 feet, and is not expensive. To make the negative, cut the paper ½ inch larger each way than the tracing; place the tracing in an ordinary blue printing frame, face up—that is, with the side drawn upon away from the glass; on this place the paper face down, so that the inked lines and the sensitized surface are in contact; then print in the sun to a dark coffee color. The print is soaked in water until drippings from it are no longer milky. It is then placed in a fixing bath made up about as follows (exactness is not important): Hyposulphite of soda, 1 ounce; water, 25 ounces.

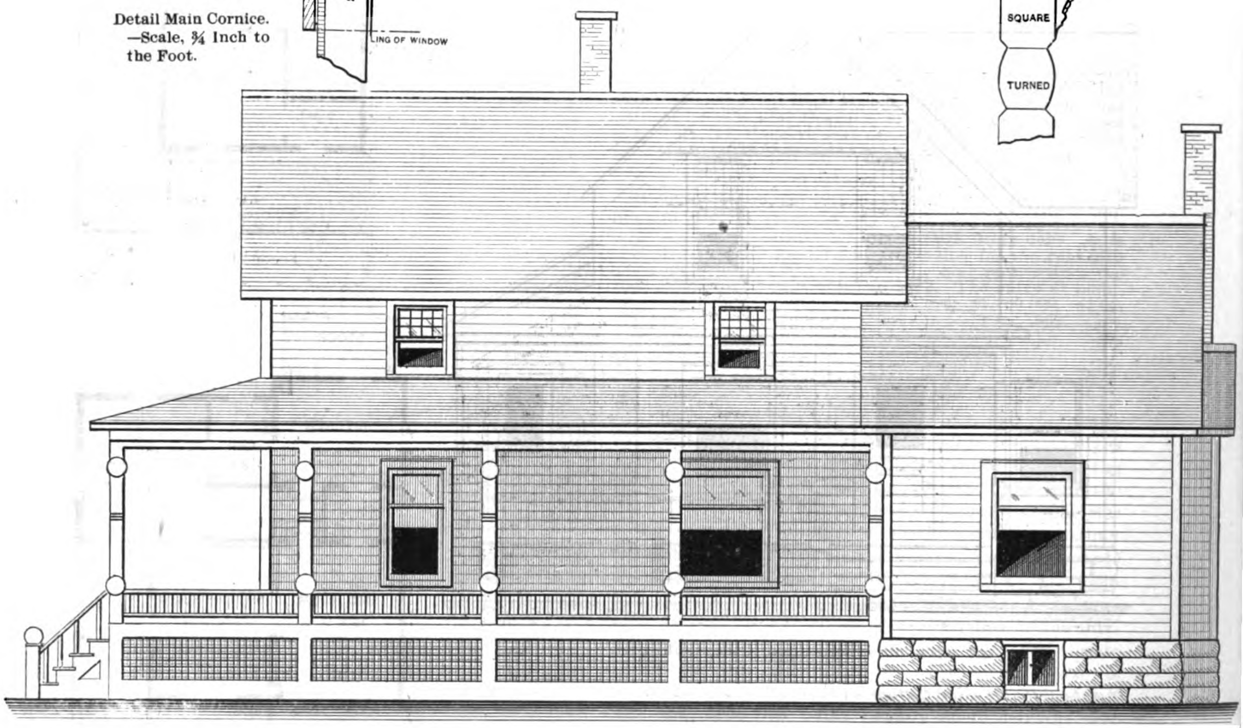
The print will change in this bath to a uniformly light mahogany color or dark buff. After becoming uniform in tint it is left in the bath five or ten minutes longer. It is then removed and washed for half an hour; then allowed to dry thoroughly, after which it will be much darker. When thoroughly dry the back of the negative should be given three good coats of the following varnish: Canada balsam, 1 part by volume; spirits of turpentine, 3 parts by volume; alcohol, 2 parts by volume. Apply quickly with a sponge. Let each coat dry before applying another. Work in a warm room.



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



Detail of Piazza Cornice.—Scale, ¾ Inch to the Foot.



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

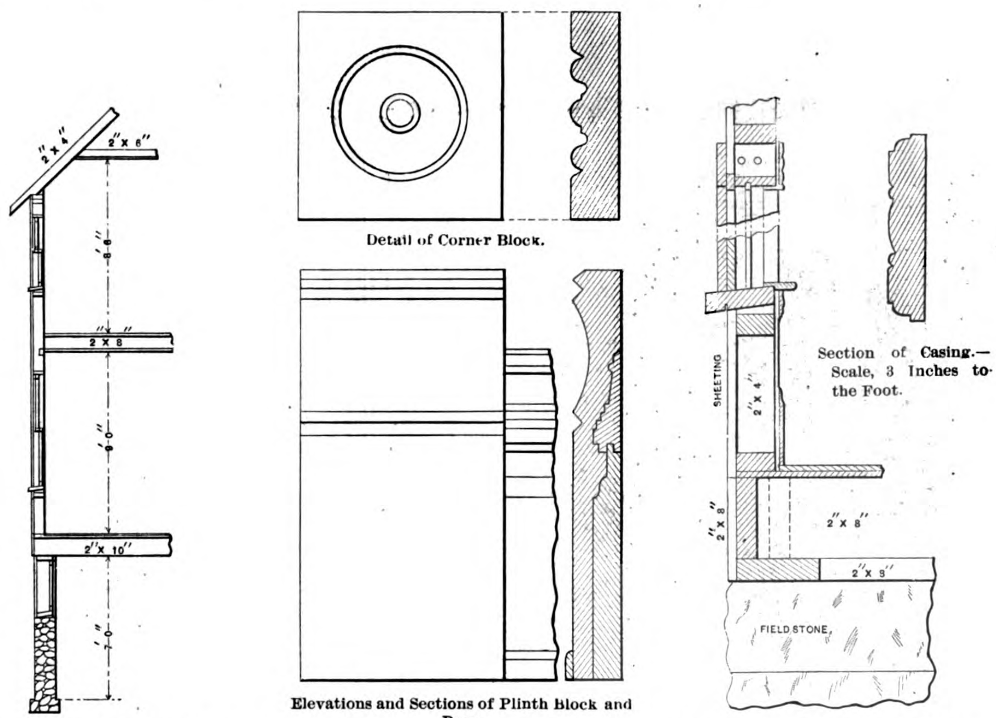
A Low Cost Frame Cottage.—Details and Side Elevation.

The result is a fairly transparent negative (reading backward) of a non-actinic color, with clean white lines and figures, from which the positive blue prints are made on ordinary blue print paper. Printing takes about twice as long as in the case of those ordinarily made, from a tracing, but several negatives can be made from one tracing if many prints are required. When through printing we file the negatives with the tracings, for future use.

The best method of getting the time of exposure for making the negative is to try one or two scraps of the paper first under the tracing and note the time giving the best negative, after which uniform results can be had without difficulty. At this season of the year (May) the printing requires three and a half minutes in the sun in the middle of the day, under a clean tracing. If here and there a line or figure in the negative is indistinct from bad contact in the printing frame, it may be easily "doctored" by scratching with a pin point or other sharp point through the gelatine surface of the paper after the negative is otherwise finished. A fresh fixing bath should be used for each batch of negatives made. Before making the positive blue prints, test a small scrap of the blue print paper by washing before exposure to the light. It should wash clean, leaving no bluish cast to the paper. Soaking and washing the paper negatives, as above, may be done in the blue print washing tray in which blue prints are being washed, as the two processes do not affect each other.

Pointing Up Brick Walls.

In finishing off the outside faces of brick walls, the operation of pointing is often resorted to, this consisting in filling up all the joints with superior mortar, and in the better class of work with cement. To properly "point" a wall requires great care, and, indeed, some skill, where thorough neatness and finish in the joint are to be secured. Moreover, pointing requires to be conscientiously done, for much of the capability of a wall to resist the action of damp and of driving rains depends upon the way in which the joints are made good. The first operation of "pointing," says a well informed writer in one of our contemporaries, is to remove all the mortar from the face of the wall which has been pressed out from between the bricks in placing them in bed. The mortar is next removed or raked out from between the joints with a tool made for the purpose, and for some distance inward, this being done in order to give a "key" bond or hold for the mortar or cement used in the pointing. As a rule, all brick work intended to be "pointed" or "tucked" is laid first with ordinary common brick mortar, the bond properly made and the walls kept plumb, and before the mortar is set hard it must be raked out of the joints about ½ inch deep. When there is not much ornamental work in brick on the face of the building, the brick work may be laid "overhand"—that is, the bricklayer may do his work from the inside of the building—and then "tucked" or pointed from the swinging scaffold. In common brick work, where the bricks used are of an inferior kind—that is, not pressed and of a uniform color—it may at one time to complete the work, as it cannot be made a second time to have the same shade as at first. It takes three hods of stopping to point 200 feet of superficial brick work, so it will not be difficult to find out how much will be required for the whole work. The stopping should be "stayed" with copperas, say 1 pound of copperas to every three hods of mortar or stopping, dissolve in hot water and incorporated when cold. The joints are then stopped or pointed in a rough manner, and no more should be done at a time than can be immediately finished by applying the putty joint before the stopping has become too hard. If this is not done, the putty joint will not combine with it as it ought, and it will fall off in a very short time. When a sufficient amount is stopped in, it is usual to rub it well with a piece of dry carpet or sacking, or something of that kind, and rub the stopping well into the pores of the bricks, that the work may appear as uniform as possible. When this is properly performed, the wall is ready for the



Detail of Corner Block.

Section of Casing.—Scale, 3 Inches to the Foot.

Section through Main Wall.—Scale, ⅛ Inch to the Foot.

Elevations and Sections of Plinth Block and Base.

Scale, 3 Inches to the Foot.

Details of Water Table and Window Frame.—Scale, ¾ Inch to the Foot.

Miscellaneous Constructive Details of a Low Cost Frame Cottage.

be necessary to stain tne whole work, because some of the bricks are much darker than others and give to the wall a mottled appearance when finished that is not at all pleasing.

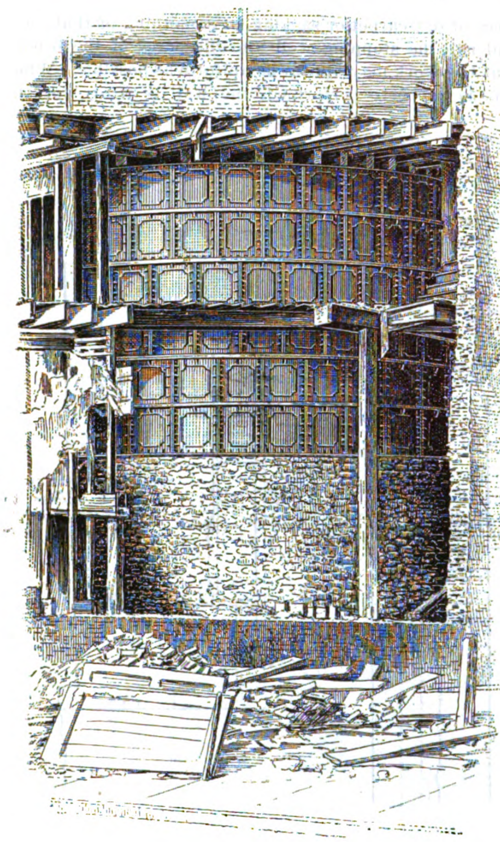
The first thing to be done in preparing for all kinds of tuck pointing is the cleaning down or washing of the walls to be pointed, and clearing them of all mortar stains or dirt. This should be done with a solution of muriatic acid and water, making use of 1 pint of acid to each pail of water used. That the acid may not leave any damaging effects after it, the work should also receive a cleansing of pure water immediately after the application of the solution. It is only necessary to clean as much of the wall at a time as can be easily reached by the workman doing the pointing.

The next operation to be performed is the "stopping." Red stopping is composed of 1 part of fine putty lime to 3 parts of fine white sand washed clean. This is colored with Venetian red and Spanish brown, and made to suit in shade as near as possible a brick colored with the intended stain. There should be sufficient stopping made color, which is composed of the same mineral paints as the stopping, Venetian red and Spanish brown, 1 pound of each to 1½ gallons of water, and as these colors have no setting properties it is necessary to add about 1 pound of copperas to 3 gallons of the stain, prepared in the same manner as for the stopping. Alum is also used in the same proportions; and sometimes ½ gallon of stale beer to the same quantity of color for setting. Two ounces of red aniline dissolved in alcohol will brighten up a barrel of the color, if such is desired. This is applied with a flat brush the usual way, after which the work is ready to receive the tuck joint, which may be rendered in either black or white joint or putty.

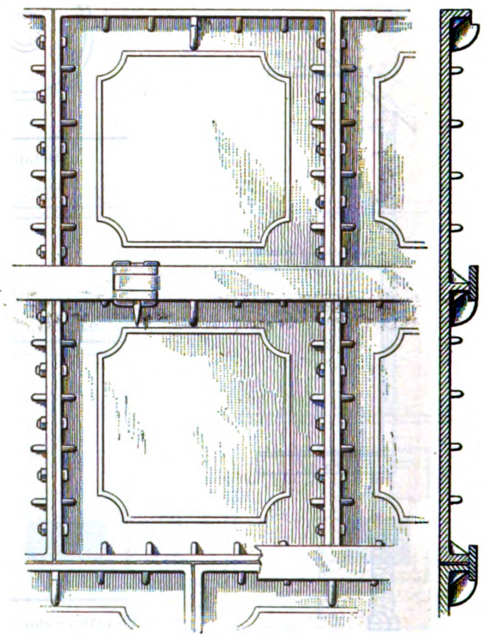
Most of the houses and offices in Manila have tiny panes of translucent oyster shells for glass. An average window, 6 feet long by 4 feet wide, contains about 260 of such panes, which temper the heat of the sun, the shells being very low conductors of heat, and also prevent the blindness which is induced by the fierce glare of the sun in that part of the world.

An Historical Water Tank.

One hundred years ago a charter was granted to certain citizens of New York giving them the privilege of building and maintaining a system of water works. Under this grant a pumping plant was established at Collect Pond and water distributed in a limited district through wooden conduits—bored logs. This continued to be the main supply of the town until the municipal authorities took up the matter and inaugurated what has since grown into the present Croton system. The business of the private company, of supplying water for domestic and fire purposes, having thus been assumed by the city, it would be supposed that they had no further field and would quietly drop out of existence.



Cast Iron Tank.



One Panel of Tank.

An Historical Water Tank.

But such was not the case, and the genius of the framer of that charter—Aaron Burr—comes into evidence. The charter carried the right to build a water works and also to carry on a general banking business. This clause now became all important, and since the water supply business had to be abandoned that of general banking was taken up, and the Manhattan Bank was born.

It appears to be the belief that this bank must, in order to enjoy its charter, maintain a tank or reservoir full of water and in serviceable condition. It would seem that such action on the part of the bank is considered absolutely essential, since such a tank has been carefully kept up for many years at the corner of Reade and Centre streets. At the recent widening of Elm street buildings were removed and the tank exposed, the tank itself just missing the line of the new street by a few inches. While the tank was exposed the photograph from which the first engraving was made was taken. The tank proper rests upon a circular masonry wall, which in turn is supported upon a circular row of masonry arches in the cellar. The tank is about 30 feet in diameter by 12 in depth and is formed of cast iron plates about 2 x 4 feet. The plates—an enlarged view of one is here shown—are flanged and bolted together, the vertical joints being broken. At each horizontal joint and at the center of each row of plates is an iron strap which rests in brackets cast on the plates. The meeting ends of each strap are formed with a single and double loop which overlap each other, as shown in Fig. 2. In the loops is a wedge which serves to tighten the strap when necessary. The tank is supplied with water by a pump in the basement which draws its supply from a well. It would be interesting to know the name of the builder of the tank and of the foundry where the plates were cast, together with the date of its erection. But the officials of the bank have not these particulars—at least they are not conveniently obtainable.

Earliest Strike on Record.

The earliest strike occurred about 1450 B. C., or upward of thirty-three centuries ago. Pharaoh was building a new temple of Thebes. The masons received very little cash, but a quantity of provisions, which the contractor thought sufficient, was handed to them on the first day of each month. Sufficient or not, they mostly ate it before the time had elapsed. On one occasion many of them had nothing left quite early in the month, so they marched to the contractor's house, before which they squatted and refused to budge until justice was done. The contractor persuaded them to lay their distress before the king, who was about to visit the works, and he gave them a handsome supply of corn, and so all went on well for that month. But the same state of things recurred by the middle of the next, and for some days the men struck work. Various conferences took place, but the men declined to do a stroke until they were given another supply of food. They declared the clerks cheated them, used false weights, and so forth—familiar enough complaints in this country under the truck system. The contractor not complying with their demands, they marched to the governor of the city to lay their grievances before him, and he tried to get them to return to work by smooth words, but that was no use, and they insisted on having food. At last, to get rid of them, he drew up an order for corn on the public granary, and the strike was at an end.

The Builders' Exchange

Directory and Official Announcements of the National Association of Builders.

Officers for 1897-8.

President,
Thos. R. Bentley of Milwaukee, Wis.
First Vice-President,
Wm. H. Alsip of Chicago, Ill.
Second Vice-President,
Stacy Reeves of Philadelphia, Pa.
Secretary,
Wm. H. Sayward of Boston, Mass.
Treasurer,
George Tapper of Chicago, Ill.

Directors.

Baltimore, Md.	S. B. Sexton, Jr.
Boston, Mass.	C. Everett Clark.
Buffalo, N. Y.	Charles A. Rupp.
Chicago, Ill.	Wm. M. Crilly.
Detroit, Mich.	John Finn.
Lowell, Mass.	Wm. H. Kimball.
Milwaukee, Wis.	W. S. Wallschlaeger.
New York City	Chas. A. Cowen.
Philadelphia, Pa.	Geo. Watson.
Portland	George Smith.
Rochester, N. Y.	John Luther.
St. Louis	P. J. Moynahan.
Worcester	John H. Pickford.

Col. Arthur McAllister.

In the death of Col. Arthur McAllister, which occurred on September 4, at Cambridgeboro, Pa., where he had gone in search of health, the National Association of Builders loses its first ex-president.

Colonel McAllister was president of the association at the time its convention was held in Cleveland, Ohio, that city being his home. He was one of Cleveland's most prominent builders, and had for many years been closely identified with the larger projects undertaken in the city and vicinity. His character was such as gave him a wide reputation as a man of remarkable ability and sterling integrity, and he was closely identified with the progress and welfare of the city of his home. His influence during tne period of his active participation in the affairs of the National Association was strongly felt for good, and his personality was such as endeared him to its members. He had been in ill health for some time prior to his death, and the end was not unexpected by the members of his family. His death will be sincerely regretted by a large circle of acquaintances, not the least sincere of whom will be those members of the National Association of Builders with whom he came into contact during his active connection with its work.

One Benefit of Proper Organization.

There is one direction in which a well organized and carefully conducted builders' exchange can benefit its members and the calling they represent which is not generally recognized, and to which too little importance is attached. Where disorganization exists among builders, the business practices which such a condition inevitably engenders, and the personal distrust and antipathies which are its natural outgrowth, cause an attitude of mind among contractors toward each other which is very soon reflected in the attitude of the public toward builders as a class. It is certain that where the members of any given calling are known to distrust each other and to condemn each other's business methods (if not openly question each other's honesty) their attitude will, soon or late, be felt by the whole business community of which they are a part. That disorganized competitors should distrust each other is only natural, especially in a business in which custom is as elastic as it is among builders; and if builders are wanting in respect for themselves and their own methods, as a class, it is fair logic that they should occupy an undefined and more or less nondescript position in the public mind.

Builders may be disorganized, in the true sense of the word, even though they are members of a builders' exchange or some other form of organization, for the mere existence of a constitution and by-laws and membership thereunder does not of necessity mean that they have become organized.

Organization among builders, to mean what the word by itself really signifies, requires that those who bind themselves together shall recognize the fact that upon their several efforts as individuals acting in unison and, so far as possible, harmony depends the accomplishment of the purposes for which they have combined. It is also essential that those who thus bind themselves together shall represent the business integrity and ability of their calling in tne city in which they live, in order that they may be recognized as such, both by the public and by their own fraternity, no matter how few their numbers. To these should be added, from time to time, other builders who desire to identify themselves with such a movement, and whose business methods and general character are above question. Impartial scrutiny should be applied to every applicant for membership, and those who fall below the standard should be rigidly and unhesitatingly excluded.

The close contact of such a body of business men as would be joined together under these conditions would rapidly efface the old inclination to distrust each other, and the intimate business relations which would naturally ensue would tend to dissipate the prejudices of the past. Out of the connection thus set up there will surely follow friendships, respect, community of interest, and a mutual desire to help and protect each other in all cases where the principles for which they stand are menaced. It is at this point that the well organized and properly conducted builders' exchange makes itself felt in the direction referred to. The exchange becomes the vehicle by which the public is shown that builders require of themselves a rigid conformity to honorable business practice, and that as a class of business men they are entitled to the same deference and respect as is given to business men in any other calling. The exchange, as has been most conclusively proven, under such circumstances becomes the source from which the influence of builders is felt in the community. Through the existance of such an exchange the builders are provided with an opportunity to participate in all matters pertaining to the welfare of the community in which they are a part; and if evidence were needed to show how greatly the service and influence of such a body of business men is appreciated, the frequency with which the help of such exchanges is solicited were proof enough.

A carefully organized exchange is a constant evidence to the public that the building business is one of magnitude and dignity, and with such a reminder continually before it the attitude of the public becomes the same toward both the builder and his business as it is towaru the members of any other trade or profession. In this one direction alone the exchange justifies its existence many times over, for one man's business treatment of another is very largely actuated by the position which that other occupies before the public. This one phase of proper organization tends to highten not only the standard upon which the business is conducted but to secure the profit and convenience with which it is transacted.

New Publications.

BUILDING CONSTRUCTION AND SUPERINTENDENCE. By F. E. Kidder. Part II. Carpenters' Work. Size, 7 x 9¾ inches; 544 pages; 524 illustrations; bound in heavy board covers. Published by William T. Comstock. Price, $4, postpaid.

This is the second part of a valuable work on the subject of building construction and superintendence, the first part, relating to masons' work, having been noticed in these columns at the time it was issued, something more than a year ago. The present volume is of the same size and general make up as Part I, but contains 100 pages more and twice as many illustrations. In bringing it out the author states in his preface that it has been the aim to furnish a series of books of practical value to all having to do with building operations, and especially to architects, draftsmen and builders. In the present volume the attempt has been made to describe those materials and methods of construction which come within the ordinary province of the carpenter or are usually included in the carpenter's specifications. In treating the various subjects the descriptive method employed in Part I has been followed little space being given to methods of determining the strength of materials, as these have been sufficiently covered in various works treating particularly of such matters, the special aim of the author being rather to show how the various kinds of work should be done, what materials should be employed and how the parts of buildings should be put together. An interesting feature of the volume is that in describing different forms of construction the methods obtaining in one particular section of the country have not been followed, but rather those pursued by different architects and in different localities, thus permitting of a comparison of methods and at the same time affording the opportunity of bringing out their relative advantages.

The work is comprised in eight chapters and two appendices, the first chapter dealing with building and finishing woods of the United States, touching upon their characteristics, properties and uses. In the second chapter wood framing of ordinary construction is considered, while chapter three discusses sheathing, windows and outside door frames. This in turn is followed by outside finish, gutters, shingle roofs, interior wood work, rough work, doors, standing finish, floors, stairs and builders' hardware. A chapter which will be found of unusual interest and value is that dealing with heavy framing, embracing bowled floors, the framing of stores and warehouses, post and girder connections, bracing of posts and girders, floors supported by trusses, compound wooden girders, trussed girders, mill construction and superintendence. Attention is also given to compound keyed beams, showing the results of some recent experiments on compound beams, and also illustrating the manner in which the author has kept pace with the investigations of engineers and scientists, as well as with the latest improvements of ever changing American methods. The eighth chapter is devoted to forms of specifications which can be used as a guide by the architect when writing specifications for carpenters' work, including the hardware trimmings, slate and gravel roofing, tin work, &c. In referring to the supervision of work the author has attempted to call attention to the defects commonly found in building materials and to inferior methods of construction, as well as various ways in which the work is often slighted.

The first of the appendices refers to some of the patented devices which are used in connection with carpenters' work, such as rolling partitions, revolving doors, dumb waiters, &c., while the second one gives tables of the strength of materials, these covering strength of iron and steel rods, wood and cast iron columns, gas pipe columns, strength of wooden beams and maximum span for floor joists. The work, as indicated above, is profusely illustrated, and the matter is presented in such shape as to prove of great value to the ambitious carpenter and builder, as well as to all having to do with the building of houses.

PAINTING TO PREVENT CORROSION, WITH SPECIFICATIONS. By A. H. Sabin. Size 3½ x 6¼ inches; 84 pages; numerous half-tone illustrations; bound in leather covers with gilt side title. Published by Edward Smith & Co. Price, $1.25, postpaid.

This valuable little work is the outcome of requests of the author to write some specifications for painting an important structure which was to be coated first with a preservative against corrosion and finished with a light colored paint. A rough draft of such specifications was drawn up and submitted to several engineers of experience, from whom valuable criticisms were received. It was then decided to publish a small edition of them, hoping thereby to elicit further criticism and information relating to actual practice and also to direct attention to the subject. The matter contained within the covers cannot fail to interest architects and building engineers, more especially as iron and steel are entering so largely into the construction of important buildings at the present day. In the arrangement of the matter sections from the specifications are given, and immediately followed by more or less extensive comments by the author. The illustrations are half-tone engravings, made direct from photographs, and cover important structures which have been treated with preservative paints.

CONTENTS.

CARPENTRY AND BUILDING

WITH WHICH IS INCORPORATED

THE BUILDERS' EXCHANGE.

DAVID WILLIAMS COMPANY, - PUBLISHERS AND PROPRIETORS.

232-238 WILLIAM STREET, NEW YORK.

NOVEMBER, 1898.

Nine Months' Building Operations.

There are so many branches of trade dependent for more or less of their activity upon the building business that some reference to the operations which have been conducted in this line in New York City and immediate vicinity during the first nine months of the present year cannot fail to prove interesting. While the amount of work throughout the country has been to some extent disappointing, there has been a fair degree of activity in the larger cities of the country, this being in a measure due to the fact that in them there is always more or less new work under way, as well as a vast amount of alterations, involving, in the aggregate, a large sum of money. The figures available for the period under review present some striking contrasts with those of previous years, more especially those relating to buildings intended for dwelling and office purposes. On the one hand there is a noticeable increase in the amount of capital invested in flats and tenements, while on the other hand there is a heavy falling off in the amount put into office buildings as compared with the corresponding period of last year; in fact, the amount is the smallest for several years. Another rather interesting feature of the period under review is that while the total number of buildings projected was slightly greater than during the first nine months of 1897, their estimated cost falls nearly ten millions of dollars below the amount invested in that period. This is doubtless explained, in part at least, by the reduced amount of capital put into structures for business purposes and the increased number of dwellings and miscellaneous buildings which were erected, especially in what is known as the Borough of Bronx. According to the figures available, covering the first nine months of this year, permits were issued for 2814 buildings, estimated to cost $57,018,231, as against 2771 buildings, involving an estimated expenditure of $66,207,665, in the same time in 1897.

Buildings Classified.

In arranging the buildings according to the purposes for which they are intended it is found that out of the 2814 structures for which permits were issued 1384 were for flats and tenements, estimated to cost $33,505,600. In both instances these figures are in excess of those for the corresponding months of 1897, when permits were taken out for 1228 flats and tenements, costing $27,241,800. In the case of private dwellings 901 were projected this year, costing $8,043,200, as against 1078 in 1897, estimated to cost $8,355,290. When we consider the figures covering office buildings, churches, stores, hotels, &c., a remarkable shrinkage is discovered. In the first nine months of this year permits were issued for 150 structures, involving an estimated expenditure of $13,950,650, as against 196 buildings, costing $28,733,625, in the corresponding period of last year. Permits were also issued for 379 miscellaneous structures, costing $1,518,781, as against 269, costing $1,876,950, in the same months of 1897. Some idea of the activity which has prevailed in the Borough of Bronx may be gathered from the statement that permits were issued for 1373 buildings, of which 1137 were flats and private dwellings, estimated to cost $9,731,000. The largest number of permits was issued in the third quarter of the year, when 1067 were taken out, the estimated cost being $18,724,881, the first quarter ranking next with 946 buildings, estimated to cost $20,373,850. In the city of Brooklyn during the first nine months of the year permits were issued for 2669 buildings, costing $11,059,629, and of this number 1033 were brick structures and 1636 frame. In the same months of last year permits were taken out for 2492 buildings, estimated to cost $10,637,972, thus showing comparatively little difference between the two periods.

The Need of Trade Schools.

Such efforts as have been made to establish trade schools for educating boys in the principles and practice of the several branches of the building trade have always demonstrated that the need and value of such education is recognized by the boys themselves. In every case where schools of this nature have been established on a permanent and substantial basis there has been no lack of pupils. The Auchmuty schools in New York City and the school maintained by the Master Builders' Exchange of Philadelphia are the best examples of pure trade training in the country, and the latter is an evidence of what could be accomplished by a well organized association of builders in any of the larger cities of the country. The expense and care attendant upon the maintenance of such a school, combined with the general lack of interest on the part of those who should be most interested, may be said to be the causes which have operated to prevent the establishment of a greater number of trade schools throughout the country. The experience of the Master Builders' Exchange of Philadelphia has proven that there is no warrant for the feeling, which is sometimes expressed, that organized labor is opposed to trade schools on the ground that they turn out half-fledged workmen who are immediately brought into competition with regular journeyman by unscrupulous employers. It is true that the latter unfortunately exist, and must be treated as such both by their workmen and their competitors. The system in relation to trade school graduates adopted by the Philadelphia Exchange makes it almost impossible for the boys to be used in any way likely to injure the journeymen. When a pupil is graduated he is given a certificate of the fact and is recognized as an apprentice, who is obliged to fill the remainder of his term, after the time spent in school is deducted, at actual work acquiring the skill and practice which can be obtained nowhere else. This arrangement is not only understood by the workmen, but is so satisfactory to them that they are lending the school their active support. Members of builders' exchanges in every large city in the country should seriously consider the great need of some means of teaching trades to the boys of the coming generation, and they should also consider the fact that they are under the heaviest and most direct obligation to provide the opportunity for such education.

Abolishing Sympathetic Strikes.

Just as we go to press it is announced that all of the unions affiliated with the Board of Walking Delegates in New York City have ratified the proposed agreement between the organization of employers, known as the United Building Trades, and the board, whereby sympathetic strikes are to be abolished and all questions in dispute are to be settled by an arbitration board composed of an equal number of employers and workmen. The agreement, it is stated, will be signed by both parties at an early date. It does not at present affect the speculative builders, who have an association of their own; but it is believed that the latter also will soon take similar action. The abolition of the sympathetic strike and the submission to arbitration of all disputes in the building trades is a very long step in the right direction. Such an agreement as that announced will redound to the advantage of both the employers and the employees, and will give the building industry in this city a stability which it has lacked for many years past.

Convention of Carpenters and Joiners.

The United Brotherhood of Carpenters and Joiners at their recent convention held in this city, reference to which was made in our last issue, elected the following officers:

President, John Williams.

First Vice-President, William Huber.

Second Vice-President, William Bauer.

Secretary and Treasurer, P. J. McGuire.

The following were elected delegates to the convention of the American Federation of Labor in Kansas City, Mo.: P. J. McGuire, Henry Lloyd, S. J. Kent and O. E. Woodbury.

Memorial to Richard M. Hunt.

A memorial which has been erected to the memory of the late Richard Morris Hunt will be unveiled in this city Monday, October 31, at 4 o'clock in the afternoon. The erection of the monument originated with the Municipal Art Society and was carried out with the assistance of the Century Association, the National Academy of Design, the Society of American Artists, the Architectural League, the New York Chapter of the American Institute of Architects, the trustees of the Metropolitan Museum of Art, the Society of Beaux Arts Architects, the National Sculpture Society, the New York Water Color Club and the Art Artisans of New York.

The memorial consists of a granite and marble bench, semicircular in form, recessed in the wall of Central Park, opposite Lenox Library, one of Mr. Hunt's most distinguished works. It is adorned by a bust of Mr. Hunt, cast in bronze, the work of the sculptor Daniel C. French, who, with Bruce Price, the architect, designed the memorial. Later, when more funds are secured, it is hoped to place two bronze figures on pedestals already provided, representing Architecture and the Allied Arts.

BRICKS made of a mixture of plaster of paris and cork are being used in the construction of powder mills. In the event of an explosion they offer slight resistance and are broken into atoms.

IN French hospitals it is stated that the floors have been painted for hygienic reasons with a solution of paraffine in petroleum, which gives them a brown color and renders them entirely impervious. A single application is said to suffice for two years. Such floors may be wiped daily with a cloth saturated with an antiseptic solution. This device is of great importance to schools, hospitals and private houses.

Painting Iron Work.

The painting of iron work is one of the most neglected yet important factors in its preservation and one to which the mechanical engineer rarely devotes much time or thought. The majority of specifications merely state that the iron work is to receive one, two or three coats, as the case may be, ignoring entirely the quality of the paint. Perhaps the engineer is not wholly to blame for this, says the *Mechanical World*, as the manufacturers of paint, like other venders of special articles, puff their rival wares, until every one, except the expert, is quite at a loss what special paint to choose. As a general rule, price is the first thing which influences the choice of paint, after which comes color, and finally covering power. The preservative action is seldom considered, whereas if this were kept prominently forward we should have had exhaustive experiments on the subject and some consensus of opinion as to the proper paint to use for iron work, one which would thoroughly preserve it under the most adverse circumstances, thereby saving the loss due to oxidation.

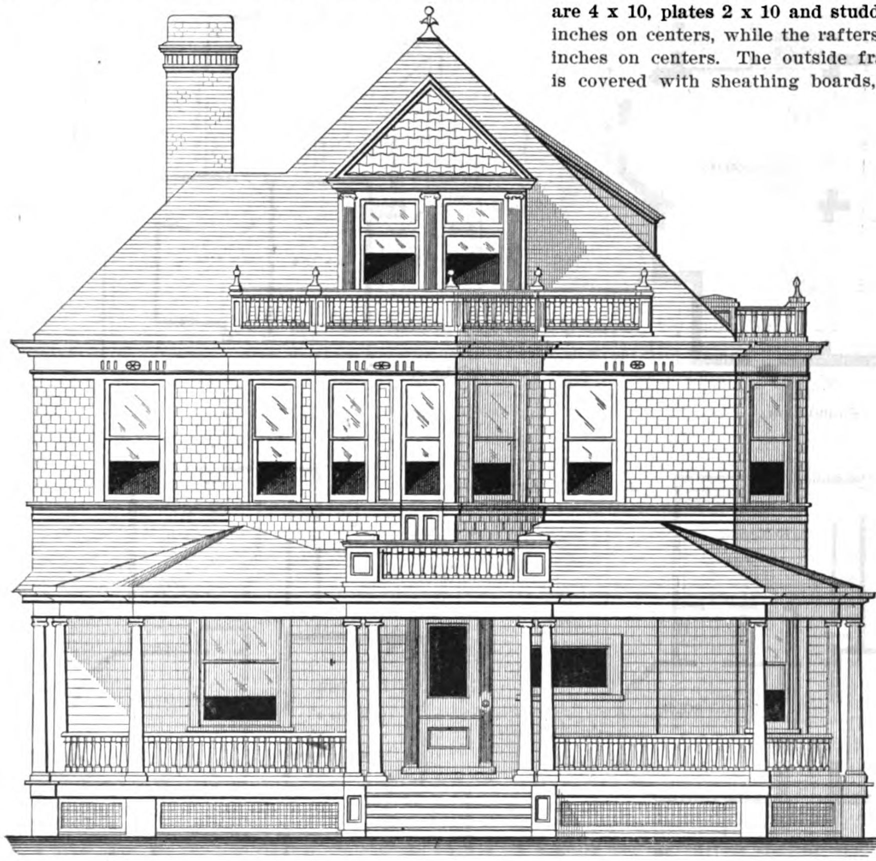
A paint to preserve iron work should possess great firmness, good hardening properties; it should be elastic and expand and contract readily with the iron at varying temperatures. Of the best paints those most used are the oxide of iron and red and other colors of lead paints. Oxide of iron paints possess greater covering power than lead paints in the proportion of three to two. From some experiments which have been made with some of Wolston's Torbay oxide of iron paint, it was found that on a surface of 10 superficial yards it took for the first coat of oxide, 1 pound; for the second coat, 1½ pounds; for the third coat, 2 pounds; while with the lead paint 1½ pounds were used for the first coat, 2½ pounds for the second coat, 3½ pounds for the third coat. It is claimed by the makers of paint from natural oxides that these oxides possess some mysterious advantages over artificial oxides which have been obtained as by-products from chemicals, that the paints from artificial oxides do not possess good covering powers, that they have not the power of amalgamating with oil, and that they have an acid reaction which necessarily corrodes the iron. This may be the fact in some cases, but we have seen artificial oxide paints which have none of these disadvantages, and which have a decided alkaline reaction, thus equaling, if not rivaling, the natural oxide paint, and, being made from waste products, they are necessarily cheaper. A good paint for iron work should be free from grit, uniform in quality, unchangeable under atmospheric influences, possess great covering powers and be of an alkaline nature. The whole of these qualities can be tested by the ordinary painter under proper supervision, except the last, which requires chemical knowledge; and we should strongly recommend the users of paint for iron work to test their paints in conjunction with a qualified analytical chemist who has made the subject his study.

Before painting the surface of galvanized iron it should be washed with an alkaline solution, as the galvanized iron frequently has a greasy acid surface when it leaves the galvanizing bath. In painting constructional iron work the wrought iron should be allowed to weather first before painting, as the oxide which forms on the surface of the iron when rolled will always, sooner or later, peel off, carrying whatever coats of boiled oil or paint there may be put upon it. We have seen this oxide peel off in flakes 2 feet and 3 feet square; we know that engineers are fond of specifying the iron to be oiled while hot from the rolls, and we have even seen it specified that castings should be coated with boiled oil while red hot. How the gushing engineer expected the castings to be fettled and cleaned before this operation we know not. A good coat of paint improves the appearance of a machine, bridge or roof, and, although it may seem a minor matter, yet we believe there is money to be saved by careful attention to the quality and price of the paint used on iron work.

COLONIAL RESIDENCE AT MADISON, N. J.

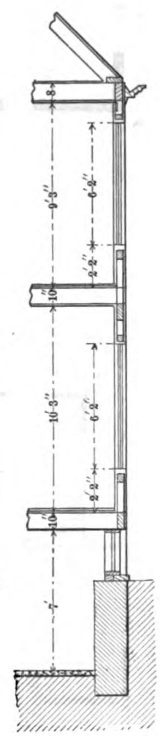
WE take pleasure in laying before our readers this month illustrations of an attractive residence treated in the modern colonial style and embodying points of interior arrangement which may not be without interest to many who are seeking homes for themselves or contemplate building for others. The house shown on the half-tone supplemental plate faces nearly south, thus giving the dining room the morning sun and the reception room and library the direct sunlight in the afternoon. Noticeable features of the exterior treatment are the several bays and dormers coupled with the front porch, which is seen to be partly straight and partly curved. Immediately over the front entrance at the second story is a small balcony which is reached from one of the sleeping rooms by means of paneled doors located just beneath the lower sash of the second-story bay window. Entrance to the house is through a Dutch door.

An inspection of the floor plans shows on the first floor a large hall, reception room, library, dining room and kitchen, communication between the two last mentioned being by means of a butler's pantry fitted with sink, shelving, &c. The dining room, library and parlor are separated from each other and from the main hall by means of double sliding doors, so that these apartments can, if occasion requires, be thrown into a suite—a very desirable feature in the house scheme. In the reception room and library are fire places with over mantels of attractive design and finish. A pleasing feature of the front hall is the main stairway with broad approach and well lighted landings. There is also a rear stairway so that from the kitchen the cellar and second floor can be readily reached.



Front Elevation.—Scale, ⅛ Inch to the Foot.

Colonial Residence at Madison, N. J.—C Powell Karr, Arch tect.



Section.—Scale, ⅛ Inch to the Foot.

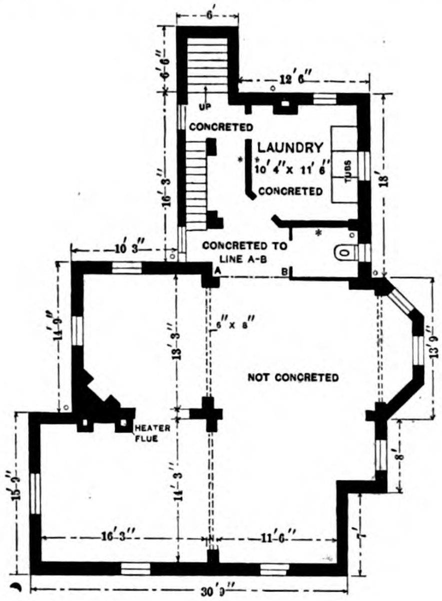
On the second floor are five sleeping rooms and bath, one front chamber having an open fire place. The bathroom is wainscoted, has open plumbing with nickel plated fixtures and one of J. L. Mott's porcelain lined iron tubs. The inside trim throughout the house is Louisiana red cypress with windows on the east, north and south fronts, glazed with best quality Pittsburgh plate glass. The oval window shown in the side elevation is of American stained glass.

The foundations of the house are of stone set on concrete footings, while above grade the superstructure rests on brick underpinning. The rear portion of the cellar, which contains laundry, servants' closet, &c., is concreted, as indicated on the basement plan. The sills are 4 x 10, plates 2 x 10 and studding 2 x 4, placed 16 inches on centers, while the rafters are 2 x 8 placed 20 inches on centers. The outside frame of the building is covered with sheathing boards, over which is laid Neponset rosin sized paper, this in turn being covered with clapboards up to the first belt course, and above this shingles are used, as indicated on the elevations. The roof, which is covered with shingles, has Neponset rosin sized paper between them and the sheathing boards. The cellar is 7 feet in the clear; first story 10 feet 3 inches and the second story 9 feet 3 inches. Between the first and second story floors are layers of Neponset Florian corrugated deafening felt, made by F. W. Bird & Son of East Walpole, Mass. The heating is done by steam.

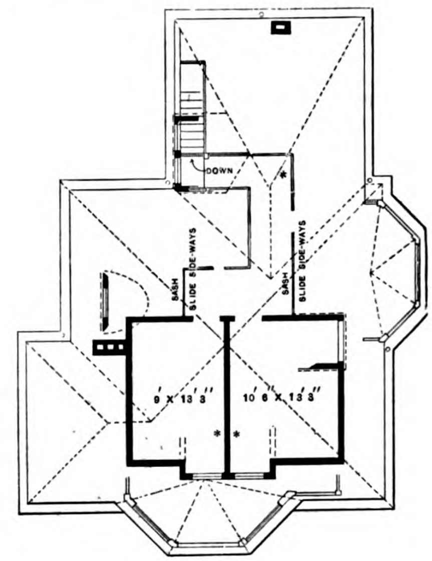
The building cost complete about $5500, and was erected for B. W. Burnett, at Madison, N. J., in accordance with plans drawn by Architect C. Powell Karr of 71 Fifth avenue, New York City.

Sand Roofs.

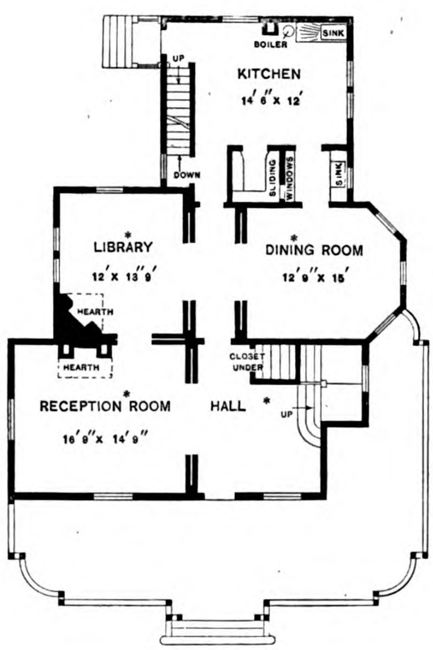
A very singular way of roofing is now not infrequently employed in Paris for small dwellings, says *Invention*. The roof is given a very gentle slope only, and is covered with battens and tarred cardboard, and then covered with a layer about 1 inch thick of sifted clean gravel. The most violent rains fall dead on such a roof, and neither hail nor sun has any effect on it. Even walking on it will cause no injury to the cardboard. Rain percolates through the gravel and runs off regularly, and habitations thus covered are much less exposed to the extremes of heat and cold which make themselves felt under zinc. It is necessary to rake up the gravel from time to time and to bring it back, as it works its way down the slope of the roof. When it has become earthy by being full of dust it is changed, but can be used again after a good washing. Thus the last cry of modern industry is a return to the earthen roof of our ancestors. The tarred cardboard is, however, an essential part of the scheme, as it prevents the passage of damp.



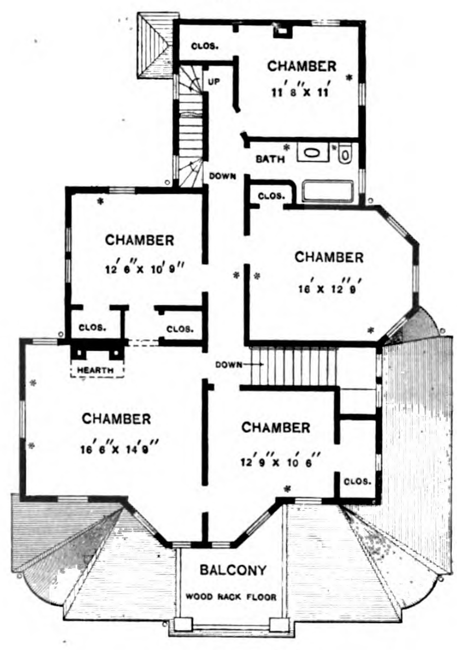
Foundation.



Attic.



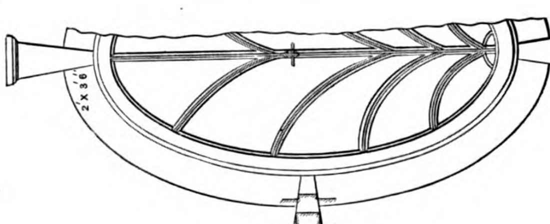
First Floor.



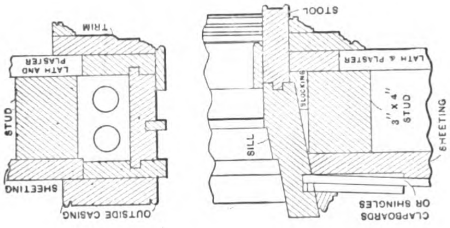
Second Floor.

Colonial Residence at Madison, N. J.—Floor Plans.—Scale, 1-16 Inch to the Foot.

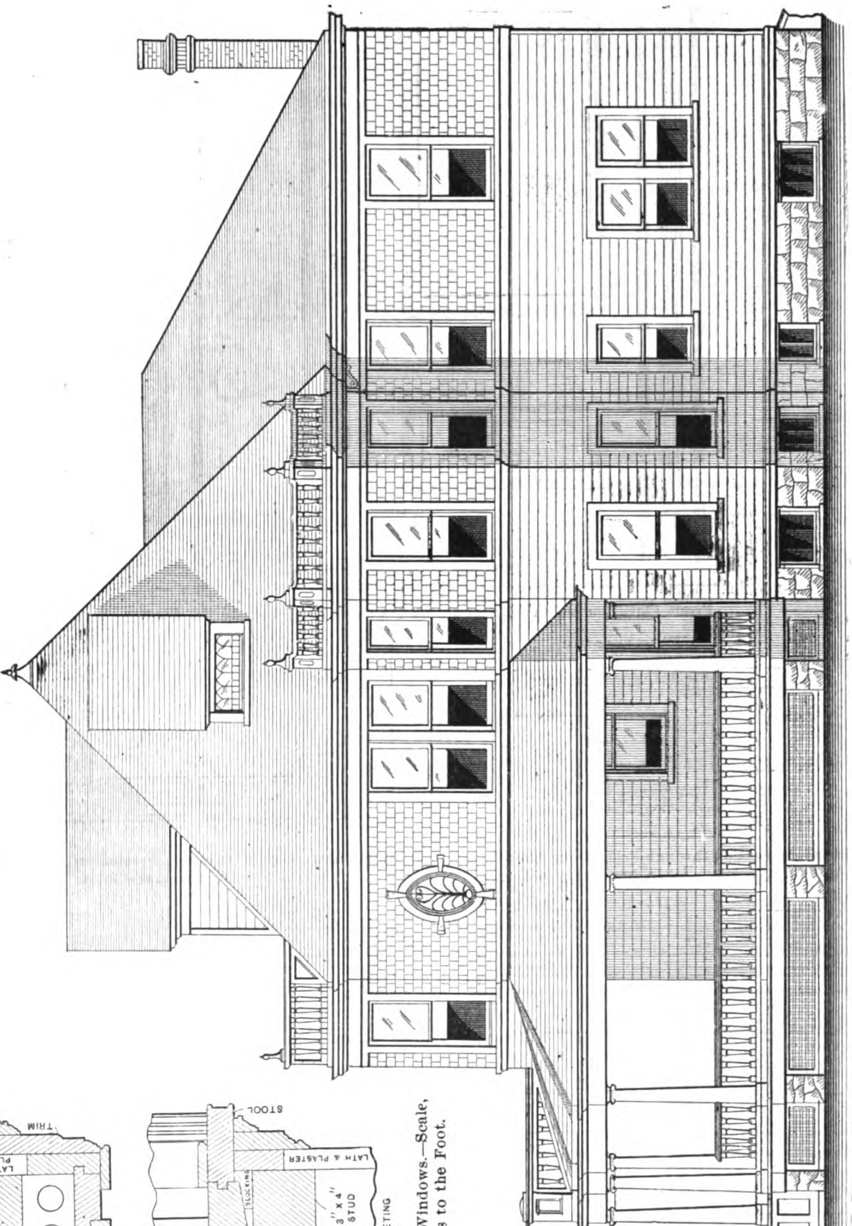
NEWGATE and the Old Bailey Sessions House, in London, fragrant with criminal memories reaching over centuries, are to be pulled down and a new Sessions House built on their site. The prison dates back to the days of Henry III, and in the year 1400 Henry IV committed it by charter to the care of the Corporation. It was rebuilt by the executors of Sir Richard Whittington and again during the Mayoralty of Beckford, in 1770, the structure being pillaged and burned by the No-Popery rioters before its completion. It was presently restored and assigned to its old uses, and now winds up its history of 500 years, subsisting hereafter only in the pages of old novelists and memory. The jail, in Hawthorne's phrase, is the black flower of civilization, and it would be hard to parallel the nigritude of vanishing Newgate.



Detail of Oval Window Shown in Second Story.—Scale, ¾ Inch to the Foot

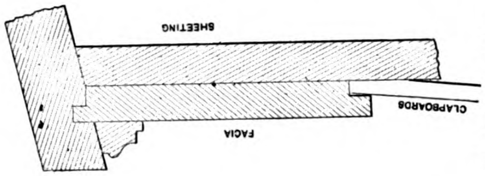


Details of Windows.—Scale, 1½ Inches to the Foot.

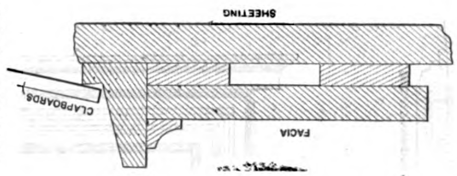


Side (Right) Elevation.—Scale, ⅛ Inch to the Foot.

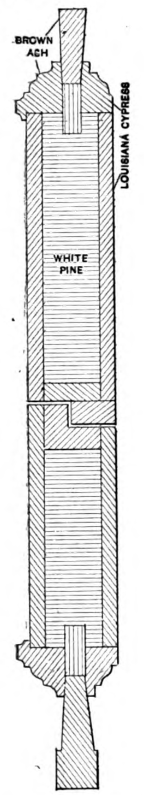
Colonial Residence at Madison, N. J.—Elevation and Miscellaneous Constructive Details.



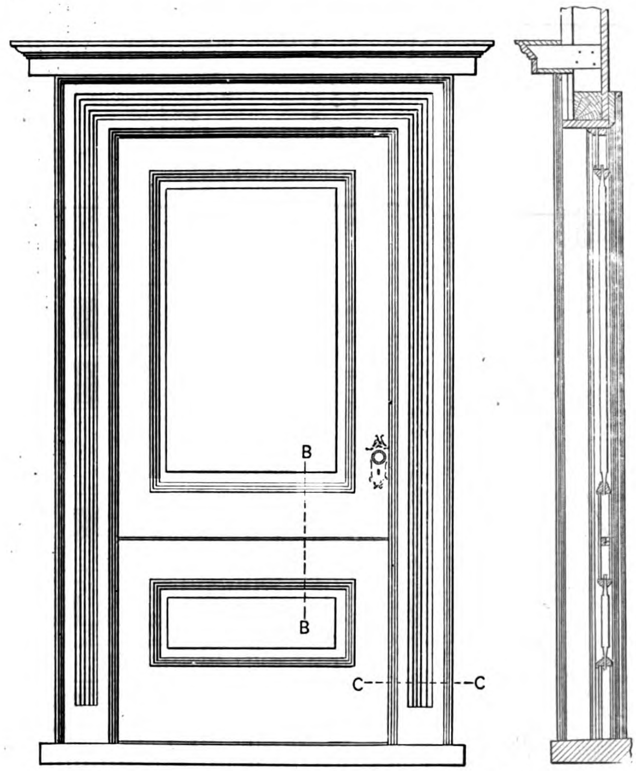
Detail of Second Story Sill Course.—Scale, 3 Inches to the Foot.



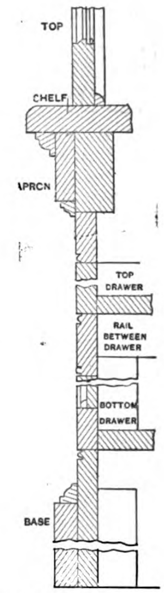
Detail of Water Table.—Scale, 3 Inches to the Foot.



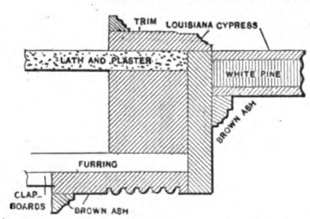
Vertical Section through Dutch Door on Line B B.—Scale, 3 Inches to the Foot.



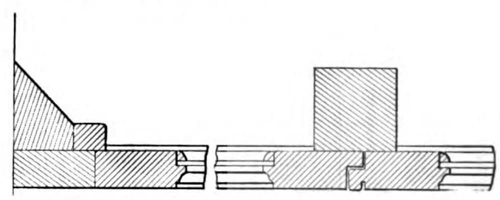
Front Elevation and Section of Dutch Door.—Scale, ½ Inch to the Foot.



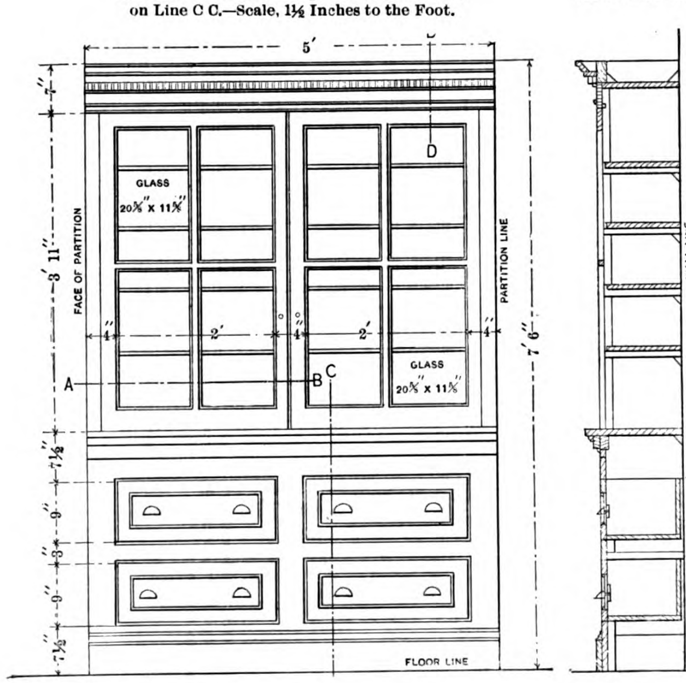
Detail of Dresser in Butler's Pantry on Line C C.—Scale, 1½ Inches to the Foot.



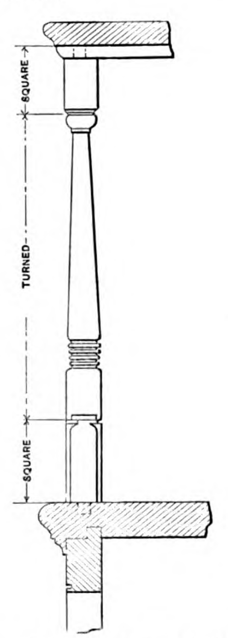
Horizontal Section through Front Door Jamb on Line C C.—Scale, 1½ Inches to the Foot.



Horizontal Section through Dresser on Line A B.—Scale, 3 Inches to the Foot.

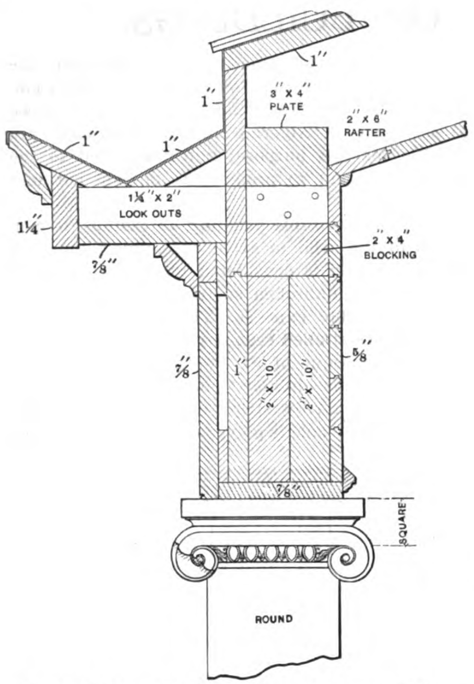


Front Elevation and Vertical Section of Dresser in Butler's Pantry.—Scale, ½ Inch to the Foot.

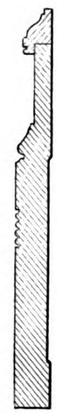


Detail of Column, Lower Shelf of Upper Case in Butler's Pantry and Counter Shelf.—Scale, 2 Inches to the Foot.

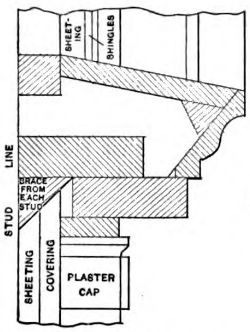
Miscellaneous Constructive Details of Colonial Residence at Madison, N. J.



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

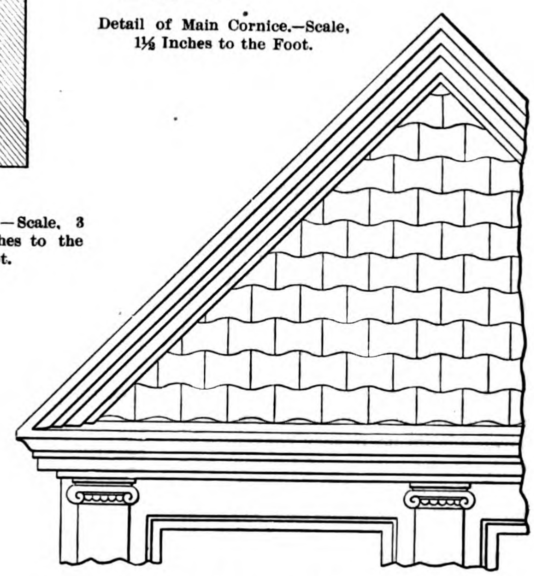


Base.—Scale, 3 Inches to the Foot.

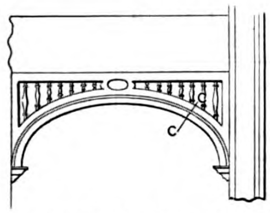


Detail of Main Cornice.—Scale, 1½ Inches to the Foot.

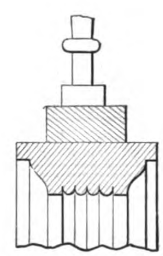
Section of Chair Rail.—Scale, 3 Inches to the Foot.



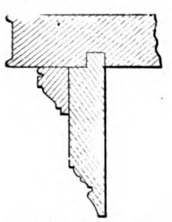
Partial Front Elevation of Gable Roof and Cornice.—Scale, ½ Inch to the Foot.



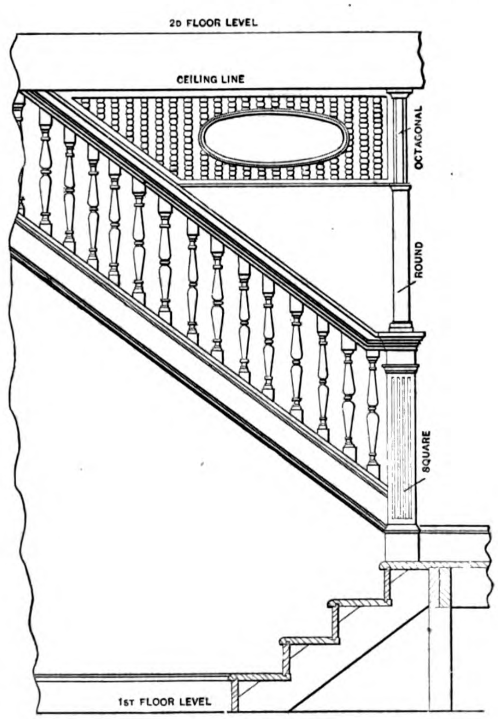
Detail of Grille at First Landing Main Stairs.—Scale, ⅜ Inch to the Foot.



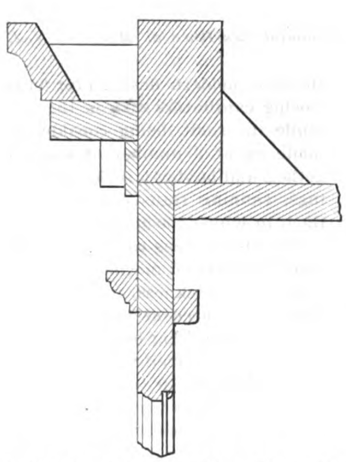
Section of Grille on Line C C.—Scale, 3 Inches to the Foot.



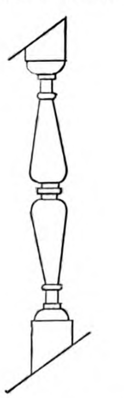
Detail of Window Stool and Apron.—Scale, 3 Inches to the Foot.



Detail of Main Stairs.—Scale, ⅜ Inch to the Foot.



Section through Cornice Cap of Dresser in Butler's Pantry Taken on Line D D.—Scale, 3 Inches to the Foot.



Detail of Stair Spindle.—Scale, 1 Inch to the Foot.

Miscellaneous Constructive Details of Colonial Residence at Madison, N. J.

MARBLE DECORATION OF BUILDINGS.

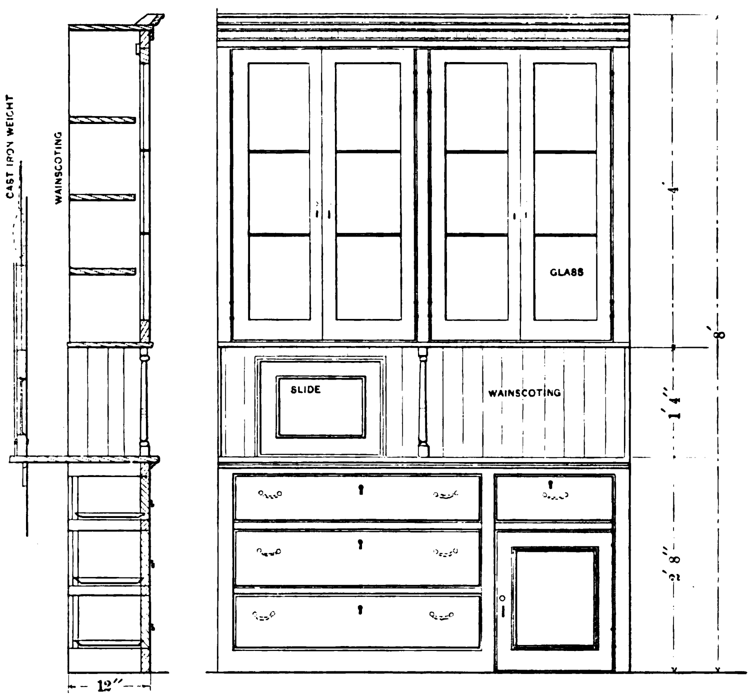
THERE are two distinct methods of decorating the surface of buildings with marble, of both of which there are abundant examples in Italy. The first was that practiced in Venice, and consisted of veneering brick and stone walls with thin slabs of marble. In the other, practiced at Bergamo, Cremona and Como, the marble formed a portion of the wall itself. "These two modes," says G. E. Street, "led to two entirely different styles and modes of architecture. It might also be said that one mode was devised to the concealment and the other with a view to the expansion of the real mode of construction."

This criticism, says the *Stonemason*, is in need, however, of much modification. It is needless to state that effects of great beauty, combined with architectural truth, have been obtained by the use of solid marble blocks. In old Italian examples the colors of the marble were alternated in horizontal bands, sometimes in equal widths, and in others with narrow courses of white marble between broader ones of dark color. Sometimes straight lintels were formed, differing in color and ingeniously keyed together. But this mode of marble decoration is too costly to be adopted to any considerable extent in this country, and we are therefore compelled, in the majority of cases, to resort to the Venetian method, which adapts itself very conveniently to the puposes of internal decoration, and enables us to do full justice to the materials employed.

The beauty of colored marble can only be properly appreciated when it is seen in large masses. When it is cut into the average sizes of ordinary building stones and bonded into a wall we lose the majesty of effect resulting from the use of a single polished slab of large dimensions such as we can only have in veneered work, and in the right use of marble veneer there need be no attempt to deceive the eye. With the use of slabs too large to be mistaken for solid blocks, and with the long vertical joints necessitated when paneling with variously colored marbles is employed, we follow a treatment strictly nonconstructional. When we have a marble with any decidedly marked pattern in it we can saw it into thin slices, and by reversing these and placing them in juxtaposition we can obtain very beautiful effects in a perfectly legitimate manner. A panel of this kind tells its own tale at once. The sections composing it cannot consist of entirely separate blocks, and they can be put together without any attempt to break joints.

Moldings are generally necessary to emphasize the lines of panel decoration. A molding may be run upon the edge of a marble stile, but if the marble be of any decided pattern the veins or other marks cutting across the lines of the molding will greatly detract from its effect. What is needed in the majority of cases is a separate boundary of color between the two surfaces. The stile being darker than the panel, the moldings should be in a darker material than either, and with panels in strongly colored marble black moldings become necessary. In paneling we have a form of decoration eminently suitable for execution in marble, because it affords such excellent opportunities for displaying the beauty of the material. One way of exhibiting the beauty of marble in the form of panels consists in employing very thin slabs for windows in place of glass. Oriental alabaster or Algerian and Mexican onyx are very suitable for this purpose; but if exposed to the weather it is prudent to protect the outside surfaces with glass.

Circular work in marble paneling, or casings, is usually cut out of the solid to avoid numerous joints, the appearance of which is considered unsightly. The advantage of a large unbroken surface is thus obtained, often at considerable expense. The Byzantine architects seem to have studied economy more closely in this respect. In the mosque of St. Sophia, Constantinople, for example, portions circular upon plan are veneered with marble cut in narrow strips, each presenting a flat surface, so that the whole is polygonal instead of curved.



Vertical Section and Front Elevation of Case in Butler's Pantry.—Scale, ⅛ Inch to the Foot.

Colonial Residence at Madison, N. J.

In some modern designs for boxed marble trusses inclosing cantilevers of iron the sides are in single slabs, while the soffit, being considerably curved in form, is made up of a number of small pieces all tongued together, and having a series of reeds, or other small moldings, running transversely, with deep quirks between them in which the joints are concealed.

Flights of steps can frequently be constructed to advantage in boxed marble. The treads may be 1¼ inches or more in thickness, with molded nosings, slabs 1 inch thick being used as risers. The steps are usually supported upon raking beams of iron, the outer strings and soffits being formed with marble slabs and having suitable moldings. In constructing such flights great care is often taken to match the steps and risers so that the former may appear to be solid, but it would frequently be better if the risers were made of a different marble from the treads, a more highly colored material being used for the former than the latter. It is better not to polish the treads, because by this means they are rendered so slippery as to be dangerous, but the full beauty of the risers may be brought out by having these of a highly polished surface.

THE ART OF WOOD TURNING.—IV.

BY FRED. T. HODGSON.

WITH regard to finishing a cylinder neatly and correctly, I think I cannot do better than quote from Holtzapfel, who is considered to be one of the best, if not the best, authority on turning and lathe work. In discussing this subject he writes: "To obtain a delicate shaving the entire length of a cylinder or a cone, or for a fine shaving that must begin and end in nothing, employed to correct the work, when that is moderately small in diameter and not far from its true or finished line, the chisel may be held in a different manner with advantage. The left hand (the back uppermost) has the whole of the fingers placed from above slightly around the work, which revolves within them. The left thumb is firmly pressed on the flat of the chisel, upon or just beyond the grinding, so that the under bevel of the blade is pressed on the work and forced to assume the most accurate tangential position. The right hand is shifted from the handle up to the blade, which it holds tightly on the rest, having only to assist in maintaining the tilt, and to prevent the tool falling away from the cut by any lowering of the handle. The right forefinger is then sometimes stretched out along the side of the chisel, the traverse of the tool being much assisted by the left thumb, which aids by pushing the chisel along the cylinder, at the same time that it keeps it in accurate contact." I may here say that this manner of manipulating the chisel will suggest itself, for it appears to be a sort of natural method and one the beginner will naturally adopt by intuition after a little experience in turning cylinders or similar work.

Figs. 29 and 30 show the proper shape of cutting edge of gouge for general purposes. Other shapes of gouges are used for special purposes, and later on I will take occasion to describe them and the work for which they are intended.

In finishing off the cylinder so as to get it parallel throughout the beginner will be likely at first to find his patience taxed to the utmost in his efforts to prevent the chisel from cutting deeper in some places than in others. It is good practice, therefore, to learn to turn a shaving off the work with the chisel which shall be the same thickness throughout, so that starting with a truly turned cylinder, after the chisel has removed its entire surface it shall remain an equally true cylinder, the only difference being its reduction in diameter. The beginner should give himself plenty of practice in this sort of work, for on the correct turning of a cylinder depends much of his success at other turned work.

If the cylinder which has been turned is to be used merely as a cylinder—that is to say, as an ordinary roller or rollers—it will be necessary to cut to proper length or lengths and remove such waste wood as may not be required. If there is ample length the gouge may be used to cut off the end, as was shown in Fig. 19, but where the length is limited and the distance between shoulders is small, tools other than the gouge or chisel must be employed. These tools are called parting tools, and are formed from pieces of flat steel ground hollow at the sides so they will clear the work as they cut through, the wider end acting somewhat in the manner of the "set" of a saw. Fig. 31 illustrates one of these tools, A being a side elevation, B a plan of its length, while C shows the cutting edge, which is V-shaped, something like the veining tool in a carver's "kit." This is ground with a bevel on the under side, as shown, and beveled inside the V so that the outside rests snug against the shoulder of the work when in operation. This tool is intended only to be used on soft woods. It must be held at right angles to the work, and should cut quickly or the shoulder will show a ragged end. A little practice with this tool will soon enable the turner to employ it dexterously and with speed. Sometimes the end of the blade is not divided, in which case the tool may be considered as a narrow chisel and is sharpened by grinding the top surface. This latter kind does very good work in careful hands, but it is not so speedy a tool as the former. As soon as the beginner can readily turn a perfect cylinder he may be said to have attained his first victory, but it will take him some time to accomplish this little feat.

It is, however, in hardwood turning where the greatest difficulties occur. To turn a maple or oak roller 2 or 3 feet long and not more than 1½ to 2 inches in diameter, making it truly parallel, is a feat of which an experienced hand may well feel proud. Yet many American turners can do this without making much of an effort, and do it quickly. Perhaps the better kind of turning to begin with in hardwood are handles for chisels, brad awls or gouges, for the reason that they are short, and if one or two are spoiled during the operation there will not be much loss of material. These may be made from almost any kind of hardwood. Those intended for turning chisels or gouges or even for files or rasps may be made from elm, ash, oak or beech, but for fine bench tools, such as paring chisels, carving tools and brad awls, the finer woods are to be employed, such as mahogany, ebony, box or holly—that is, when such woods are procurable.

Handles that undergo any pounding by a mallet should be made of hickory, ironwood (which is another name for horn beam), or other tough and hard woods. A few conventional shapes of handles are shown in Fig. 32 of the illustrations, A showing the proper thing for a rasp handle, B for the handle of a turning chisel; C will make a good handle for a firmer chisel; D is an old style brad awl handle, while E is a handle suitable for a graver and for some kinds of carving tools. A piece is taken off of the last mentioned handle, leaving a flat side, in order to meet the exigencies of the engraving in hand.

Practice with these articles until any one of them can be turned out at pleasure will have prepared the operator in the handling of his tools for such an advanced stage of the art that he may safely be trusted with work of greater pretensions than he has hitherto attempted. Following on this line he may proceed to turn up longer work, such as table legs, stair balusters, spindles and similar things. Before undertaking this kind of work in hardwood, however, the beginner should be impressed with the imperative necessity of always having his tools in first-class condition. In turning, as in

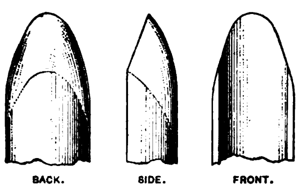


Fig. 29.—Showing Proper Form to Grind a Gouge.

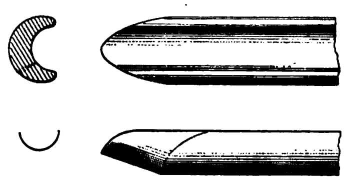


Fig. 30.—Views of Gouge Ready for Use.

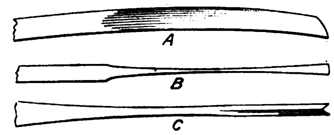


Fig. 31.—Several Views of a Parting Tool.

The Art of Wood Turning.—Some of the Tools Employed.

all other trades where edged tools are employed, good work can only be produced when sharp tools are used. Indeed, in lathe work it is much more of a necessity to have the tools ground thin and well honed than is the case with planes and chisels used in ordinary joinery or cabinet work, for in delicate turning if the tool has to be forced by the hand to stick to its work the forcing may break the work, forcing it off its centers, or otherwise disfiguring it beyond repair.

In turning long stuff the pliancy or elasticity of the wood causes a certain amount of vibration when the work is set in rapid motion. In order to prevent this so far as possible the turner must make light cuts whether with gouge or chisel, and he should also have a poppet head through which the work may be slipped after it is rounded off a part of the way. This will support the work while being operated upon. It is employed in the following manner: A short piece of the end of the work is turned, and then the support is passed over it and secured by wedging under the bearers. As the work progresses the support is moved along. The extra poppet head may be formed of wood of the shape shown in Fig. 33. It consists of a head in which is bored a hole, A, of the proper diameter, and a tail piece fitted into the lathe bed, and sufficiently long to receive a mortise, B, through which a wedge may be driven to hold it down firmly upon the bearers. When the work is turned down to its intended form each short length should be finished, except the polishing, as the operator proceeds, for as soon as the cylindrical form of the work is destroyed the poppet head is unable to furnish any further support.

By the aid of the gouge and chisel alone a great variety of forms suitable for ornamentation, cabinet work and other purposes may be produced, but a few simple things, such as are shown in Fig. 34, will be the best with which to commence, as these are designedly made in easy form, so that they may be wrought with only chisel and gouge. Take the two examples shown in Fig. 34, and it will be seen that one consists of two short legs suitable for a small foot stool and having no other ornamentation than a regular taper from the three beads at the neck to the end of the leg shown by the dotted lines, with the exception of a couple of beads at regular distances which are easily formed by the chisel. The taper is to be regular, and the legs should have the appearance of having passed through the beads as though they were rings of wood. Any change from a straight line from the shoulder to the foot will at once be noticed by an experienced eye. These two legs are turned from one length, making a considerable saving of time, as one "chucking" or centering answers for both. The distances for marking off the beads, shoulders and point to separate the legs may be made on a rod before the operation commences. Then when the stick is rendered cylindrical the various points may be transferred by a pencil mark from the rod to the revolving wood, this method insuring uniformity of lengths and distances. For the proper thicknesses the calipers must be used. The table leg presents less difficulties to the beginner than the previous example, as there are not so many breaks in its length. The turnings so far may be designed in the lathe—that is, the operator first forms an idea as to what he wants, then while the material is revolving he can mark off the distances he requires, either with the point of his chisel or with a pencil, first, of course, roughing off the stuff and making it cylindrical, or at least that portion of it he intends turning. Then if he has an artistic eye he will turn in his beads, coves and squares to suit his fancy. Having made one leg, spindle or other work satisfactory to himself he will take a rod and mark off the projections and hollows on it, the same as the finished work so far as distances and spaces are concerned. From this rod he will mark off the other legs, spindles or similar work he intends making of the same pattern.

If the work is to be prepared for polishing it is better to sandpaper it while it is revolving in the lathe. For hardwood which has to be hard finished or polished do not have the sandpaper too coarse, as it is apt to leave scratches on the work, which will show through the polish. No. 0 sandpaper is perhaps the best for hardwood, while for the pines, bass wood or other soft woods a coarser number will answer the purpose unless the work is intended for a pattern for cast iron or brass. In that case the sandpaper must be used very sparingly, as it will reduce the dimensions too rapidly. The best way to use sandpaper on straight work is to take about a quarter of a sheet and apply it to the revolving stuff with the right hand, allowing the paper to wrap itself around the work. The operator can then move the paper to and fro on the work parallel with its axis. When the work is considered to be sufficiently smooth the sandpaper should be removed and the work gone over with turnings or shavings, which are held in the hand and pressed against the work while it is still revolving. This latter process removes all sand that may have penetrated the pores of the wood and gives to the work a finished appearance.

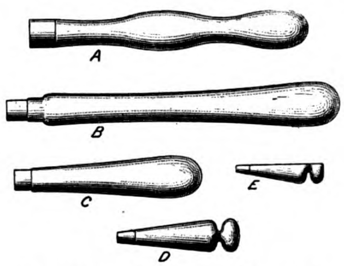


Fig. 32.—Some Conventional Shapes of Handles.

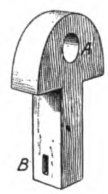


Fig. 33.—Extra Poppet Head.

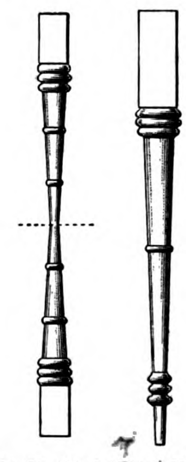


Fig. 34.—Work Which May Easily be Wrought with Chisel and Gouge.

The Art of Wood Turning.—Some Examples for Practice.

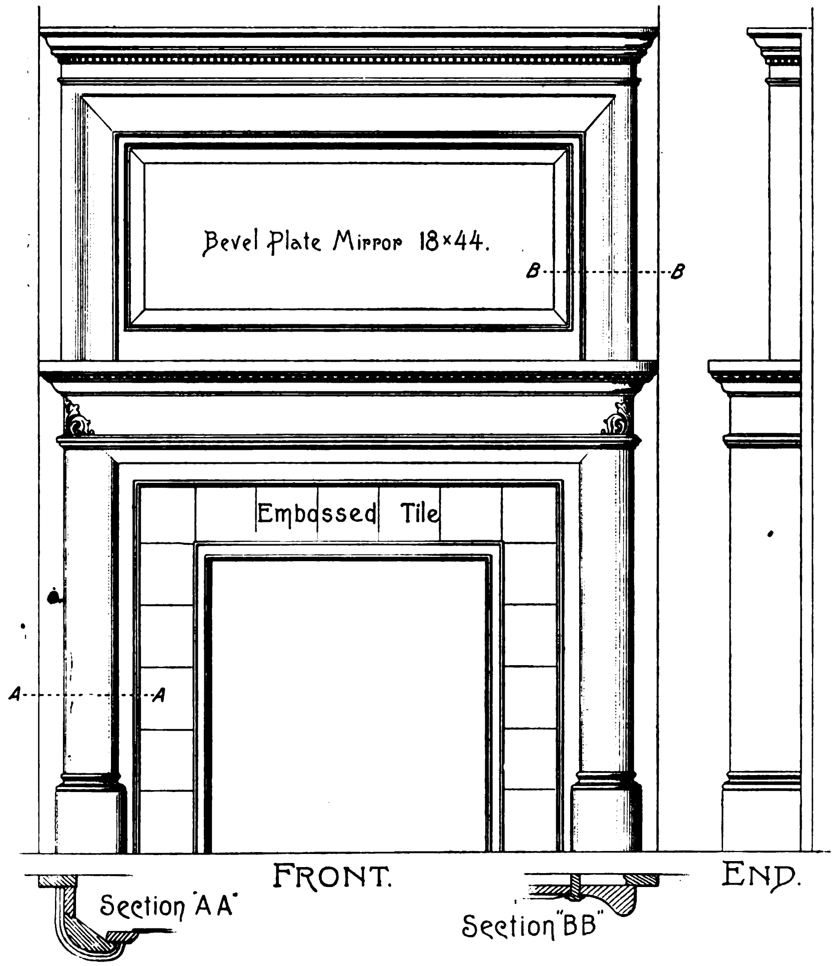
WHAT is probably the most protracted labor dispute on record has just been brought to an end in England. It had lasted for 24 years. The contention was one which sprung up in 1874 between the Original Society of Paper Makers and the Association of Employers of Carded Labor, the employers having refused a demand from the workmen for an increase of wages of 6 pence a day for vatmen and couchers and 3 pence per day for men in other branches of the industry. The settlement was in the nature of a compromise, by which the first part of the demand was granted and the latter part refused. It is probable that at least some of the workmen who originally asked for the increase are alive to reap the benefits of the struggle.

Design for Parlor Mantel.

A feature of every well appointed parlor or drawing room in homes of moderate cost, as well as in those of the more pretentious kind, is an attractive fire place mantel with over mirror, the design being, of course, in keeping with the general character of the finish of the apartment in which it is placed.

We present herewith illustrations of a parlor mantel designed by Grodavent Brothers, architects, of Denver, Col., which may not be without interest to a large class among our architectural friends.

As will be seen from an inspection of the engravings the facings are embossed tile, the mirror is of bevel plate and the wood work may be executed with pleasing results in cherry. The design is quiet in tone, yet rich and effective, being particularly suitable for a room in which the finish is handsome but unpretentious.



Design for Parlor Mantel.—Scale, ⅛ Inch to the Foot.

Lead vs. Zinc Paints.

G. R. Henderson of the Norfolk & Western Railroad contributes to the *Railroad Gazette* a report of a series of exposure tests to determine the efficiency of lead and zinc paints. For the different materials he reaches the following results:

Tin.—The best results were obtained with first coat white lead and second coat white zinc. The second coating of zinc gave generally the best results, and the second coating of lead the worst.

Galvanized Iron.—The same remarks apply to galvanized iron that were given for tin.

Sheet Iron.—The mixture of one-third white zinc and two-thirds white lead, for both coats, gave the best results on this material, and in general the zinc paints gave better results than the lead paints.

Poplar.—The second coats of zinc showed up well on poplar, no matter whether the priming coats were white lead or white zinc, or mixed lead and zinc. The lead second coating showed up the worst on this material, but in each case where the second coat was of zinc, totally or partially, the paint was in a perfect condition.

White Pine.—The remarks made relating to poplar apply to white pine also.

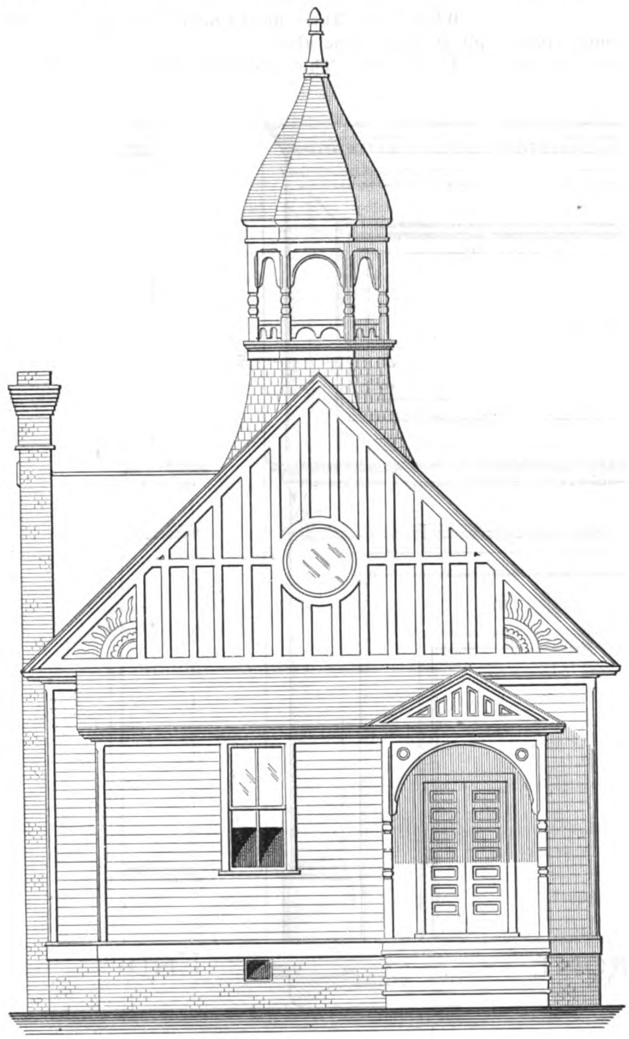
Yellow Pine.—This material seems to be difficult to properly treat with paints; the best results were obtained with the first coat of lead, and the second coat of lead and zinc mixed. Where the first coat was of lead and zinc mixed, or entirely of zinc, the results were poor throughout, which seems to indicate that as a general thing the lead is better for priming on this material.

Conclusion.—The lead priming and zinc coating is generally good for tin, galvanized iron, poplar and white pine. Sheet iron showed up best with both coats of mixed paints. Yellow pine appeared best with the first coat of lead and the second coat of lead and zinc mixed. Comparing the materials which were painted, we find that generally poplar retains the paint better than white pine, and would, therefore, be preferred for siding on buildings, &c. Yellow pine seems to be the worst of all for this purpose. Black iron, as a whole, seems to retain the paint better than either tin or galvanized iron.

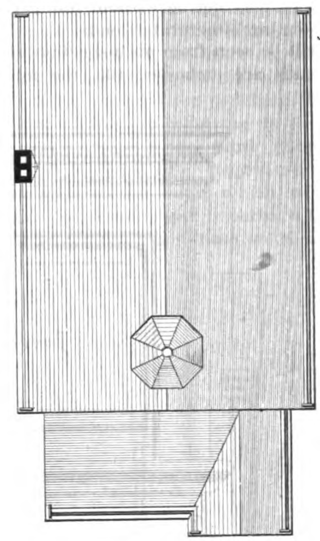
A COUNTRY SCHOOL HOUSE.

A DESIGN well adapted for execution in villages and country towns, and which may be used either as a school house or chapel, is that which we illustrate herewith. It has one room for the accommodation of pupils, and was built at Lonsdale, near Knoxville, for the school directors of the Twelfth District of Knox County, Tenn., at a cost of $850. The foundations are hard brick faced above grade with No. 2 pressed brick laid in lime mortar. The girder is 8 x 10 inches; floor joist, 2 x 12 inches, placed 16 inches on centers; ceiling joist, 2 x 6 inches, trussed, as shown in the details, and placed 24 inches on centers; sills, 4 x 8 inches and studs and rafters 2 x 5 inches. The exterior is sheeted with ⅞-inch surfaced boards, on which is placed No. 1 yellow poplar weather boarding. The roof is covered with No. 1 Georgia pine shingles laid 5½ inches to the weather, the cupola or belfry floor and roof being covered with tin. The gables are finished as shown in the engraving. The exterior is painted two coats lead and oil with primer.

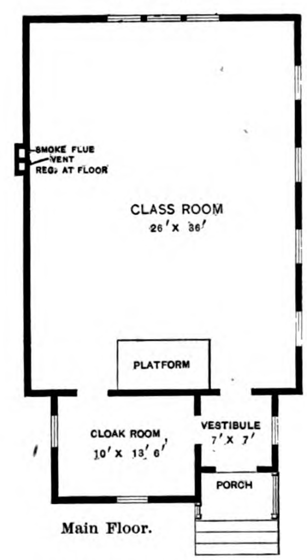
The interior finish is Southern white pine surfaced and given two coats hard oil left bright. The building is plastered two coats. The walls are wainscoted 3 feet 6 inches with neat cap and base. The vent flue is provided with register at the floor and being situated next to the hot smoke flue assists ventilation. The building was planned to accommodate scholars of both sexes and all ages. An interesting feature is the provision for lighting the room, it being seen that the windows are all at one side and the rear, while the wall which is at the right of the pupils as they face the platform is blank.



Front Elevation.—Scale, ⅛ Inch to the Foot.



Roof Plan



Main Floor.

Scale, 1-16 Inch to the Foot.

A Country School House.—Frank K. Thomson, Architect, Knoxville, Tenn.

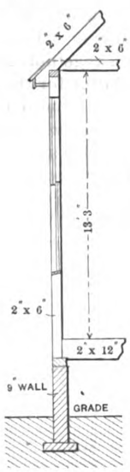
The school house was designed by Frank K. Thomson, architect, Knoxville, Tenn.

SOME interesting data about the occupations of the American people are given in the bulletin of the eleventh census recently published. It shows that the total number of persons engaged in gainful occupations in 1890 was 22,735,931. Of these, the females formed 17.22 per cent. Agriculture, fisheries and mining formed the pursuit of 9,013,336, manufacturing and mechanical industries claimed 5,091,293 persons, trade and transportation, 3,326,122; domestic and personal service, 4,360,577, and professions, 944,333. Among manufacturers and mechanics, carpenters and joiners take the lead, numbering 611,482, dressmakers and milliners following second with 499,690.

Exterior Scaffolding.

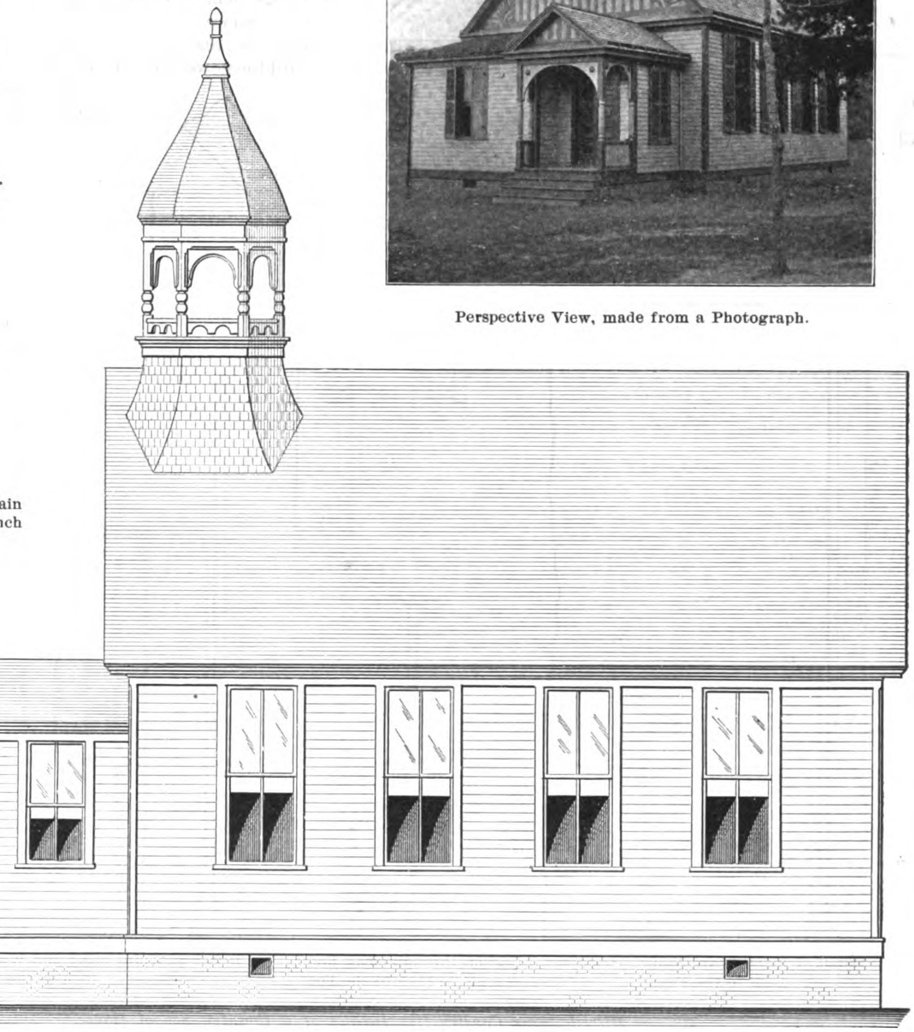
The custom in regard to scaffolding for the erection of the exterior of buildings differs in various parts of the country. In New England it is usual to erect an outside staging constructed usually of 4 x 4 uprights spaced 6 or 8 feet apart, in double rows, and connected and braced by 6-inch boards, the scaffolding being carried to the top of the building. In New York more commonly the scaffolding is projected on putlogs, from story to story. The work of laying the face brick, &c., is done from each floor. The question of which is the best, says a writer in the *Brickbuilder*, is largely a matter of usage, but there is one way of looking at it which we think is worthy of consideration. If the building is anything more than the plainest kind of commercial structure, the architect likes to study it as it goes along. If the outside of the building is covered with staging from top to bottom, it is like working a typewriter which letters upside down. You cannot see what is being done until perhaps it is too late to make any change. On the other hand, if the staging covers only one story at a time, any imperfection, irregularity or undesirable combination can be seen at once from the outside in its true proportions and full effect and can then be altered or remedied before the building is carried any higher.

It is the fond belief of New England contractors that they get better bricklaying in and around Boston than anywhere else in the country. We doubt if our New York brethren would quite agree to that; at any rate, we hardly believe that the alleged superiority is due entirely to the fact that outside stagings are used here. Certainly the opportunity of watching the building as it goes along is something that would be welcomed by every architect, and we all know how anxiously at times we have waited for the final removal of the staging, often in serious doubt as to whether this pet scheme of color or that detail would have its true effect, and we certainly should advise inside staging in every case where it is possible, in order to study the building as it goes along.



Section through Main Wall.—Scale, 1/8 Inch to the Foot.

Perspective View, made from a Photograph.

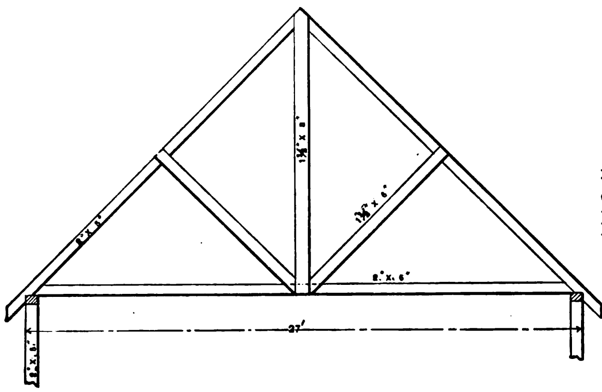


Side (Right) Elevation.—Scale, 1/8 Inch to the Foot.

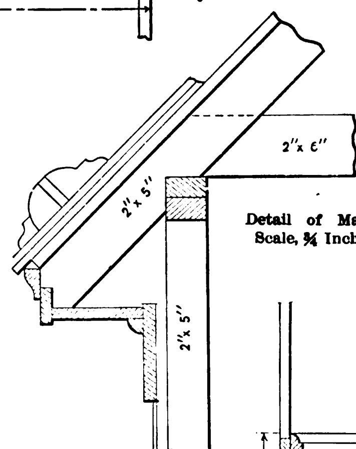
A Country School House.

A Triangular House.

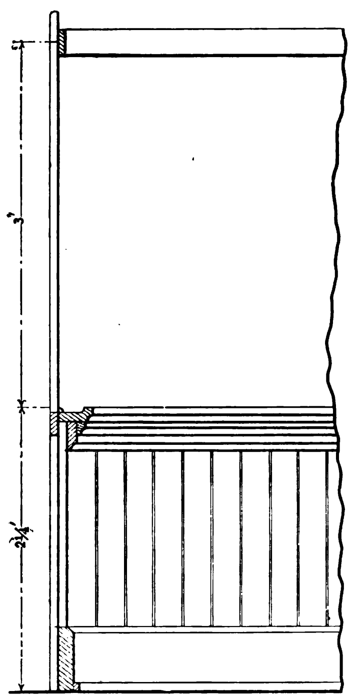
The most peculiar house in the United Kingdom is said to be a small triangular building erected about 300 years ago at Rushton, in Northamptonshire, by Sir Thomas Tresham, a fervent Roman Catholic, who is supposed to have wished by his design to typify the Trinity. The house is all threes, each of its three sides being exactly 33 feet 4 inches—that is, 33 1-3 feet—in length. There are three stories; each has three windows on each of the three sides, and each of the windows in two of the three stories is in the shape of a trefoil—the three-leaved shamrock. The panes of glass are all triangles, or three-sided. In each of the other windows there are 12 panes of glass, in three fours. There are three gables on each side rising from the eaves; and from the centre, where their roofs meet, rises a three-sided chimney, surmounted by a three-sided pyramid, terminating in a large trefoil. The smoke escapes from this chimney by three round holes on each of the three sides. On the top of each gable is a three-sided pyramid covered with a trefoil. The building is almost covered with inscriptions and carvings. Three Latin inscriptions, one on each of the three sides, have 33 letters in each. Three angles on each side bear shields. Over the door is a Latin inscription of three words, meaning "There are three that bear record." Inside the house each corner is cut off from each of the three main rooms, so that on each floor there are three three-sided apartments. It may be interesting to note that the house is not inhabited.



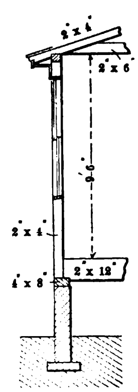
Elevation of Roof Truss.—Scale, ⅛ Inch to the Foot.



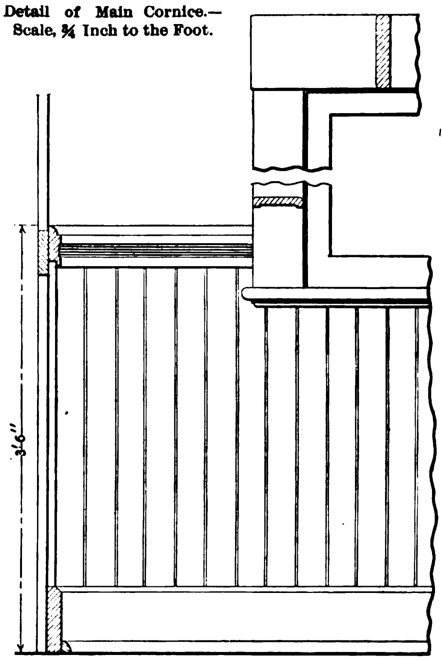
Detail of Main Cornice.—Scale, ¾ Inch to the Foot.



Detail of Black Board Finish.—Scale, ¾ Inch to the Foot.



Section through Cloak Room.—Scale, ⅛ Inch to the Foot.



Detail of Wainscoting and Window Trim.—Scale, ¾ Inch to the Foot.

Miscellaneous Constructive Details of a Country School House.

Workmen's Houses in Germany.

United States Consul-General Monaghan at Chemnitz reports to the State Department that there is a movement on foot in Germany to furnish workmen with better housing. "Now," he says, "they are crowded into buildings which often look like barracks. The proposed houses will be built upon lots about 16½ feet wide by 102 feet deep, thereby allowing for a front yard for flowers and a back yard for a vegetable garden and shed, the latter for the keeping of poultry or some domestic animal. The houses will contain five rooms. A parlor and kitchen will be on the first floor, the parlor containing a porcelain stove and heating pipes, and the kitchen a wash boiler and stove. The three bedrooms on the second floor will easily hold five or six persons and can be made to accommodate ten. In the largest an iron stove will be placed. A pump will provide water where the city water works do not extend to the house. The cost of such a house and lot, when a number are built at a time, will be between $850 and $950. It will rent for about $53 a year—that is, for the same price the workingman has to pay for two rooms in the barrack-like tenements of the large cities."

WILLIAM W. BOYINGTON, one of the oldest architects in Chicago, Ill., died October 16, in the eighty-first year of his age. He designed many well-known structures, and continued in active business until a few years ago, when advancing age compelled him to retire.

WHAT BUILDERS ARE DOING.

THE reports which have come to hand this month show that there is very little, if any, change in the building situation in the principal centers of the country. While architects are more or less engaged, the opinion seems to prevail among builders that very little new work will be commenced before the spring season opens. The talk is hopeful of better times and the situation would seem to be ripe for a considerable degree of activity in the early months of the new year.

Baltimore, Md.

Secretary E. D. Miller of the Builders' Exchange states that the feeling among the builders of that city is not very hopeful of any marked increase in the volume of business before the opening of next season. He says that a considerable amount of work is now under contract, most of which will be completed this fall. Indications point to a good spring business, and there seems every reason to hope that these indications are well founded.

It is estimated that the total amount of work done up to the close of this season will probably fall below that recorded in 1897, an appreciable falling off being observed in the suburban dwelling house districts.

The Master Plumbers' Association recently held their annual outing on the grounds of the Baltimore Pleasure Club, on the shores of Middle River.

Butte City, Mont.

The report of Building Inspector Kennelly for the month of August, which was issued recently, makes an excellent showing. There were 76 permits issued, the total estimated cost of the buildings being $123,380, for which the fees were $161.50. One building was to cost $20,000, 24 were in excess of $1000 each and 19 between $500 and $1000, the remainder of the permits being for repairs and additions. When it is understood that the estimate given the building inspector rarely if ever reaches the actual cost, it will be safe to say that the ultimate cost of those for which permits were issued will reach $150,000.

The strike against Contractor Whitehead, previously reported, has been abandoned, the Bricklayers' Union adopting a resolution rescinding its former objection to the use of non-union material in the building. The bricklayers, however, refuse to permit the employment of any non-union workmen, to which demand the contractor has acceded, and the work is progressing favorably.

Boston, Mass.

The total number of permits issued during the past two months shows a falling off from the number issued during the corresponding months of last year. It is estimated, however, that the approximate cost of the buildings to be erected will compare favorably with the reports of the same months in 1897. The amount of work now projected and in the hands of architects seems to give warrant for the belief that the opening of the coming season will show a satisfactory activity. Little expectation is felt that new work of any magnitude will be begun before snow flies. The majority of the new work recently undertaken has been in the residence portion of the city, a large number of apartment houses and dwellings of the better quality having been begun after the building season was well advanced.

It is expected that the new dry dock to be built by the Government at Charlestown will be begun as soon as possible. Indications point to the fact that the material of which the dock is to be built will probably be granite, although it is said that the matter has not been finally decided at this time. The new bathhouse built by the State on the Metropolitan Park reservation, at Revere, which was recently destroyed by fire, is to be immediately rebuilt.

Brooklyn, N. Y.

The feeling seems to be gaining ground, in spite of the isolated indications to the contrary, that the progress of arbitration as a means of settlement of all labor differences is unquestionably advancing. The action of the central organizations representing the various trade unions has been strongly tending to the adoption of some agreement between the workmen and employers which will prevent the possibility of the disastrous disturbances of the past. The better organization of the employers has made possible joint action and the establishment of agreements looking to the prevention of strikes, and the arrangement annually, or as often as may be necessary, of wage scales, working rules, &c.

Several small strikes have occurred during the past month as a result of the objection on the part of members of old established unions to work with the members of the new union recently established by the plasterers, and which, it is claimed, is not a regular union or entitled to recognition as such. The old plasterers' union has a membership of about 800 and is represented in the Board of Delegates. The new union is said to have been instigated by contractors who are at variance with the older unions.

The volume of business shows no noticeable change from last month and the appearances are still good that the season will close with a satisfactory degree of activity.

Chicago, Ill.

There is a feeling of uncertainty in Chicago as to the relations between employers and workmen during the coming season.

An agreement is reported between the Masons and Builders' Association and the Brick Manufacturers' Association through which it is claimed an attempt will be made to secure complete control of the business in which the two are interested, and it is because of this agreement that the workmen fear the combination may result in changes of the wage scale, &c.

The agreement mentioned provides that members of the two organizations shall deal only with each other, the purpose being to exclude all irresponsible contractors or dealers in masons' supplies. The two organizations state that it is their intention to work, so far as possible, in harmony with their employees, and an attempt will be made to extend the agreement which has existed for years between the masons and their workmen to the brick manufacturers and their workmen. This agreement calls for an annual adjustment of all questions between employers and workmen, and requires that no strike or lockout shall be permitted during the pendency of any question at issue between the two.

Among the new buildings planned and in early stages of erection are a ten-story structure for light manufacturing purposes, at 161 Market street, to cost about $60,000; a grain elevator, to cost $100,000, near the Belt Railway Company's yards, and a large number of small buildings for dwelling and store purposes in the suburban districts, to cost anywhere from $2000 to $7500. A large amount of improvements is contemplated by the city engineers' department, largely confined to bridges over the river and their approaches.

The Chicago Architects' Business Association have elected the following officers for the ensuing year:

President, Samuel A. Treat.
First vice-president, Normand S. Patton.
Second vice-president, George Beaumont.
Treasurer, O. H. Postle.
Secretary, Charles R. Adams.

The Board of Directors will be composed of William G. Barfield, Charles W. Nothnagel, F. W. Handy, George L. Harvey, J. C. Morrison and Martin Carr.

The Committee on Arbitration is as follows: W. Carbys Zimmerman, Edmund R. Krause, Samuel A. Treat, Charles R. Adams, Dankmar Adler, George Beaumont and Normand S. Patton.

The National Iron League, with headquarters in Chicago, held a meeting in Pittsburgh September 26 for the purpose of perfecting the organization.

The "smoker" given by the Builders' Club to the Chicago Architectural Club on the evening of September 28 proved a most pleasant occasion for all concerned. After an hour of sociability, a dinner was served in the club's banquet room. A short *post-prandial* programme followed, President D. V. Purington of the Builders' Club presiding. At the close of the dinner, the custom of the club of sending the flowers from the banquet table to sick members was followed, and this courtesy was also extended to the sick members of the visiting club.

New York City.

There is very little that is new to report in connection with building operations in the metropolitan district. In a large city like New York there is more or less work in progress all the year round, but just at present the greatest activity is in the districts lying above the Harlem River, in what is known under the new order of things as the Borough of Bronx.

Secretary Vaughan of the Mechanics and Traders' Exchange states that the general feeling prevailing among the members of the exchange in reference to the condition of the building business is that there will be little work of any magnitude undertaken during the remainder of this season. The feeling also prevails that the volume of business for 1898 will fall somewhat below that of the year previous. The prospect early in the season was indicative of a large amount of work, but the war talk and the war itself combined to cause many important contracts to be postponed. As a result, notwithstanding the erection of a number of large buildings in the lower portion of the city, the majority of the work has been confined to dwellings and apartment houses, warehouses and stores of the smaller sort. In view of the fact that many projected buildings were abandoned this year, and of the better feeling in general business circles, it is believed by members of the exchange that 1899 will be a very busy year.

As we go to press it is announced that all the unions affiliated with the Board of Walking Delegates have ratified the proposed agreement between the organization of employers known as the United Building Trades and the board, whereby sympathetic strikes are to be done away with and all questions in dispute settled by an arbitration board composed of an equal number of employers and employed.

At the regular annual meeting of the New York Lumber Trade Association, held on October 12, Charles L. Adams of Wilson, Adams & Co. was elected president for the ensuing year, Richard S. White of John C. Orr & Co. was chosen first vice-president, William P. Youngs second vice-president, Charles E. Pell treasurer and William R. Bell, Jr., secretary.

The trustees elected for three years were Charles A. Meigs, John H. Ireland, F. T. Reid, Leroy Clark, E. H. Ogden, Thomas Williams, A. J. Newton, Russell Johnson, John F. Steeve and F. W. Starr.

Pittsburgh, Pa.

J. A. A. Brown, superintendent of the Bureau of Building Inspection, has brought suit against David E. and W. G. Park, owners of the Park Building, he charging that the defendents have failed to comply with the law providing for safety appliances on elevators. The suit is brought under the act of May 2, 1895, which provides a penalty of $3 a day for such neglect.

Inspector Brown is also especially active in relation to the manner in which the reviewing stands erected for use during the Knights Templar conclave are constructed. The closest attention was paid to stands built by property owners on the line of parade and every precaution was taken to insure their perfect safety.

Pittsfield, Mass.

On the question of the construction of the contract between Hopkins & Roberts and the city of Pittsfield, involving about $20,000, a case is being tried before an arbitration committee at the time of this writing. The contractors are represented by Isaac N. Woodbury of Boston, of the firm of Woodbury & Leighton, and the city of Pittsfield by Mr. Palliser, a New York contractor, and these two have chosen Chas. A. Cowen, also of New York City, as a third. Probably a large number of experts in the various branches of building will be examined and the rights of the case are to be thoroughly sifted.

Scranton, Pa.

An unusual case, as to what constitutes the lowest responsible bidder in the eyes of the law, is undergoing trial at present in Scranton, Pa. This is a suit in equity brought by Eugene Taylor and Charles R. Burnett to enjoin the Winton School Board from accepting the highest bid on the erection of a new school house.

Collins & Brennan bid $10,815; Dunmore Lumber Company, $10,715; Peck Lumber Company, $8750. A majority of the board voted to award the contract to Collins & Brennan and that firm have had the foundation walls built. The complainants came to court and secured a preliminary injunction restraining the contractors from proceeding with the work and a rule on the board to show cause why it had not accepted the lowest bid. After a couple of weeks the board came into court and, admitting that it had not acted the part of wisdom, asked to have the injunction made permanent, and saying that it had rescinded its former action and awarded the contract to the Peck Lumber Company. After another couple of weeks the board rescinded its rescinding resolution and came into court again, asking to have the equity case reinstated, on the ground that its first action was within its jurisdiction to determine what should constitute the lowest responsible bidder. The case at this writing is in the hands of the judge.

San Francisco, Cal.

The building business in San Francisco still continues very dull, with little prospect of being enlivened during the remainder of the season. There are few contracts under way of any magnitude and no prospect of any large work being undertaken in the near future. It is, however, anticipated that the coming season will open much more actively that the present one has closed, and builders are, one and all, looking forward to a revival which shall correspond in volume to the general resumption of activity in other lines.

Washington, D. C.

A new ordinance has been introduced into the House, under the title of A Bill to Regulate the Hight of Buildings in the District of Columbia, under which it is proposed that no combustible and non-fire proof building intended to be used as a residence, apartment house or hotel shall be erected to the hight of more than five stories or exceeding 60 feet above the sidewalk. Buildings intended for business purposes solely may be erected to the hight of 75 feet without being of fire proof construction. All buildings, except churches, hereafter erected or altered, to exceed 75 feet in hight shall be fire proof or non-combustible, and of such materials throughout as may be prescribed by the Commissioners of the District of Columbia. No building shall be erected or altered on any street in the District of Columbia to exceed in hight above the sidewalk the width of the street in its front, and in no case shall a building exceed 90 feet in hight on a resident street nor 110 feet on a business street, as designated by schedule approved by the Commissioners of the District of Columbia, except on business streets and business avenues 160 feet wide, where a hight of not exceeding 130 feet may be allowed. The hight of buildings on corner lots shall in all cases be regulated by the limitations governing on the broader street; provided that spires, towers and domes may be erected to a greater hight than the limit herein prescribed when approved by the Commissioners of the District of Columbia. No wooden frame building hereafter erected or altered and intended to be used for human habitation shall exceed in hight three stories, or 40 feet to the roof. The hight of all buildings shall be measured from the level of the sidewalk opposite the middle front of the building; if the building have more than one front, the measurement shall be made upon the front facing the street of steepest grade. The limitations of hight herein prescribed shall not apply to Government and municipal buildings.

Notes.

A short time ago the Master Builders' Association of Kansas City, Mo., opened their new quarters in the Postal Building, at the corner of Eighth and Delaware streets, with a housewarming. B. F. Deatherage delivered an address on the lien law and short speeches were made by William Rose and W. W. Taylor.

LAW IN THE BUILDING TRADES.

WHAT CONSTITUTES USE OF PARTY WALL.

Under a party wall agreement one party was to be liable for half the cost of a wall built by the other whenever he built to such wall. He built a studded wall next to the party wall, touching it and cemented to it, to keep out the moisture. The court held that this constituted such a use of the walls as to make him liable under the agreement. Such an agreement also binds the purchaser of the property if he avails himself of its benefits.—Harris *vs.* Dozier, 72 Ill. App. Ct. Rep., 542.

LIABILITY ON TERMINATION OF INDEFINITE CONTRACT.

Where one had been engaged in furnishing labor and materials and in superintending work in the repairing and erection of buildings for another, under an arrangement for no definite period in the future, nor for the repair or erection of any particular buildings, he was entitled to maintain an action for what was due him, immediately on having elected to terminate such arrangement.—Quin *vs.* Bay State Dist. Co., Mass., 50 N. E. Rep., 637.

RISKS ASSUMED BY WORKMEN ON BUILDING.

The obligation of an employer to furnish safe places for his men to work upon does not impose upon him the duty of keeping a building which they are employed in erecting in a safe condition at every moment of their work. The hazard of working upon such a building is an ordinary hazard, incident to the employment, and therefore assumed by the employee.—Richardson *vs.* Anglo-Amer. Prov. Co., 72 Ill. App. Ct. Rep., 77.

WHAT SUB-CONTRACTOR MUST SHOW IN SUPPORT OF CLAIM.

A sub-contractor, in attempting to enforce a lien, must show that there was something due to the principal contractor at the time of filing the lien, or at the time he gave legal notice of his contract, or that thereafter a sum became due which would be applicable under the law to the payment of his debt to the claimant.—Madden *vs.* Lennon, 52 N. Y. Supp. Rep., 8.

ARCHITECT'S CERTIFICATE AND SUIT FOR DAMAGES.

A contract provided that on failure of the contractor to do any of the work required the other party should, upon the architect's certificate of such neglect, be at liberty to terminate the employment and complete the work himself; his expenses to be audited by the architect, whose certificate should be conclusive. The court held that an action for a breach of the contract and for expenses incurred for labor and materials furnished for same could not be maintained without the certificate of the architect, unless sufficient excuse for failure to procure same was shown.—Int. Cement Co. *vs.* Beifeld, Ill., 50 N. E. Rep., 716.

CONTRACT FOR CARPENTER WORK.

An agreement to do all the carpenter work of four houses for a specified sum, though the price for the work on each house be separately stated, is an entire contract, and a failure to complete either of the houses is a breach of the contract.—Broxton *vs.* Nelson, Ga., 30 S. E. Rep., 38.

LIQUIDATED DAMAGES AND PENALTIES.

A stipulation in a building contract providing that the contractor shall forfeit $10 for each day after a certain day that the building, contracted to be built for $6900, remains uncompleted, will be treated as a penalty, where there is a failure to show that any damages actually resulted from such delay.—Conneley *vs.* Priest, 72 Mo. App. Ct. Rep., 674.

NEED NOT FENCE TOPS OF PARTY WALLS.

An owner of premises partly covered by a building, and bounded by party walls, is under no obligation to fence the top of the party walls so as to prevent persons who may be on the roof of adjoining buildings from falling over into his yard.—Woods *vs.* Miller, 52 N. Y. Supp. Rep., 217.

RIGHT IN WALL ACQUIRED BY USE.

Where a wall is built as part of a house, and used for over 20 years by the owner, the subsequent use of the wall by the owner of an adjoining lot will not deprive the original owner of the possession of same, although such use may entitle the adjoining owner to an easement.—Pearsall *vs.* Westcott, 51 N. Y. Supp. Rep., 663.

RECOVERY FOR HEATING APPARATUS.

In an action on a contract to furnish heating apparatus, a recovery may be had if there has been a substantial compliance with the terms of the contract, less damages requisite to indemnify the other party for failure to fully comply with same.—Shepard *vs.* Mills, Ill., 50 N. E. Rep., 709.

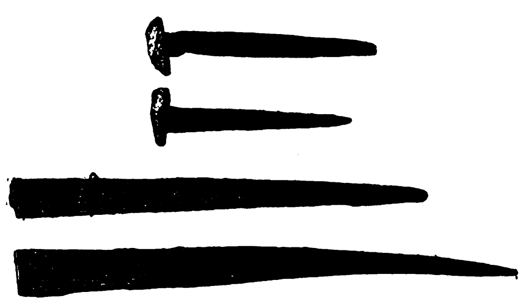
CORRESPONDENCE.

Creosote as a Paint and Wood Preservative.

From PROSPECTIVE HOME BUILDER, *Troy, N. Y.*—Will some of the readers tell me how to use creosote as a floor paint, and how it is employed to preserve the wood and prevent dampness?

Nails of Our Forefathers.

From F. K. THOMSON, *Raleigh, N. C.*—The writer has just had the opportunity of watching the demolition of a very old residence in this city. The exact age of the building could not be learned, but it is considerably over the century and a quarter mark. The sills of the building were 14 x 14, the corner posts 5½ x 14, and the braces 5½ x 10 inches, framed into the posts and sills, drawbored and pinned. The studs were also mortised into the sills and plate, and the lookouts to support the cornice were mortised into the plate and pinned. The nails used were all hand made of various sizes. The feature, however, that struck me most forcibly as being unusual was the hand made lath nails used in fastening the hand split lath to the studding. I inclose a couple of these nails, thinking they may interest some of the readers as being a relic of the past in this direction. I also send a couple of the larger hand made nails used in the same building as being of equal interest.



Some Nails of Our Forefathers.

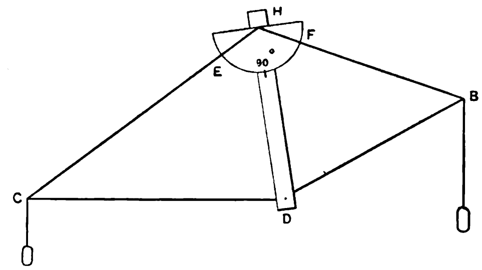
Note.—We have made drawings of the nails submitted by our correspondent and reproduce them herewith full size. It is of course impossible to indicate the effect which has been produced upon them by their long use, but it may be interesting to state that the lath nails, which are the shorter, show scarcely any traces of rust, and are practically as good as the day they were made. The larger nails, which are without heads, have a very slight coating of rust extending down to within ½ or ¾ inch from the point. To the older generation of readers these nails may not appear unusual, but to the younger readers we have no doubt they possess points of curious interest.

Covering Shingles with Galvanized Iron.

From G. J. M., *Ontario.*—Knowing that the paper takes a strong interest in answering all questions addressed to it, I take the liberty of asking for information on the subject of covering a cottage roof with galvanized iron, which has been already shingled and which is leaking badly. The house is 40 x 46 feet, with a deck 10 x 20 The deck is already covered with galvanized iron.

Truss for Dredge Boat Crane.

From B. B., *Perth Amboy.*—I inclose herewith a sketch showing a method of solving the problem presented by "F. O." in the issue of the paper for October. Using a board as the basis upon which to construct the device, draw the lines C D and D B, representing the required position of portions of the crane. At the points C and B stick two pins and at the point D affix, by means of another pin, a movable piece, as D H, representing the truss. Now at the top of this piece and at the point H attach a protractor so that its center line will correspond with the center line of the piece D H. At the point H attach to a pin two cords which pass over the pins at C and B, having at their ends small weights attached for the purpose of keeping the cords taut. The movable piece D H may now be moved to the right or to the left until the cords indicate the same number of degrees on either side of the figure 90, as shown at E and F. The



Truss for Dredge Boat Crane.

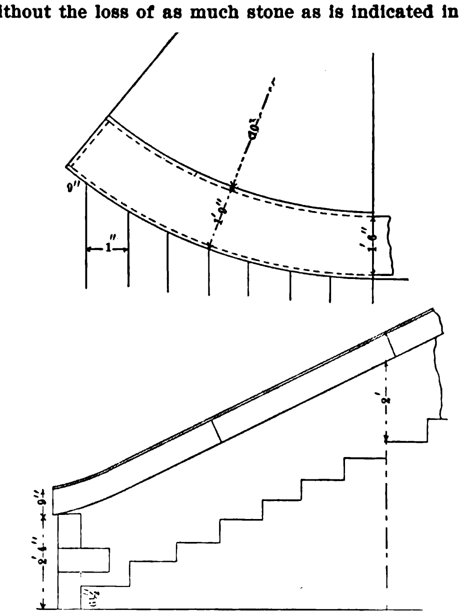
piece D H will then represent the angle at which to place the truss frame. This model may be constructed to a convenient scale, as one-quarter or one-eighth full size, the distances D C, D B and D H representing the respective proportions of the crane to the assumed scale.

Sheet Metal Roofs in Hot Climates.

From R. P. S., *Texas.*—I would like to inquire through the columns of the paper if there is any way of preventing a metal roof from heating a room below. The heat produced from metal roofs is a great drawback to their use in this climate.

Pattern for Stone Coping.

From J. K. A., *Phoenix, Ariz.*—Will some reader of the paper show me how to make the pattern to work the stone coping shown in the accompanying sketches without the loss of as much stone as is indicated in the



Pattern for Stone Coping.

sketch presented on page 312 of the issue of the paper for December, 1895?

Constructing a Fluted Column.

From M. S. H., *Canton, Miss.*—Please publish the following inquiry in the next issue of *Carpentry and Building:* What is the best and most substantial manner of constructing a fluted column 30 inches in diameter and 20 feet high, to be made of plaster or cement on a wooden frame work? What is the best plaster to use, the best lath—metal or wood—and what is the best manner of applying the plaster ?

Suggestions for a Roof Plan.

From DOWN EAST, *Maine.*—I inclose floor plans for a six-room house possessing some interesting features of arrangement. I would like suggestions as to the method of putting on a good steep roof, and one that will give two fair sized chambers in the attic. I am not a carpenter, mason or builder—simply a man who has hopes of a home for himself. If you see fit to publish these plans do not give my name and address, but credit them to a man down in Maine who is building air castles.

Placing Sheathing Boards.

From T. T. C., *Dubuque, Iowa.*—I would say in reply to the correspondent who raises the question that the best method of placing sheathing boards is illustrated in Fig. 2 on page 171 of the July number of *Carpentry and Building:* The plumb joint shown in Fig. 1 will not, in my opinion, strengthen the frame as much as in Fig. 2. I should prefer the boards put on diagonally with joints well broken. This opinion is based on the assumption that the building is placed on a continuous wall. If placed on piers and posts, as is often the case in summer cottages, sheathing placed as in Fig. 1, with joint in the center between piers, would be the better method, as it would then act as a brace and stiffen the walls of the frame work.

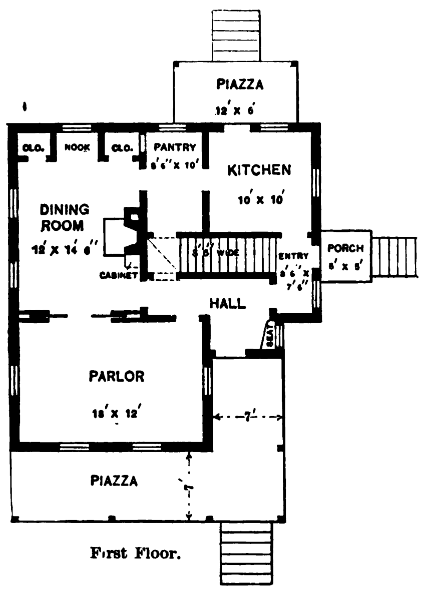
From GEORGE H. WOLFE, *San Francisco, Cal.*—In the issue for July two sketches are published showing different ways in which sheathing boards are nailed to a building, and the correspondent requests answers as to which is the better method of using. San Francisco is pre-eminently a city of wooden houses, there being more buildings constructed of wood here than in any other city of equal size in the United States. We do not use here the word "sheathing," but instead we say "diagonal boarding." I think the second method shown is decidedly the one to be preferred. Start the diagonal boarding at the lower corner at an angle of 45 degrees. All the boarding on that side should be parallel with the start. The main thing about diagonal boarding is to thoroughly nail at every stud, taking care also to cut out all knot holes. More diagonal boarding is used in this city than in any other on the coast, hence my remarks are made from personal observation extending over a period of nearly 50 years in San Francisco.

From J. W. T., *Siloam Springs, Ark.*—I think the method of placing sheathing boards shown in Fig. 2 of the July issue is much to be preferred as regards strength.

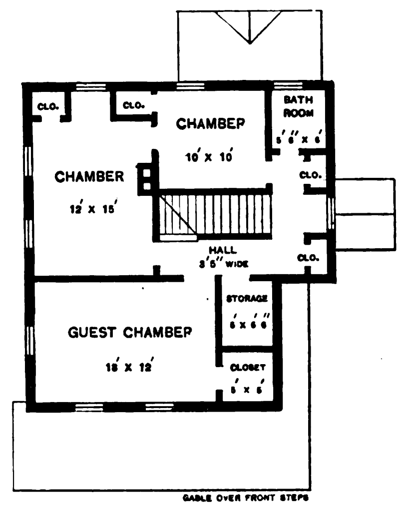
From C. J. S., *Oakland, Cal.*—Regarding the inquiry relative to diagonal sheathing, I agree with the idea shown in sketch No. 2 of the July issue. I believe the bracing power to be about the same as that shown in sketch No. 1, and I also claim a great saving of time, which is quite essential in these days of competition.

From J. P. B., *Princeton, Ill.*—In answer to the inquiry of "L. E. P.," in the July number, I would say that it depends much on the location of the openings, shape of building, &c., how the sheathing should be placed. For a building with one opening the method shown in Fig. 2 in that issue is the better, as there are more long boards to act as ties or braces. Unless there is a heavy stud in the center where the boards meet there will not be stuff enough to firmly hold the nails in the method shown in Fig. 1. If the window is in the second story with a large opening underneath style No. 1 would show the better way of supporting the wall above and of preventing unequal settlement. While placing sheathing on a building diagonally is a very good way where there are few openings, ordinarily I do not favor it, nor do I see any advantage in so placing it, as the lumber is cut to pieces so much more by the openings that it does not serve as well for a tie or a support as when put on horizontally. In many cases it makes a much weaker building to use the sheathing diagonally. If braces are needed to support the walls or to stiffen the building, put them on separately. Again, cutting lumber on a miter is a wasteful plan of using it, and one that makes extra work, besides the nails used to fasten the points on each board are liable to split them and not hold. For a very little extra expense a building can be sheathed on the inside with a cheap grade of lumber, and thus add greatly to the stiffness and warmth of the walls. When furred with lath and plaster this inside sheathing makes a solid wall inside as well as out. I often find that a very good way, and a cheap one, to truss a partition is to sheathe it diagonally.

From H. C. V., *Monroe, La.*—As to the best method of applying sheathing boards on the side of a building, I



First Floor.



Second Floor.

Scale, 1-16 Inch to the Foot.

Suggestions for a Roof Plan.

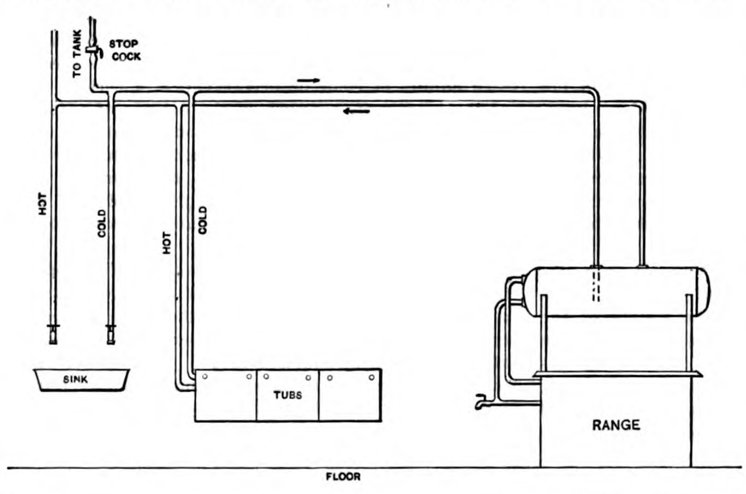
think the scheme presented in Fig. 2 of July issue is perhaps a little the stronger, for the reason that it forms a longer tension brace, and if well nailed on every stud it crosses will form a crowding brace as well. I do not, however, think it a matter worth much argument, as either way is amply strong to brace the building, provided the boards are well nailed to the studding.

From F. L. W., *Washington, D. C.*—I think the method shown in Fig. 2 of the July number illustrates the better scheme of placing sheathing boards on a building, for the reason that the sheathing put on in this manner forms a better and stronger tie for the frame, and also acts as a brace equal to Fig. 1, while the extra labor and waste of material would at the same time count against the latter. These are the reasons which practical men will appreciate, I think.

Remodeling Defective Plumbing.

From J. C. M., Parsons, Kan.—In reply to "H. C. T.," Piermont, N. Y., who stated that he remodeled the defective plumbing by simply changing the pipes, and in quired if there is any better way, I would suggest that the pipes all be carried to the ceiling, as shown in the sketch herewith, so there will be no danger of them freez ing, and they will be less liable to give trouble from becoming air bound. Putting the pipes under the floor might prove satisfactory in Texas or some other warm climate. With the work as now arranged, if he wanted to shut off the water at the tank on a cold winter night he could not empty the pipes, and they would freeze if not well protected.

From EICKY, Woodstock, Ill.—In the September issue of the paper "H. C. T." of Piermont. N. Y., shows some sketches of remodeled plumbing. I think some small points have escaped his attention. A stop cock is shown on the supply to the boiler. Suppose some one closed this stop when there is fire in the range and all of the hot water faucets are closed—what then? The heat goes on—no safety outlet for increased pressure. Something must give soon, then—— ?—and a job for another plumber. I would suggest that he use a stop and waste with drip tube, which will allow the steam to escape through the vent hole in the boiler tube, or extend hot water outlet on

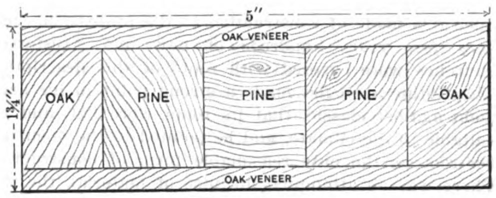


Remodeling Defective Plumbing.—Sketch Submitted by "J. C. M."

top of range boiler to a point above the water supply in the tank. It is better to carry it over the tank, then it will not drip into the wrong place. This last method also insures against that sudden puff of steam collected in the top of the boiler which is so common soon after opening hot water faucets. The cold water pipe from boiler to range should be extended inside of the boiler with a bent tube which should reach nearly to the bottom, thus giving the range a chance to heat all of the water in the boiler. In draining the boiler it will also serve to siphon out most of the water which lies below that opening. There should be openings in both the hot and cold water pipes under the floor so that the system can be completely drained if desired.

Construction of Veneered Doors.

From IGNO RAMUS, *Lafayette, Ind.*—In looking over some of the back issues of the paper I notice in the March number that "W. T. Davies" of Somerville, Mass., asks for a method of making veneered doors, and as being of possible benefit to him and others I offer a few suggestions: In order to make a good veneered door



Construction of Veneered Doors.

which will not warp it is first necessary to glue up a core, which will be the foundation for the veneers. Use white pine for the cores and let it be well seasoned. The quality need not be the best, as common pine will do. In making cores proceed in the following manner: Rip ⅞-inch pine into strips 1½ inches wide and glue enough of them together to form the width of stile or rail. The outside strips will have to be of the same wood as the veneers, unless the doors are to be flush molded, in which case the outside edges of the stiles only need be the same as the veneers. After the glue has become hardened take the cores to the wood worker and face and join them. Next take them to the planer and run them to 1¼ inches thick, though perhaps it would be better to rip the stuff 1⅝ inches wide, leaving ⅜ inch to work on, for these cores must be perfectly straight and out of wind. If proper care is taken when gluing up they can be kept pretty straight so that less timber will do to work on. Make veneers 5-16 inch thick, and glue on before framing the door, because it is much easier to lay the veneers on the stiles and rails than it would be after the door was put together. Having followed the directions thus far the stuff will now be 1⅞ inches thick, giving ⅛ inch to work on. Take the stuff to the wood worker once more and take off a light cut to remove all defects. Join one edge and rip to the proper width. Also dress to 1¾ inches thick, leaving the veneers about ¼ inch thick. For making a thicker or thinner door enlarge or reduce the core as circumstances require. The accompanying sketch represents a section of the stile of a door, which will help to explain my meaning. This shows three pine and two oak strips, but it might be better to use four pine and two oak, all ⅞ inch thick, for a 5-inch stile. The writer of this has been engaged in planing mill work for the last 15 years, and this is the method used in making veneered doors for the market.

DECORATION OF OPEN TIMBER ROOFS.

FASHIONS in architecture have generally been a series of reactions, more or less violent, according to the extravagant lengths to which their abettors have gone. In one direction alone—that of roof design—we have a singular instance of reactionary taste. In the earlier days of the Gothic revival, which many of our readers remember, says a writer in the *Building News*, the timber and plaster imitation groined roof held for a time a supremacy; but it was quickly followed by what was known as the "open timber roof"—a modern imitation of the old mediæval roof. The late R. & J. A. Brandon's work on the "Open Timber Roofs of the Middle Ages," first published about 1849, increased the fervor for this form of roof, if it did not really introduce this mode of construction to the profession. In a very few years hundreds of new and "restored" churches were covered with roofs of this description. The Gothic apologist made a strong point in his argument against classic, that its roofs were flat, and unsuitable to the climate, and he pointed to the open timber roof as the only reasonable form of construction. There was no attempted disguise of material, the timbers were visible and honestly framed, the high pitch gave hight and imparted an ecclesiastical appearance, which no flat roof could give. As usual with extremists, the open timber roof designer carried it too far. Architects vied with one another in trying to make the framing more complex and elaborate; they introduced "notches," "stopped chamfers," open tracery filling in and other kinds of detail. Every pair of principal rafters repeated the same design of framing, or they varied alternately. Looking upward into a high pitched roof of this sort was like looking into a dark cavern of timber—a perplexing mass of collars, struts and braces. And the cost of a roof of framed principals was a considerable item in the expenditure of a church. Not only were roofs of churches in the Anglican Communion so treated, but every dissenting chapel in the country was roofed on the same principle, and the wider the span the more complex was the framing or trussing. As was to be expected, the scantlings of the timbers in many buildings became reduced in size and a pinched, starved appearance was presented by many roofs whenever the architect or contractor found it necessary to cut down the cost of the work. Other objections made themselves apparent. Where there were no direct tie beams the rafters tended to spread from the collar downward, sometimes thrusting out the walls, or when there were braces across the angles between collar and rafter an injurious strain would be created on the tenon or connection of principal rafter and brace. The collar and brace roof is a common type; so is the cross braced truss.

Why Roofs Failed.

Many of the hammer beam roofs of this class failed from the want of thick walls and the weight of the roof bearing upon the end of the hammer beam. As a matter of fact, the designers of modern open timber roofs tried to give the appearance of the ancient examples, but with less ample means for obtaining strength and stability. The walls were generally too thin to use double wall plates. The latter when used were not strutted or trussed, as in the old examples, from the feet of the principals to the center of bay so as to form one horizontal plate to resist the rafters' feet. Curved or ornamental braces were introduced again, where straight braces would have been stronger. Thus a very usual type of roof truss is one in which the collar, principal rafters and hammer beams are framed with curved braces suitable only for small spans. Such trusses ought not to be too far apart, and the older examples of them to be found in Norfolk and Suffolk are generally not more than 20 feet in span, and are spaced often at less distance than 10 feet.

The hammer beam roof was at one time a very favorite form; it could be made ornamental, and the old examples of Norfolk, like those of Trunch and Wymondham, supplied models. In these double framed roofs the rafters were framed into the purlins, which, in turn, were framed into the principal rafters. Some have collar beams stiffened by curved braces above; others have no collars, but the roof is framed with curved braces tenoned into the hammer beams and principals. These curved braces keep to a certain extent the principals together and act as an indirect tie to them. A more elaborate class have all these members—collars, struts and hammer beams—connected by curved braces. The ecclesiastical architect and builder delighted to use them, as they gave an enriched and decorative look to the interior. But the number of joints and the want of a direct tie made them costly and not always safe roofs, and in several cases iron tie rods were introduced between the hammer beams. After the elaborate framed principal or truss a less expensive and plainer type of roof followed, in which the curved rib or brace took the place of the hammer beams and curved struts and braces. To the introduction of French Gothic we, no doubt, owed this change. In many of these a wooden tie beam carried a king post, a very usual type of roof in France during the Middle Ages, in which collars and braces were used, and sometimes stirrup pieces. Viollet le Duc illustrates several examples of these cradle roofs. Semicircular ribs connected with the principal rafters are boarded internally and form a wagon shaped vault, which assists sound and avoids the defects of the acutely pointed roofs as an internal covering. Various kinds of polygonal barrel roofs, boarded underneath, or with arched principals, are to be noticed, and these have continued to the present time. Their boarded surfaces are often divided by molded ribs into panels.

Polygonal Barrel Roofs.

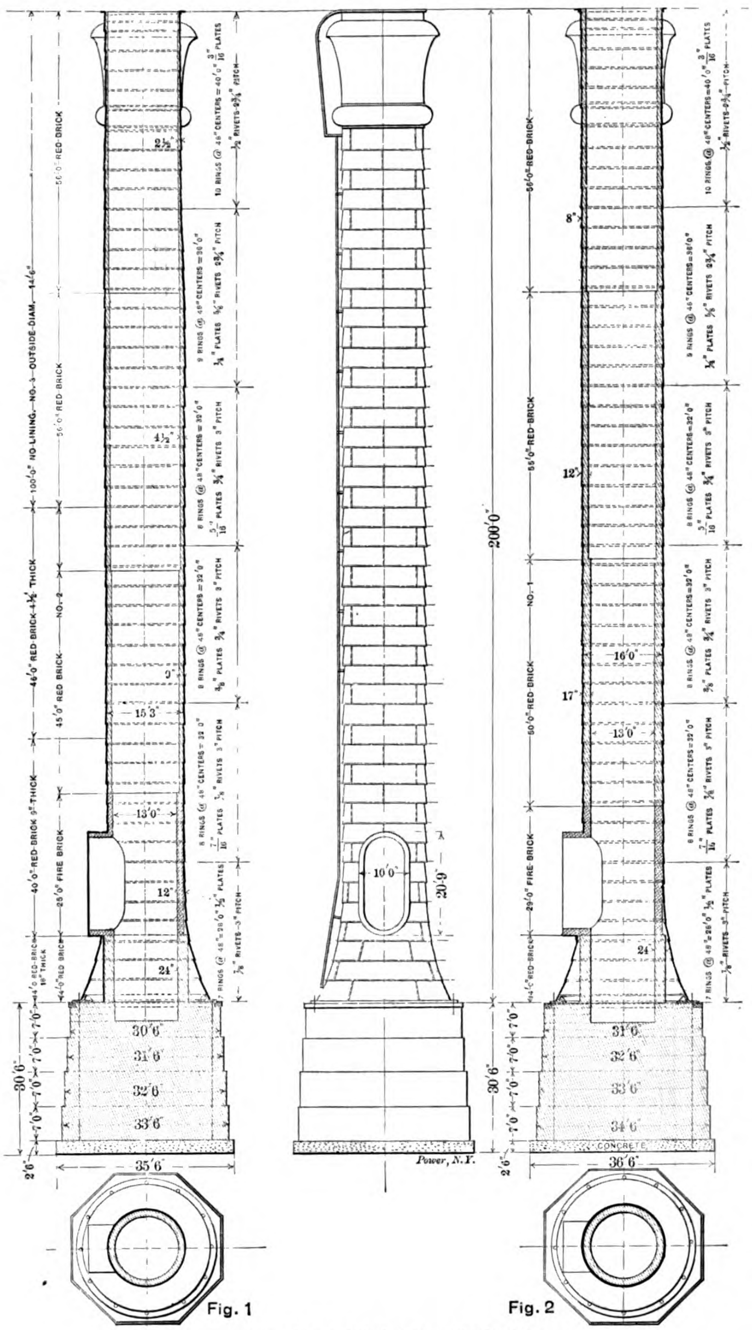
The construction is simple; the principals are framed with collars and braces, or diagonal braces, which cut off the upper angle of the roof. In many recent churches the boarded vault, whether barrel shaped or polygonal, has a tie beam at the springing, and often a post at the center, as in the French roof. Occasionally the vault is plastered. The merits of this form of construction are many. 1, The boarded or plastered vault prevents the loss of sound upward, and its resonant qualities are helpful; 2, the boarded or plastered surface admits of color or decoration; 3, a serious defect of the open roof, boarded on the outside of rafters, is obviated; we mean the condensation of moisture during the winter months or when a sudden change of temperature occurs. The slates are fixed on the rough boards placed on the rafters, through the joints of which the condensed vapor from the slates trickles down or falls in drops.

The question of the treatment or decoration of roofs is a large and interesting one, and we have witnessed a few changes in taste. When the open timber roof craze was at its hight the timbers were universally stained and varnished underneath. The darker shades of staining produced a gloomy and dark effect in the building; even the light varnished roof got dark in course of time. These dark stained rafters plastered between were certainly not decorative, and had a gridiron look about them. Roofs are now seldom stained and varnished in this fashion.

A revolution in taste has, happily, set in, and architects have learned that all wall and plain roof surfaces, whether boarded or plastered, are intended for decoration. But very little has yet been done to our roofs. It is true we have a few successful examples of painting or distemper decoration; but a large number of our finest halls and churches are still destitute of any scheme of decoration. In, we believe, a few cases the mural and roof decoration in the panels has been done in thick linoleum, or some similar material, and fixed by a damp proof process. The boarded vault divided by arched principals, often supported by marble shafts with molded caps and bases, is almost absurd without some sort of decoration or scheme of color.

BRICK VERSUS STEEL CHIMNEYS.

SOME very interesting particulars bearing upon the comparative cost of brick and steel chimneys are contained in an article contributed to a recent issue of *Power*, by W. E. Crane, and from which we take the following: In the erection of chimneys two objects are in view. One, to produce a sufficient draft to consume the necessary amount of fuel, and the other to carry the products of combustion so high that they will be thoroughly diluted before being brought low enough to breathe. A short chimney is a very unhygienic thing and should never be allowed near where people live or work. In the construction of chimneys cost enters largely into account, and the first cost is liable to be scrutinized more than the durability. In the illustrations, Fig. 1 is a steel stack with a very thin lining. It is so thin that the expansion, contraction and the swaying of the stack would throw down the lining in a short time. It would not pay to put such a lining in. Fig. 2 has a durable lining, but it is expensive. These stacks are built of the same thickness of metal and are as light as should be built for self supporting metal stacks. The brick chimney, Fig. 3, is an illustration of putting up a chimney with a minimum number of bricks and yet an exceedingly stiff and stanch structure. A chimney like this, built of good brick and mortar, will sway very little in high winds and will last for generations. The base being nearly the same in the three, the foundations would be practically the same. When the bids came in, Fig. 1 and the brick chimney were nearly identical in price; Fig. 2 was about $1000 higher. It would please the eye better to put in a ring in the small part of the chimney, but this would catch rain and snow and for utility is better left off. Advocates of steel stacks claim there is a better draft owing to tightness in a steel structure, but if you should calk all the joints so as to make this sure it would add greatly to the expense. Until joints are calked steel stacks will leak unless the brick lining is tight. Where you have a middle core in a brick chimney there may be some infiltration of air through the outside, but this will go up through the space between the outer and inner shells. The inner shell should be laid up with lime mortar, and the outside should be a mixture of lime and cement, or all cement. Care should be used that the top is covered securely so that the weather is kept entirely from the masonry. A lead cap with joints burned together makes a thoroughly tight cover. It is not every locality that has a competent lead burner, and in such places a cast iron cap must be used. It should be bolted together with copper bolts, as wrought iron bolts will last but a few years. It is also a good idea to put in wrought iron rings at intervals, and these rings should always be put in top and bottom of flue opening and top of chimney. Fig. 4 shows the remaining portion of an 18 inch x 60 foot stack of No. 8 metal. This stack was put up four years ago on a boiler that heats a car barn in winter. It is not used in summer. This stack now consists of a cylinder of oxide of iron with its outside coat of paint. The upper portion was blown down this summer. This is the usual fate of thin stacks in a few years, and they can be seen in various places most any time. Usually, however, they have to be replaced as soon as possible.



Comparative Cost of Brick and Steel Chimneys.

IT is stated that as a direct result of the opening of a warehouse at Caracas, Venezuela, by the National Association of Manufacturers, orders have been received in Philadelphia for the erection of three dwellings at

Masuto, a suburban resort of Caracas, located on the coast. Nilson Bros., architects, are working on the plans for the buildings, one of which is for President Andrade, and which, when completed, will probably be the most palatial in the Republic. Both of the others are for President Andrade's ministers.

The Advance in Sanitation and Ventilation.

We print below the report of Committee on Sanitation of the American Public Health Association, with special reference to drainage, plumbing and ventilation of public and private buildings, presented by J. W. Hughes, chairman of the committee:

From such information as has been obtainable from the large field covered by your committee we are justified in reporting an increased interest in all matters relating to what may be termed practical sanitation, or the carrying out in actual work of the theories and plans of the advanced thinkers and experimenters in sanitary science. The work of our association and kindred organizations, as well as the untiring efforts of individual sanitarians, in the past has resulted in awakening an active inquiry and interest, and there is no longer heard the scoffing remark and sneering insinuation when an improvement is suggested that involves a pecuniary outlay. This is especially noticeable in the plumbing department of our work. We are of opinion that there is a tendency in some cases to rush from an extreme apathy and do-nothing policy to one of too great an elaboration and complication; in the carrying out and planning of plumbing apparatus, safety, effectiveness, simplicity are the requirements.

Sewers, public and private, are to-day better constructed and more carefully planned than in the past, but the question of the best method for the disposal of sewage has yet to be solved and is becoming of more pressing importance every day. That our great towns and other centers of population cannot continue to use the rivers and streams as public sewers without serious danger to the public health goes without saying. We are pleased to note an increased and practical interest in the question of the disposal of sewage by means of irrigation farms and other plans than that of running it into the streams.

The ventilation of public buildings is receiving the attention that its importance merits. The introduction of the power fan combined with the development of cheap electrical force has opened up a large field of possibilities. Whether the effectual ventilation of private buildings and dwellings will receive its solution from this source is a question. The greatest objection to the introduction of a system of ventilation into a private building that will at all approach the necessities of the case, especially in northern climates, is the greatly increased cost of fuel. Fresh air cannot be introduced, warmed and expelled at the rate required for an apparatus that will be even approximately effective, without a largely increased fuel bill. The question of effective and economical ventilation of dwellings is one presenting many difficulties and large profits to the inventor who can solve it.

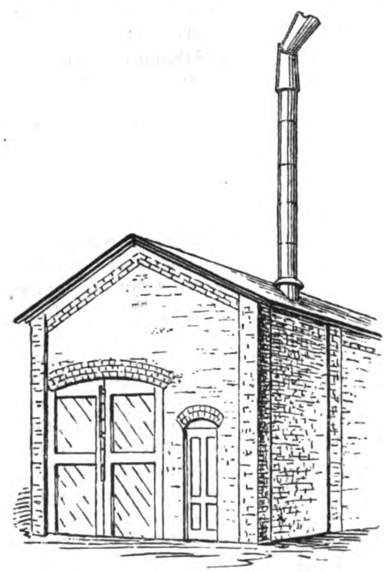


Fig 4.

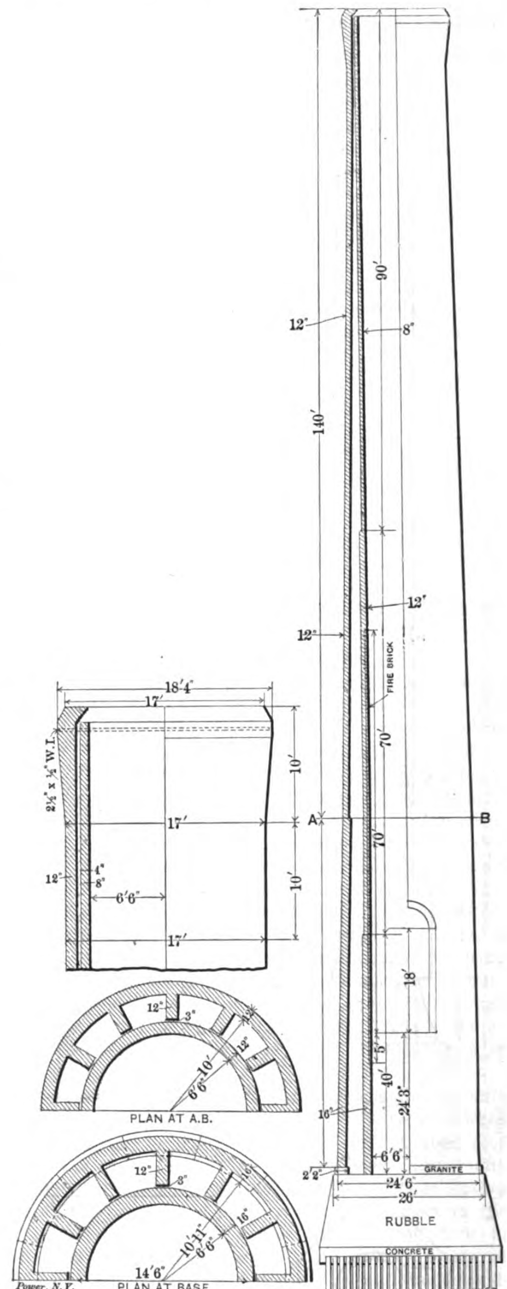


Fig. 3 LOAD ON PILES=2500 TONS

Comparative Cost of Brick and Steel Chimneys.

An Ingenious Method of Marking Level Glasses.

Some men will see the laws of nature working in a way they did not expect, will study the case and make useful application of what they have learned. It is when these instances are so simple as to be apparently insignificant that they are the most certain to be ignored entirely. A clap of thunder impresses all men, but the falling drop of water dreamed of by Watts resulted in the revolution of the shot industry. That many men will see, while few will apply, is a universal law.

The marking of the glasses of carpenters' levels and similar tools is a simple operation, consisting merely of a scratch on the surface of the glass. This method has its drawbacks, the principal one of which is that the minute grooves cut in the glass materially weaken it and render it more liable to fracture. This difficulty has been entirely overcome by the process of marking in vogue in the works of the Stanley Rule & Level Company, at New Britain, Conn. In fact, the glass at the groove has been so strengthened that it will break first at some other point. In addition, the line is absolutely indelible and permanent, and is sharp and well defined. The process consists in fusing the glass at the mark and incorporating with it minute particles of metal which color the line. The metal is imbedded in and inclosed by the glass, which effectually protects it. How this is accomplished is wonderful in its simplicity.

The machine for doing the work is shown in the first engraving. It consists of a cast iron base upon which are formed heavy supports carrying the table and bearings for the shaft. Upon one end of the shaft is mounted a cast iron disk, the face of which is formed with a V-shaped projection, as indicated in Fig. 2, which is about twice the thickness of the disk. By means of the thumb nuts shown the table can be adjusted toward or from the disk. Upon the top of the table are two standards, upon which the level glass is placed, one end of the glass abutting against an adjustable stop. The glasses are all curved slightly in the direction of their length. The operator places the glass upon the standards and turns it with his thumb and finger. As the glass is turned its bulged portion comes in contact with the edge of the ridge on the face of the disk. As the wheel in 6 inches in diameter and revolves at 2500 revolutions per minute, the frictional heat generated is sufficient to partially fuse the glass at the point of contact with the wheel, and in this fused portion fine particles of iron, given off by the wheel, are imbedded. A microscopical examination of the line proves this to be true. An actual mechanical union of the iron and glass is the result. While to the naked eye the line appears clean and sharp, under the microscope it presents a ragged and mottled appearance, which will be perceived in Fig. 3, which is a portion of the line magnified about 50 times. The particles of metal appear to be deposited in longitudinal lines. The wave effect is probably produced by slight vibration.

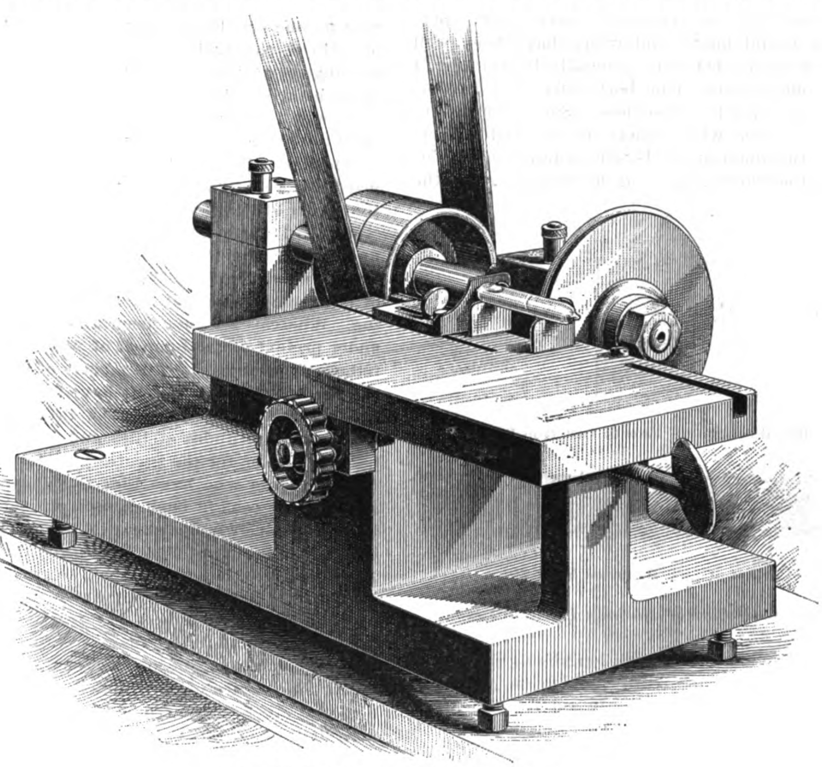


Fig. 1.—Machine for Marking the Glasses.

An Ingenious Method of Marking Level Glasses.

This method of marking is due to the fact that a man saw an operation which resulted in the opposite from what he expected. Instead of passing over the incident as being too trivial to be of any moment, he examined it with care, experimented, and finally developed the process just described. It was another instance of a falling drop of water revolutionizing a method of manufacture.

Justus A. Traut, who is connected with the Stanley Rule & Level Company, one day wanted to illustrate his remarks with a short piece of glass tubing. Not having a file or other implement for scratching the tube at the point at which he wished it to break, he held it against the cone of a lathe near which he was standing, trusting that the edge of the cone would scratch the glass sufficiently. The glass was marked, as expected, where it touched the iron, but when he broke the tube the fracture was not along the mark, but some little distance from it. The tube had been marked, but certainly had not been weakened at the mark. Here was the germ of the idea which resulted in the new process. Experiments were made with wheels of different metals and alloys, run at various speeds, to find the best suited to the purpose. Steel, copper, brass and bronze would not work at all, and the wheels now used are of the same material as the lathe cone—cast iron.

Construction of Veneered Doors.

In view of the discussion which has been started in the Correspondence department relative to the construction of veneered doors, the following description taken from the *Canadian Architect and Builder* may not be without interest:

Visiting a large wood working factory some time ago in New Haven, Conn., where veneered doors are made in large quantities, I interviewed the foreman with regard to the method of manufacture of these doors, and this is substantially what he said: "Our first operation is to take common coarse white pine boards, with sound knots, and which have been well kiln dried, the stock used being generally 16 feet long, 1 x 12 inches, and surface it on both sides by a Daniels planer without regard to thickness. Some boards are thinner than others, while others are warped in drying, and the thickness of the boards is immaterial, perfectly seamed surfaces only being necessary. After the

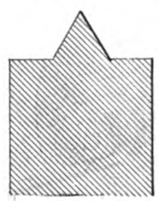


Fig. 2.—Radial Section of Face of Cast Iron Wheel.

Fig. 3.—Portion of Line Magnified Fifty Times.

An Ingenious Method of Marking Level Glasses.

stock is planed it is cut into such lengths as the bill of doors calls for. They are ready now to be glued up. The face board, of whatever hardwood is to be used, is planed generally to ¾ inch thick, and is also run through a Daniels planer. The stock is now ready to go to the gluing press, and as the Daniels planer makes the best gluing surface in the world no scratch planing is needed. After properly heating in a box the stock is brought out and carefully glued, the hardwood face parts being marked for it. From three to five parts are put in the press at one time, and a pressure of 20 tons, brought down by screws, is put upon these parts. After remaining in the press the proper time they are taken out, and generally remain several days before being worked up, which gives the glue plenty of time to harden. When ready to work again these parts are taken to a Daniels planer and squared up, after which the parts are taken to a very nice cutting table or bench saw, and are cut up to sizes required, leaving them ⅛ inch large for future dressing. It is a positive necessity that the saw cuts free and clear, as heating has a tendency to warp the stock or spring it slightly, which would make it necessary to dress the stuff again. If the saw does not heat, the stiles come out perfectly straight, and these stiles can be laid on a Daniels planer bed and a light shaving taken off. They are now straight, and if the saw table is in good condition, square, the other side may be finished with pony planer or with a Daniels. I prefer a Daniels, because it makes a better gluing surface. The work is now ready for the veneering, the thickness of which is immaterial, as it may vary from the thickness of thin paper to ¼ inch. Heated cauls are now used for the veneer, and the stiles, if heated at all, are just warmed and the veneer glued on by piling up with a hot caul between each stile. The old fashioned way of making veneered doors may do very well when only two or three doors are to be made, but in these days of sharp competition we are obliged to adopt the quickest methods compatible with efficiency and good finish. I may say we never make less than 50 doors at a time."

Wages in Olden Times.

In Riley's "Memorials of London" it is recorded that by the regulations as to wages and prices in the city made in the time of Edward III, A.D. 1350, it was ordained that the tilers should take for the working day, from the Feast of Easter to St. Michael, 5½ pence, and from the Feast of St. Michael to Easter, 4½ pence. Also that no one should pay more to the workman aforesaid on pain of paying 40 shilings to the Commonalty without any release therefrom, "and he who shall take more than the above shall go to prison for forty days."

It was further ordained "that the thousand of tiles shall be sold for 5s. at the very highest."

The following royal order made in the time of Edward III, A. D. 1362, regarding materials for roofing and the wages of tilers, will likewise be of interest:

Edward by the grace of God, &c., to our well beloved and trusty John Peeche, Mayor, and Thomas de Lodelowe, Recorder, of our City of London, and the Sheriffs of the same city and of the County of Middlesex, greeting. Whereas we have been given to understand that under pretext of the tempest of wind, which has of late unhappily occurred in divers parts of our realm, by reason whereof many buildings have been leveled with the ground, and many dilapidated, broken, and damaged, and great multitudes of tiles and other coverings have been wholly or for the greater part torn from the roofs thereof; those who have tiles to sell, and other things suitable for roofing such houses, do sell the same entirely at their own pleasure, at a much higher price than heretofore they were wont to do; and that the tilers and other roofers of buildings, seeing so great an urgency for persons of their calling, hesitate to follow their trade, or to do any work, unless they receive excessive wages for the same, and in like manner refuse, to the no small loss and grievance of our commonwealth; by reason thereof, by advice of our Council, we have ordered that tiles and other things requisite for the roofing of buildings shall be sold at the same price at which they used to be sold before the Feast of our Lord's Nativity last past, and at no higher rate; and that tilers and their men or assistants, and all other servants, artificiers and workmen, shall not take, or in any way presume to exact, for their daily labor, greater stipends or wages than before the said Feast they were wont to do; and that the makers of tiles and other things requisite for the roofing of buildings, shall make from day to day tiles and all other things for the roofing of buildings, and shall expose the same for public sale, when so made, as heretofore they used to do, without any withholding or concealing thereof. And we do entrust to you and command you, that all and singular the matters aforesaid you will cause to be publicly proclaimed in the City, and will cause it on our behalf strictly to be forbidden, that anyone shall do aught against the Ordinance aforesaid, or dare attempt to do, privily or openly, on pain of forfeiting unto us all things that he may forfeit; and all those who, after our proclamation and prohibitions aforesaid, shall be found doing to the contrary thereof, will take and imprison without delay, and their goods and chattels, as being forfeited to us, will arrest, and under arrest detain, until we shall think proper to give other orders as to the same, you certifying us from time to time in our chancery as to all that you shall do herein. Witness myself at Westminster the 28th day of March in the 36th year of our reign.

The Builders' Exchange

Directory and Official Announcements of the National Association of Builders.

Officers for 1897-8.

President,
Thos. R. Bentley of Milwaukee, Wis.
First Vice-President,
Wm. H. Alsip of Chicago, Ill.
Second Vice-President,
Stacy Reeves of Philadelphia, Pa.
Secretary,
Wm. H. Sayward of Boston, Mass.
Treasurer,
George Tapper of Chicago, Ill.

Directors.

Baltimore, Md.	S. B. Sexton, Jr.
Boston, Mass.	C. Everett Clark.
Buffalo, N. Y.	Charles A. Rupp.
Chicago, Ill	Wm. M. Crilly.
Detroit, Mich.	John Finn.
Lowell, Mass.	Wm. H. Kimball.
Milwaukee, Wis.	W. S. Wallschlaeger.
New York City	Chas. A. Cowen.
Philadelphia, Pa.	Geo. Watson.
Portland	George Smith.
Rochester, N. Y.	John Luther.
St. Louis	P. J. Moynahan.
Worcester	John H. Pickford.

Improper Practice in Soliciting Bids.

It is reported that the committee of the Board of Education of Chicago, Ill., having charge of buildings and grounds has decided that when bids are solicited for building work in future they shall be asked for both the entire contracts and for separate parts thereof. For example, if a contract for a school house is to be let, bids will be invited from carpenter or mason contractors for the entire work and also for the carpenter's or mason's work separately, and for any other subdivisions as may be stipulated, all other bidders for those parts of the work generally performed as sub-contracts, such as plumbing, painting, plastering, &c., thus being required to submit bids both to the general contractor and to the committee of the board.

This is a condition that has been strenuously opposed by the National Association of Builders for years, on the ground that it is unfair to both general and sub-contractors. The association maintains that bids should be asked for either as a whole or separately, but never in both ways. If it is desired that the building be erected by one contractor he should be allowed to choose his own sub-contractors and left free and unhampered from the danger of having irresponsible sub-contractors forced under his supervision and against his will. The owner always holds in his own hands the prevention of any damage to himself in his right to reject the bid of any contractor who is not responsible or capable of carrying on the whole work safely.

If it is desired that the work be done under separate contracts for each part and supervised by the owner or his agent, it is unfair to bidders that they be required to submit their bids to any other person than the owner. There might be certain sub-contractors who would not perform their work under certain general contractors for any consideration, believing that their money would be delayed or that they might be otherwise unfairly treated.

It is most obvious that such a system is full of evils and injustice to all concerned—the owner, the general contractor and the sub-contractor—in spite of the fact that the first named seeks private benefit by the system. The practice of soliciting bids for the entire work and also for separate parts of a proposed building at the same time proceeds from a desire on the part of the owner to secure the erection of his building as cheaply as possible, and he thinks that by obtaining both kinds of bids he can combine them in such form as will reduce the cost below that estimated by the lowest bidder for the entire work. In theory the owner intends to benefit himself by selecting the lowest bid of each kind and then requiring the carpenter or mason contractor whose bid for either the carpentry or mason work was the lowest to assume the whole contract and become responsible for the sub-contractors whom the owner has thus selected.

It is obvious that a responsible general contractor in preparing his estimate of the cost of a building as a whole asks bids from only such sub-contractors as he knows to be responsible, and it is equally obvious that in such a case sub-contractors will submit bids only to general contractors whom they know to be responsible. It ought, therefore, to be self-evident that no general contractor should be required to assume the responsibility of any sub-contractor other than those of his own selection. Nor should any sub-contractor be forced into a dependence upon any general contractor other than those of his own selection.

When an owner seeks to profit by this practice he combines the most undesirable and dangerous features of the building business, for aside from the fact that his action stamps him as a person who intends to profit at the expense of the contractor, he sets up conditions that are conducive to the lowest rate of efficiency and the highest rate of dissatisfaction to all concerned. Contractors who are thus combined against their desire are naturally less likely to work in harmony, and the general contractor who is thus compelled to assume the responsibility for sub-contractors forced under his control is at a great disadvantage in securing the highest efficiency or expedition. The details of possible annoyances and delays under such a practice are self evident to every contractor or architect in the country whose point of view is not obscured by thought of immediate profit at any cost.

The position of the sub-contractor is rather worse than that of the general contractor, for he is asked to perform his work under, and look for his money from, a contractor who has been selected by the owner generally on the sole ground of his having been the lowest bidder for either the carpentry or masonry. This general contractor may be conducting business upon so small a capital that he is compelled to pay the sub-contractor of one job with the proceeds of the next, and the sub-contractor may feel that he is totally unwilling to perform his work under such a general contractor for the same price that he would for another and more responsible man.

It is perfectly fair for the owner to solicit bids in either one of the ways he chooses, either of which is perfectly fair and legitimate in principle, but it is not fair that bids be solicited both ways, and such a practice should be rigidly discountenanced by both architects and contractors. The position of the National Association in regard to the practice is defined in the following clause from the Code of Practice, which represents the joint conclusions of both general and sub-contractors:

5. Contractors should decline to give architects or owners estimates in the aggregate, when the said architects or owners are soliciting estimates in detail, nor should estimates be furnished in detail when estimates are solicited in the aggregate.

The Exchange as a Business Institution.

The experience of such builders' exchanges as those in Baltimore, Boston, Buffalo, Philadelphia and some of the other cities shows conclusively that such organizations are not only of distinct and measurable benefit to the building trades, but are an influential power for good in the affairs of the cities in which they exist. Being, as these exchanges are, purely business organizations, their influence extends beyond the mere calling they represent, and is felt in ways in which, before they were established, it was impossible for the builder to make himself felt. The fact that so many apparently diversified interests are represented in the building business makes the exchange, in which they are all represented, one of the most important centers of business influence that can be set up, and the benefit to the community of being able to secure the action of such a body of men, in time of need, is much greater than is generally understood.

All the exchanges mentioned have been active and most valuable participants in various movements for the welfare of the cities in which they exist, and have taken active part in affairs in which the influence of active, nonpartisan business men was desired. In nearly every case the building laws of the several cities mentioned have been revised or actually created by the exchanges, and in all matters of public concern these bodies have taken a prominent part.

Until exchanges were established the bidders, as a class, were practically unrecognized in the cities named, and their position among business men was more or less undefined, but since the exchanges were instituted the condition has entirely changed, and the interests of the builders are as much in evidence as are those of any other trade or profession. These exchanges, however, represent the best type of business organization, and are rigidly careful to maintain a high standard of membership, and to otherwise conduct their affairs in such a manner as shall demand respect and consideration. They are excellent examples of what may be accomplished by builders in any of the large cities of the country, and their course points the way for similar efforts elsewhere with liberal assurance of success.

Fire Resistance of Structural Iron.

As a building material iron or steel is in many respects far superior to wood. It is true that the former is exposed to destruction by rust, but the visible parts can be kept free from rust by painting them with a suitable material from time to time. The invisible, or rather inaccessible parts, can also be protected in a like manner at the start, but such coats of paint cannot be considered permanent preventives of rust.

Experience has shown, says W. Sims, in an article in *Stahl und Eisen*, that the best protector for structural iron is cement. By exposing pieces of iron which had been imbedded in cement for a long time, it was proven that rust cannot assail iron thus protected, provided the cement surrounds the iron on all sides and so that no hollow spaces exist between the latter and the cement coat. Slag cement would not be suitable for the purpose, as it contains acids. The expectations entertained from the application of iron as a fire proof building material have only been partially fulfilled, however.

In the beginning it was believed that by the exclusive use of iron in connection with other refractory materials the problem of erecting actually fire proof buildings had been solved. The destruction by fire of numerous iron and stone buildings, however, which were deemed fire proof, showed that they had no claim to this distinction. They often fell in shortly after the outbreak of the fire. The collapse, as was later ascertained, was due to the fact that the metal parts, then mostly cast or wrought iron, had lost their carrying power. It was recognized from the fact that something had to be done to protect the iron from the direct action of the fire, so as to prevent its loss of carrying power and expansion.

That the carrying power of cast and wrought iron decreases at higher temperature was shown as early as 1886, but the city government of Hamburg was the first to have exhaustive tests made which corresponded in every respect to the conditions met with in a great conflagration. These tests included cast and wrought iron as well as wooden supports. The supports were placed upright into an iron frame, and hydraulic pressure, amounting to about 15,000 pounds per square inch, put on. For heating the supports a furnace, lined with fire brick and provided with gas burners, was used. The furnace consisted of two parts, arranged on an upright shaft; the two parts could be closed and opened at will. The supports passed through the furnace so that a little space was left between support and top and bottom of furnace, permitting the introduction of air from below and exhausting the gases of combustion above.

It was shown that unprotected iron supports lost their carrying power in from 17 to 59 minutes, according as the heat was increased faster or slower. Supports filled up with mortar or trellised showed hardly any better results, but proved again the necessity of incasing the supports by a fire proof or non-conducting material. The duties of the latter are to delay the advance of heat to the iron, and to possess sufficient strength to resist the shock of falling *debris* and the attack of the stream of water thrown by a fire engine. In the subsequent tests the supports were encased in slabs of plaster of paris, xylite or stone wood, asbestos cement, &c. The results were remarkable. Provided with such a casing the iron supports retained their carrying power for as long as three hours and 56 minutes. An oaken support without casing withstood a similar pressure in the fire for only one hour and 21 minutes. The heat of the flame at which the tests were made ranged between 1100 and 1300 degrees C.

CONTENTS.

RESIDENCE OF MR. GEORGE G. TELLER, AT CRANFORD, N. J.

J. A. OAKLEY, JR., & SON, ARCHITECTS.

SUPPLEMENT CARPENTRY AND BUILDING, DECEMBER, 1898.

CARPENTRY AND BUILDING

WITH WHICH IS INCORPORATED
THE BUILDERS' EXCHANGE.

DAVID WILLIAMS COMPANY, - PUBLISHERS AND PROPRIETORS.
232-238 WILLIAM STREET, NEW YORK.

DECEMBER, 1898.

Competitions in Low Cost Houses.

In this issue, which brings to a close the twentieth volume of *Carpentry and Building*, will be found an announcement elsewhere presented, relating to a portion of the programme which we have arranged for our readers for the new year. In it we have briefly described some of the work which we hope to accomplish during the ensuing twelve months, and have outlined several plans that have been formulated for supplying our patrons with interesting articles on timely topics. An important feature of the announcement and one which we feel very sure will be heartily welcomed is that relating to competitions in low cost dwellings. The contests, which are open to all, are three in number and call for designs of frame houses costing, in the localities in which they are planned, $750, $1000 and $1500 respectively. These are classes of houses in which there is widespread interest and the competitions should bring responses from every section of the country. We invite each and every reader of this journal to consider himself a committee of one to bring these competitions to the attention of his friends and acquaintances, to the end that the list of entries may be as large as possible. The publication of the designs winning prizes in these contests will constitute a very interesting feature of the twenty-first volume of *Carpentry and Building*.

Educational Work of the Y. M. C. A.

For some years past the Young Men's Christian Association as a body has been steadily extending its work in the direction of assisting the educational needs of young men. In most of the larger cities of the country local branches of the association have taken up this work enthusiastically. Evening classes have been established, in which, for a very moderate fee, young men who are occupied in earning their living during the day are given the opportunity of acquiring or improving themselves in an education along commercial, industrial and other practical lines. That the benefits thus offered are appreciated by those for whom the classes are designed is shown by the fact that in the last school year, from July 1, 1897, to June 30, 1898, 25,130 different students were enrolled in the 1988 evening educational classes carried on at 350 branches of the association. These classes, which are scattered throughout all parts of the country, provide for young men a means of intellectual and industrial improvement the value of which cannot be overestimated. In order to systematize this educational work and increase its efficiency, the Educational Sub-Committee of the International Committee of the Young Men's Christian Associations some two years ago undertook the task of standardizing the work of the evening classes. To this end a system of international examinations was prepared, which is now in successful operation. The annual report of the committee for the school year ended June 30 last, which has recently been published, gives an interesting account of the workings of the system and shows the excellent results already secured.

Analysis of the Classes.

Of the 25,130 pupils taught in the association classes during the year, 26 per cent. were mechanics, 20 per cent. were general tradesmen, 21 per cent. were clerks, and the remaining 35 per cent. were students or others without definite trade or profession. Of these, 49 per cent. took up commercial subjects, such as arithmetic, bookkeeping, &c.; 11 per cent. took instruction in industrial subjects, such as carpentry and wood working, plumbing, mechanical drawing. &c.; 12 per cent. took up the scientific branches, such as electricity, hygiene, physics, chemistry, &c.; and the balance applied themselves to general educational subjects, as English, algebra, geometry, languages, free hand drawing and political study. The average expense to the pupil of a season's instruction in industrial classes was $5.20, in commercial classes $3, and in the scientific classes $3.40. From among the 25,130 pupils, 750 were granted certificates of proficiency by the International Committee this year, having successfully completed the requirements of the examinations. These certificates receive recognition at present in over 60 of the leading colleges and universities in America. A special recommendation has been made by the committee this year to the various associations to push forward the instruction in manual work, in drawing and design and in mathematics, physics, chemistry and electricity, because these subjects lie at the foundation of the trades and industries. It is likely that this phase of the work will receive a strong stimulus in the present season. To aid intelligent interest therein the attention of employers, manufacturers and business men in general is being called to this important work, not only because it tends to the welfare of the young men, morally, commercially and industrially, but also on account of its bearing upon the extension and development of the industrial and business interests of the country by the training of intelligent and efficient workers. The pupils taught are on an average 23 years old, and are mostly employed in the daytime, so that but for these facilities they would be denied any educational opportunities of the kind.

Electric Palace at the Paris Exposition.

The colossal Palace of Electricity, which has been designed by Eugene Henard, will be one of the most remarkable features of the Paris Exposition in 1900. The façade will be 390 feet long and will be surmounted at its highest point, more than 230 feet above the ground, by a colossal statue of Electricity. By day this façade will be outlined against the sky in a lacework of metal and glass, and at night it will glitter like a diadem of jewels, flashing the colors of the diamond, ruby and emerald. It is estimated that 12,000-horse water power, which is equivalent to a flow of 300 gallons of water per second, will be required to operate the machinery. This water will be raised from the Seine by an immense pumping plant and will be made to do double duty by adding to the scenic effects of the grounds. At the Chateau d'Eau there will be a beautiful cascade, about 100 feet high, on which at night the electric lights will play. All the lower part of the Palace of Electricity will be hidden by the Chateau d'Eau, above which the central hall will rise to a commanding elevation.

Convention of the American Institute of Architects.

The American Institute of Architects, in accordance with previous announcement, held their thirty-second annual convention in the banquet hall of the Arlington Hotel, Washington, D. C., the sessions opening on the morning of November 1. There were about 100 delegates from various parts of the country in attendance, and the deliberations of the body were presided over by George B. Post of New York City. After addresses of welcome in behalf of the Washington Chapter, and on behalf of the District of Columbia, President Post delivered his annual address, which commanded the earnest attention of those in attendance.

The president's address was followed by the report of the treasurer, after which came the reports of chapters, these being given in condensed form by the secretary, taking them in their chronological order. The reports of various standing committees followed, and Alfred Stone presented a report as delegate to the National Conference on Standard Electrical Rules. After the routine business had been disposed of the matter of the change in the by-laws came up for discussion, these being considered clause by clause.

In the afternoon a reception was tendered the institute by the President of the United States, after which an interesting session was held at the Octagon House. An evening session, held at the Arlington Hotel, was devoted to further consideration of the by-laws, and then the members adjourned until the next day.

After the president had called the session to order on Wednesday morning, Professor Sabine of Harvard University read a paper on the subject of "Acoustics," this being followed by a discussion of the subject from the pen of Adolph Cluss, a member of the Washington Chapter, but at present in Germany. A very able paper on the "Peculiarities of Timber," by Prof. B. E. Fernow, Chief of the Divison of Forestry, Agricultural Department, was read by J. C. Hornblower of Washington. A very interesting report was that of Prof. G. B. Merrill of the United States National Museum on the "Little Known American Ornamental Stones," this being illustrated by specimens of the various stones mentioned.

On the evening of Wednesday there was a very interesting talk by Dr. Cyrus Adler of the Smithsonian Institute on the "Place to be Assigned to the Jewish People in Architectural History." These remarks received the closest attention on the part of the audience and the speaker was tendered a very hearty vote of thanks. The next order of business was an address by H. G. Bradley of Boston on "General Practice in Regard to the Employment of Electric, Heating and Sanitary Engineering," a brief discussion following, in which the president and W. L. B. Jenney of Chicago took part.

The report of the Committee on Building Laws, laid over from the previous day, was then read by the secretary, in which reference was made to the proposed new code of building regulations for the city of New York and the difficulties in the way of preparing a uniform code to suit the dissimilar conditions prevailing in different sections of the city. Reference was also made to the restriction of the hight of mercantile buildings in Boston to 100 feet in place of 125 feet; to the codes on plumbing, which had been adopted in many cities and towns, and to the controversy between the advocates of ventilation and non-ventilation of traps. In general, it was stated the changes that were made in building regulations throughout the country tend to favor incombustible materials in all classes of buildings. In Boston, for example, all school houses, tenement houses and apartment houses of every sort must be of fire proof construction throughout, while the proportion of fire proof private dwellings has enormously increased within the past decade in the Eastern States. It was the opinion of the committee that there is reason to believe this tendency is increasing, and is certain to create a demand for improved and especially cheaper methods of building fire proof floors, roofs and stairs.

The discussion of the proposed by-laws was concluded, after which they were adopted, to take effect on January 1.

The officers elected were: President, Henry Van Brunt; first vice-president, W. L. B. Jenney; second vice-president, J. W. McLaughlin,; secretary and treasurer, Glenn Brown.

Auditor for two years, S. A. Treat; for one year, E. H. Kendall.

Directors for one year, Frank Miles Day, T. D. Evans, Joseph L. Hornblower. For two years, Robert W. Gibson, Levi T. Schofield, W. M. Poindexter. For three years, George B. Post, James W. McLaughlin, Arthur G. Everett and W. C. Smith.

Thanks were tendered to the Washington Chapter of the American Institute of Architects for the completeness of the arrangements for transacting the business of the convention and the enjoyable entertainment of its members; to the Cosmos Club; to Bernard E. Green, superintendent of the Congressional Library, as well as to others.

On the afternoon of Thursday the delegates visited various points of interest in the city, the members of the Washington Chapter acting as escorts.

It was decided to hold the next meeting of the institute at Pittsburgh, Pa.

Brick Makers' Convention.

The Executive Committee of the National Association of Brick Manufacturers has issued an announcement to the effect that the thirteenth convention of that body will be held in Columbus, Ohio, February 7 to 10, inclusive 1899.

Lightning Rods on the Washington Monument.

One of the best evidences of the value of lightning rods up to date has been afforded by the Washington Monument. It is capped by a small four-sided pyramid of aluminum, which metal, so cheap to-day, was very costly at the time of the building of the greatest obelisk that the world has ever known. This aluminum tip is connected with the ground by four copper rods which go down deep into the earth. On April 5, 1885, five bolts of electricity were seen to flash between the monument and a thunder cloud overhanging in the course of 20 minutes. In other words, the monument was struck fiercely five times, but it suffered no damage whatever. On June 15 of the same year a more tremendous assault was made upon the monument from the heavens, and the result was a fracture of one of the topmost stones. The crack still remains to show what nature can do in the way of an electrical shock, but the slightness of the damage is evidence of man's power to protect himself from such attacks. The obelisk is ideally located for attracting electrical assaults from the skies, and yet, while many times hit, it has suffered only once, and that time to a trifling extent.

The Statue of Liberty, New York Harbor, is protected by copper rods united to the figure and extending through the pedestal to copper plates buried in wet ground beneath the foundation. Lightning has never injured the statue in the least.

Sureties on the bond of a contractor, conditioned that he "shall only perform said contract, and all the covenants and agreements therein contained, and shall pay and discharge from said premises all liens for material, labor or otherwise, which may accrue on account of said contract," are not liable for the failure of such contractor to pay sub-contractors who have no lien on the building.—Spalding Lumber Co. *vs.* Brown, Ill., 49 N. E. Rep., 725.

A COLONIAL HOME IN CRANFORD, N. J.

THE design which forms the basis of our supplemental plate this month is that of an attractive residence finished in the modern colonial style, and presenting exteriorally some rather clever effects. The treatment is bold and striking, the noticeable features being the broad projecting cornice extending entirely around the house, the swelling bays, the impressive front, with its ample veranda and the side gables, one of which is recessed and has an ornamental window of leaded glass. The surroundings are picturesque to an unusual extent, the broad lawn at the left gradually sloping away to a tiny stream crossed by rustic bridges, which, however, are too far in the foreground to be seen in the lower view on the half-tone plate. A few hundred feet to the left of the rustic bench is the carriage house and stable, the drawings of which will appear in a subsequent issue. The house is that of George G. Teller, located at the corner of Orchard street and West End place in Cranford, N. J., and was recently completed in accordance with drawings prepared by Architects J. A. Oakley, Jr., & Son of Elizabeth in the State named.

An examination of the plans shows on the first floor a main stair hall of liberal proportions from which are readily accessible, through sliding doors, the parlor, library and dining room. The parlor and library at the right of the hall are also separated by sliding doors, and beyond the library is a cozy den, which can be reached from the outside of the house if desired by means of a side entrance. An interesting feature of the main hall is a commodious closet at the left of the vestibule, and at the right a convenient nook with seat. The dining room communicates with the kitchen directly in its rear through a well arranged butler's pantry, and there is also direct communication between the front door and the kitchen by a passage 3 feet in width, which avoids the necessity of servants going through other rooms in order to reach the front door. There are also stairs to the cellar and to the second floor, both of which are readily accessible from the kitchen. On the second floor are five sleeping rooms of good size, together with bathroom and water closet. It will be noticed that the latter is separate from the bathroom, an arrangement which will be appreciated by many who object to a combination of this department with the bathroom. The stairs on this floor land near the center of the building and are also convenient to the stairs leading to the attic. In the attic are two finished rooms with closets, and there is ample space unfinished which can be used for storage purposes.

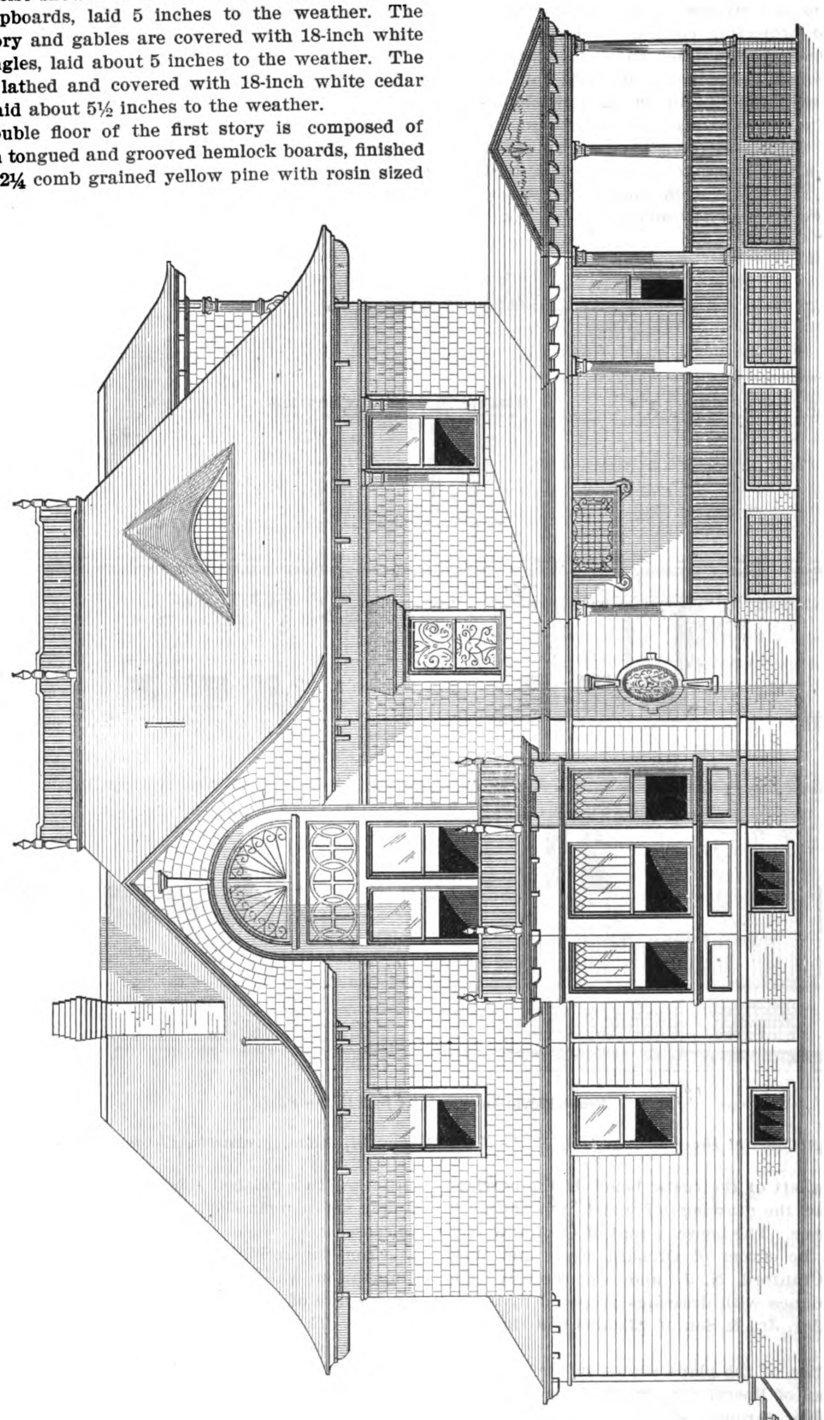
Front Elevation —Scale, ⅛ Inch to the Foot.

A Colonial Home in Cranford, N. J.—J. A. Oakley, Jr., & Son, Architects, Elizabeth, N. J.

From the architects' specifications we learn that the foundation walls, piers, chimneys, flues and trimmer arches are of brick, laid in lime cement and sharp sand mortar. The cellar bottom is covered with 4 inches of concrete composed of coarse gravel or cinders and cement and finished with ½ inch of sand and Portland cement. The sills, posts and beams and rafters are of spruce, while the balance of the frame is of hemlock. The girders are 6 x 10 inches; the sills, posts and ties 4 x 6 inches; the plates 2 x 4's, doubled and spiked together; the rafters, 2 x 6 inches, placed 20 inches on centers, and the hips and valleys 2 x 8 inches. The first and second floor joist are 2 x 10 inches, and the third floor joist 2 x 8 inches, all placed 16 inches on centers. The outside studs and braces and supporting partitions are 2 x 4 inches, placed 16 inches on centers. The veranda sills are 4 x 8 inches, the veranda beams 2 x 8 inches, while the veranda rafters and ceiling beams are 2 x 6 inches, all placed 20 inches on centers. The entire outside frame is covered with ⅞ x 10 inch matched hemlock boards, on which is laid rosin sized paper, this in turn being covered from the sill to the belt course, and wherever else shown on the elevations, with white pine 6-inch clapboards, laid 5 inches to the weather. The second story and gables are covered with 18-inch white cedar shingles, laid about 5 inches to the weather. The roofs are lathed and covered with 18-inch white cedar shingles laid about 5½ inches to the weather.

The double floor of the first story is composed of ⅞ x 9 inch tongued and grooved hemlock boards, finished with ½ x 2¼ comb grained yellow pine with rosin sized

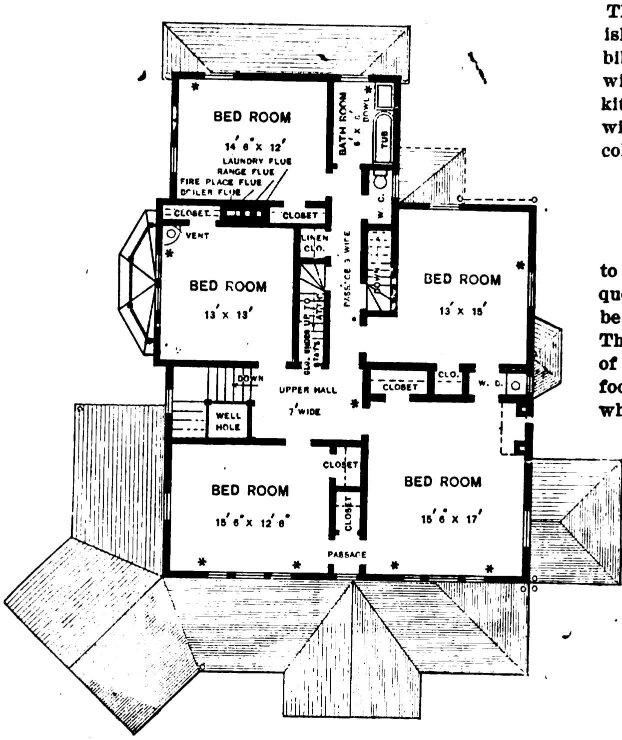
The inside trim is of white pine, with the exception of the bathroom, which is in oak, and the kitchen, which is in North Carolina pine. The kitchen is wainscoted 3 feet 6 inches high, finishing with cap and molding. The ceiling of the main hall is paneled with 4 x 4 inch pine and has a ⅞-inch molding broken around each panel.



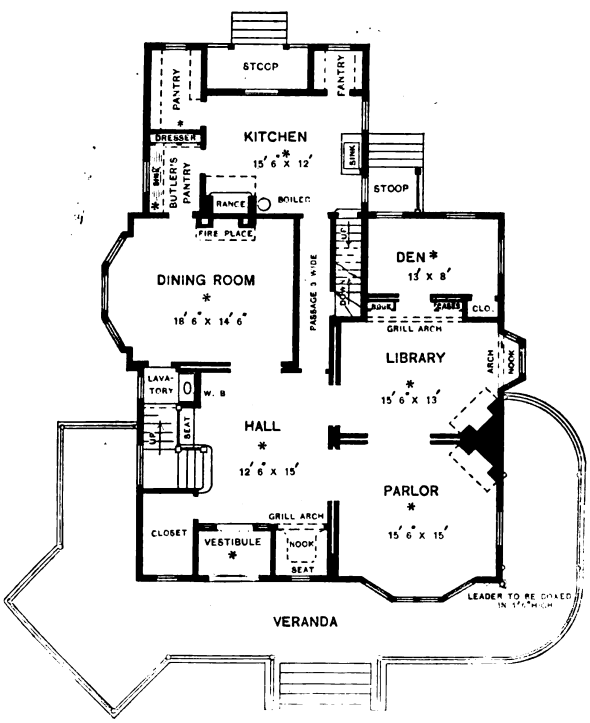
A Colonial Home in Cranford, N. J.—Side (Left) Elevation.—Scale, ⅛ Inch to the Foot.

paper between. The second and third floors are of ⅞ x 3½ inch North Carolina pine, laid in courses and blind nailed. The veranda floor, which has a grade of ⅛ inch to the foot, consists of 1¼ x 3 inch tongued and grooved white pine, jointed in white lead, driven up close and blind nailed, the edge of the flooring finishing with round edge and cove.

All the interior wood work, such as trim, sash, doors, stairs, &c., has one coat of wood filler and two coats of Pratts & Lambert's interior hard oil finish. In the parlor, library and dining room, as well as in one of the sleeping rooms on the second floor, are open fire places with mantels. The walls of the house are treated with one coat of King's Windsor cement plaster, and then with one coat of King's Windsor cement finishing and lime putty. The trim of the parlor has three coats of white paint and one coat of enamel, while the side walls and ceilings of all the rooms and hall have one coat of glue size and two coats of Plasterco in tints. The bathroom, which has a hardwood floor, has open plumbing, the fixtures including an embossed Vigilant silent siphon jet closet and Standard Majestic porcelain lined tub, the pipes and connections being nickeled. The water closet in the cellar is of the Albany front outlet washout type. The butler's pantry has an oval copper tinned and planished sink supplied with hot and cold water and nickeled bibs, plug and chain. The house is piped for gas and wired for electricity and has speaking tube from the kitchen to the second-story hall. The exterior is painted with two coats of white lead and raw linseed oil in light colors, and all tin work has two coats of metallic paint.



Second Floor.

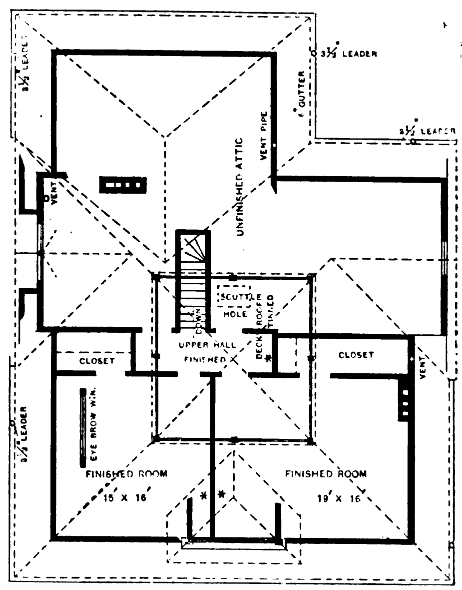


First Floor.

A Colonial Home in Cranford, N. J.—Floor Plans.—Scale, 1-16 Inch to the Foot.

Greek and Roman Stables.

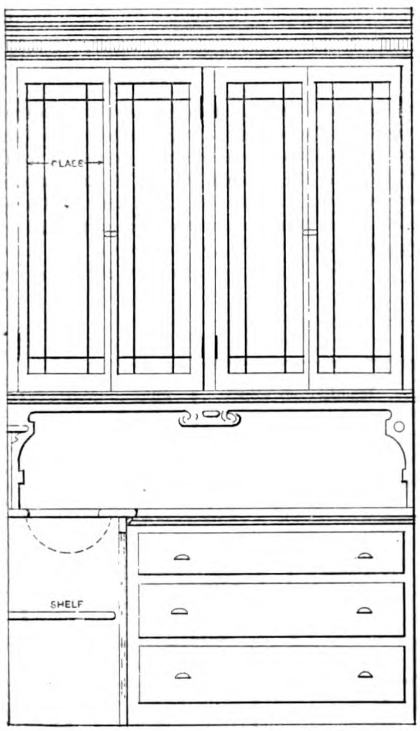
The Greek stable was to be so contrived with respect to the house that the owner could see his horse frequently, and the stall was to be so managed that it would be difficult to steal the provender out of the manger. The floor was to be sloping and on a declivity, and made of stone, each stone being about the size of the horse's foot. The groom was to lead the horse out of the stable when he was to be cleaned and dressed, and after the first meal to remove or turn him from the manger, that he might return to his second or evening food with fresh appetite. They were muzzled when cleaned and the groom stood sideways. In the stable they were confined by a halter to the manger. The stable yard was paved with round stones, with a ridge or border of iron for keeping them together, hardening the hoofs, &c. Beside the stable yard was a rolling place for the horses to roll themselves in. In the Roman stable we find rails to separate the horses, and the patena or manger of a rack, images of gods painted upon the stalls, a painted portico annexed to the imperial stable and lodgings of grooms near them, for so commentators interpret Caligula's stopping in a stable to sup. Stables to the present day are dark, and the ancients had an idea that darkness contributed to fatten animals.



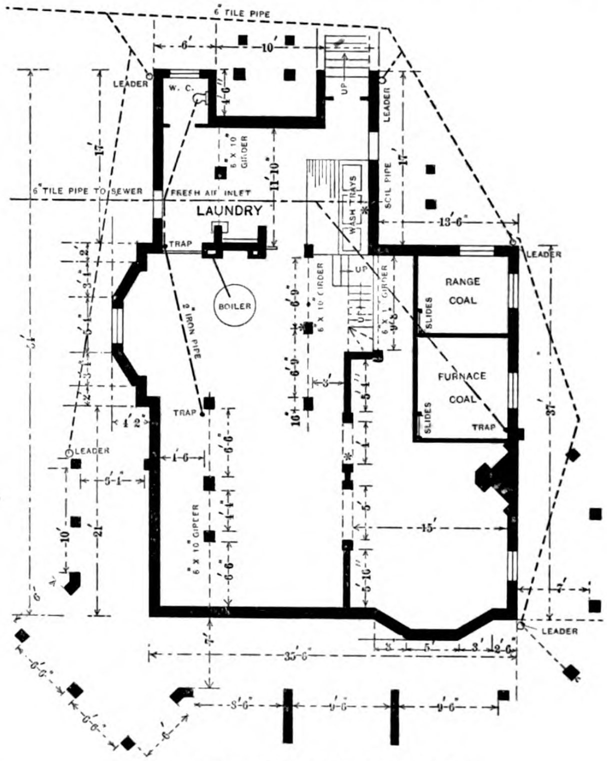
Attic with Outline of Roof Plan.

Exhibition in Boston.

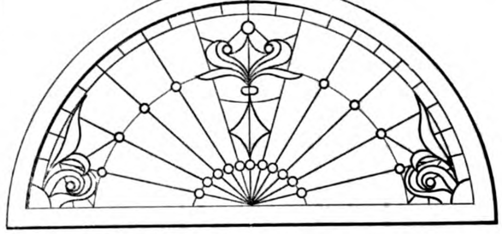
The Twentieth Triennial Exhibition of the Massachusetts Charitable Mechanic Association was officially opened in the large exhibition building of the association on Huntington avenue, Boston, on Saturday evening, October 8, in the presence of 5000 invited guests, including the chief officials of the State and city. Governor Wolcott made the official opening speech and pressed the button which set the machinery going. President Rockwell opened the exercises with a short address in which he called attention to the long period in which the association has held unchallenged its peculiar field, and then introduced Governor Wolcott, who said from the date of the founding of the association it has been one of the useful agencies for the education of the people. There are over 300 separate exhibits in the fair, and the variety is even greater than usual, but electricity predominates over everything. Much of the machinery is shown in operation, and the exhibition has many mechanical and popular features. It was thrown open to the general public on Monday, October 10, and will remain open day and evening until December 3.



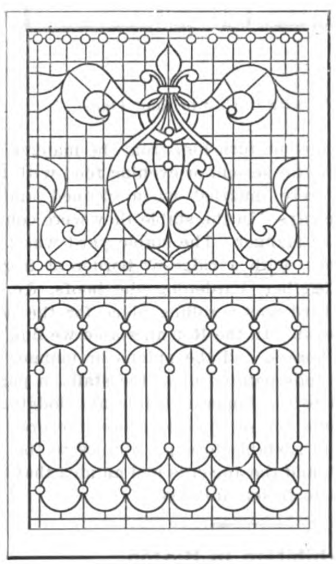
Front Elevation of Dresser in Butler's Pantry.—Scale, ½ Inch to the Foot.



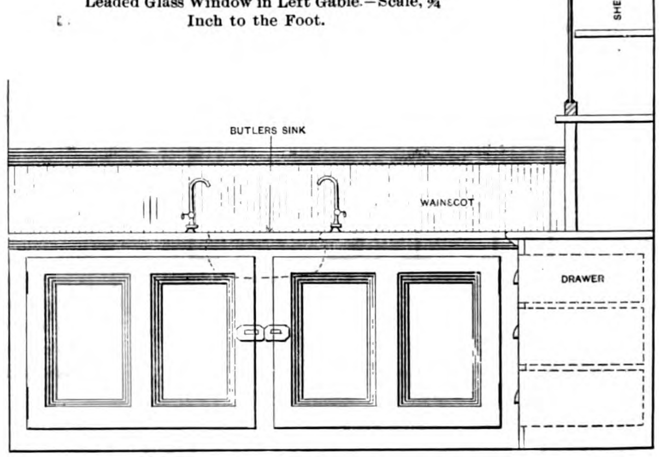
Foundation.—Scale, 1-16 Inch to the Foot.



Leaded Glass Window in Left Gable.—Scale, ¾ Inch to the Foot.

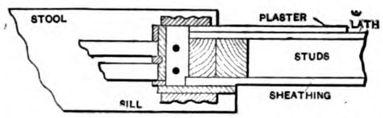


Leaded Glass Window at Second Landing of Main Stairs.—Scale, ¾ Inch to the Foot.

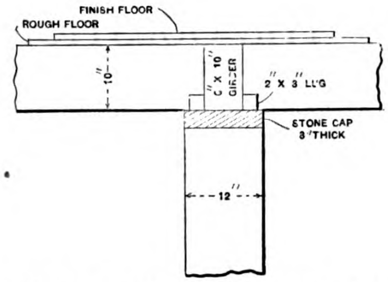


Side Elevation of Dresser in Butler's Pantry.—Scale, ½ Inch to the Foot.

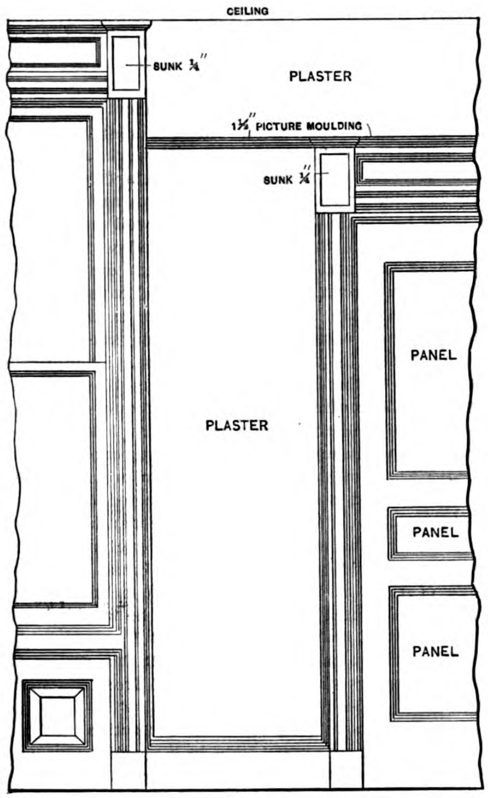
Miscellaneous Constructive Details of a Colonial Home in Cranford, N. J.



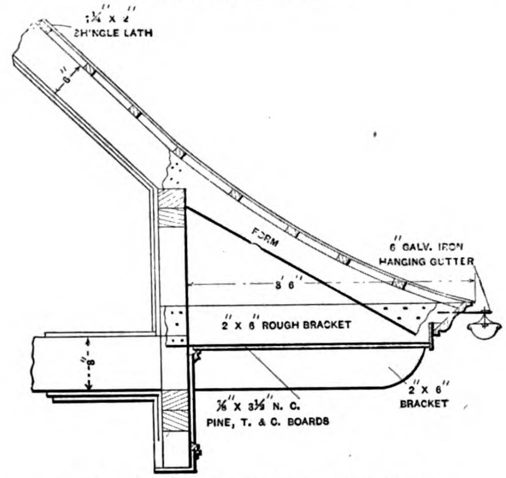
Horizontal Section through Window Frame.—Scale, ¾ Inch to the Foot.



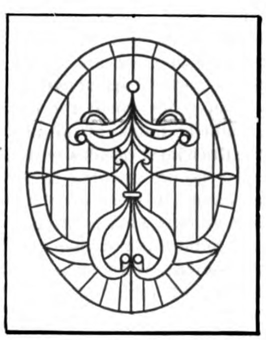
Detail of Girder and Floor Joists in Cellar and Over Sliding Doors. —Scale, ½ Inch to the Foot.



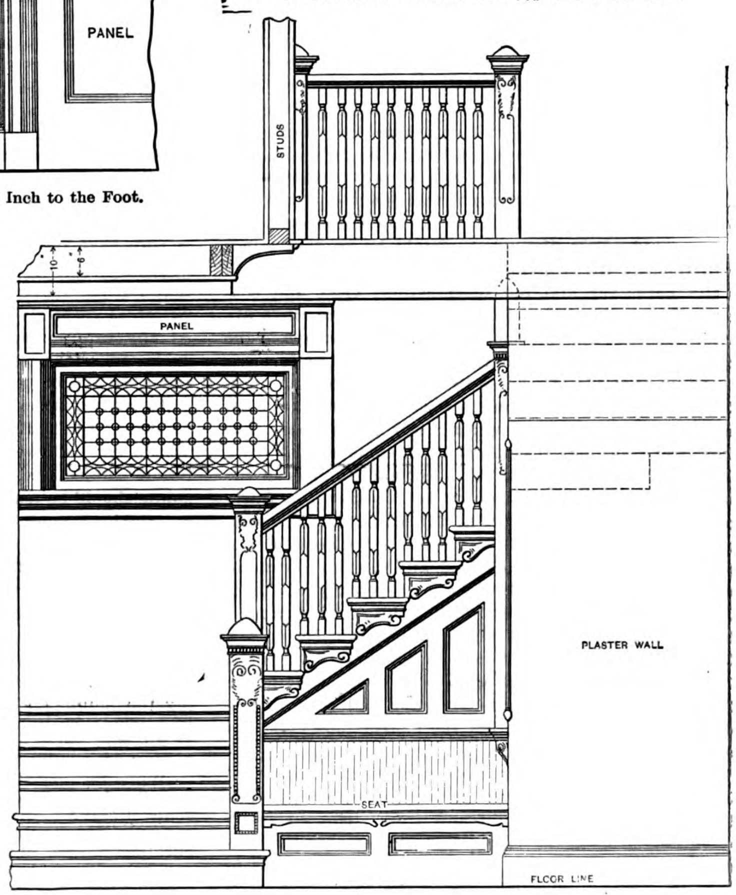
Details of Trim on First Floor.—Scale, ½ Inch to the Foot.



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



Leaded Glass Window in Lavatory Under Main Stairs.—Scale, ¾ Inch to the Foot.



Front Elevation of Main Stairs.—Scale, ¾ Inch to the Foot.

Miscellaneous Constructive Details of a Colonial Home in Cranford, N. J.

THE QUESTION OF SPECIFICATIONS.

BY T. BUCKLER GHEQUIER.

IT was a builder of a peculiar sort who once remarked to me, when I called his attention to a grievous departure from my written instructions, that he never looked at the specifications after the work was started, but used his best judgment regarding construction and finish. In these days when the tongue has been so largely supplanted by the pen and typewriter he was, of course, on the wrong track—the left instead of the right hand one—and doubtless he has had more or less severe collisions as a consequence. But really, when I glance, as opportunity permits, over the lengthy volumes of descriptions in which our modern architects seem to delight, I often wonder when with his multifarious occupations, perplexities and troubles the poor builder can find time to study them, and how he can keep the twentieth part of their clauses and sub-clauses in his head. If shortness and crispness are the essentials of a good speech they are of no less value in formal documents of all kinds. If brevity is the soul of wit it is equally so of specifications. Nothing is accomplished by great length except confusion and a tendency to say "cuss words." If a contractor has made up his mind to scamp the work, reams of written paper piled on each other will not prevent it; there will always be some loophole for him. If he is stupid he will have to be told anyhow, for he will not be able to understand much that he reads. If he is intelligent and honest a few general instructions about the kinds of material and methods of decoration will suffice.

To all, whether architects or builders, who have to compose specifications I should say as a first warning, beware of prolixity. The fact is, although it may sound heretical, that both drawings and specifications are really non-essentials in building. The tongue directed the construction of the first edifice, and if it were possible now we would have use for nothing more. But the requirements of our various buildings and of our civilization are so great and numerous that they must be put on paper for fear that they will be forgotten. As aids, the drawings and specifications are of great value and we cannot ordinarily do without them, but the properly constructed building is the end of our aim and not the aid. This distinction should be kept in mind; consequently the drawings should be only such as are really necessary and the specifications clear and concise. Frequently items shown clearly on drawings are again mentioned in the specifications and perhaps in the contract, causing confusion amid the different terms.

As an example of useless items let us take the question of mortar. Some specifications contain the most minute details as to its mixing and proportions. Are they ever followed? Occasionally in some special work there can be no deviation, for a certain strength in the building would be lost thereby; but ordinarily a fairly good mortar is quite sufficient for all needs. The contractor rarely supervises the mortar bed unless he suspects too much lime is being used, and the sub-contractor will have the mortar mixed as is customary whatever the specification says. So with paint mixing and a dozen other things. The letter of the law becomes a dead letter in the face of custom and tradition, but if the spirit is good and the work well done what is the difference? I am far from counseling bad work or disobedience of instructions, but the instructions must not be too onerous to start with.

The forms that specifications assume are many, but those only are good that are perfectly clear and simple. Blank forms can be bought and are distributed gratis by various firms in the shape of advertisements, but they are all likely to prove of little use. A good plan is to state all the general conditions of the work first; then the headings should be arranged as they will naturally follow each other in the building, such as Excavation, Grading and Well Digging, Stone Work, Brick Work, Roofing, Plastering, Wood Work, &c., so that estimators, mill men and the like may be saved as much trouble as possible. The general conditions should contain in numbered clauses everything that appertains to the accomplishment of the work outside of the material and labor. They should specify what, if anything, the owner is to furnish; the architect's position and authority, notes about water supply and sewer connections, fuel, if the finish is likely to be in cold weather, scaffolding, tools, &c.

One clause recently inserted in most architects' specifications has somewhat, but needlessly, troubled many contractors. That is that the work should be kept in repair, except from the owner's carelessness, for six months or a year after completion, and a certain sum shall be retained therefor. In a well built house this simply means that a few doors and windows are to be eased and perhaps some settlement cracks filled. Such a clause known from the start need cause the contractor no hardship, for he can arrange to meet it. It saves the owner considerable petty annoyances, and it has a tendency to prevent carelessness. Promptitude in attending to the insignificant matters likely to call for it gives the contractor friendly intercourse with the owner and he is likely to gain rather than lose thereby. I recall one case in my experience, and but one, in which such a clause might have proven injurious to the builder. A boiler house had to be erected on spongy soil. After a careful examination and consultation with the contractor, who was also a bit of an engineer, we decided that it would be wise to put in a broad footing or grillage of railroad iron. The owner concluded, however, in view of the additional cost, that he would simply drain the site. I insisted not only that I should be relieved in writing of all responsibility but that the clause relating to repairs should be eliminated from the specifications.

It is not an easy thing to insure perfection and the mention of every necessary item in a specification, and often when I have finished one and gone carefully over the drawings at my side I have felt that something must surely be omitted, overlooked or forgotten. We are all fallible and subject to mental lapses and errors. It is here that the builder's experience and thought can help. It seems to me that if he has discovered anything that has been overlooked it is his duty to inform the writer. I certainly should highly esteem such kindness. At any rate some margin should be allowed for just such omissions, so that the work may progress smoothly and be perfect when finished.

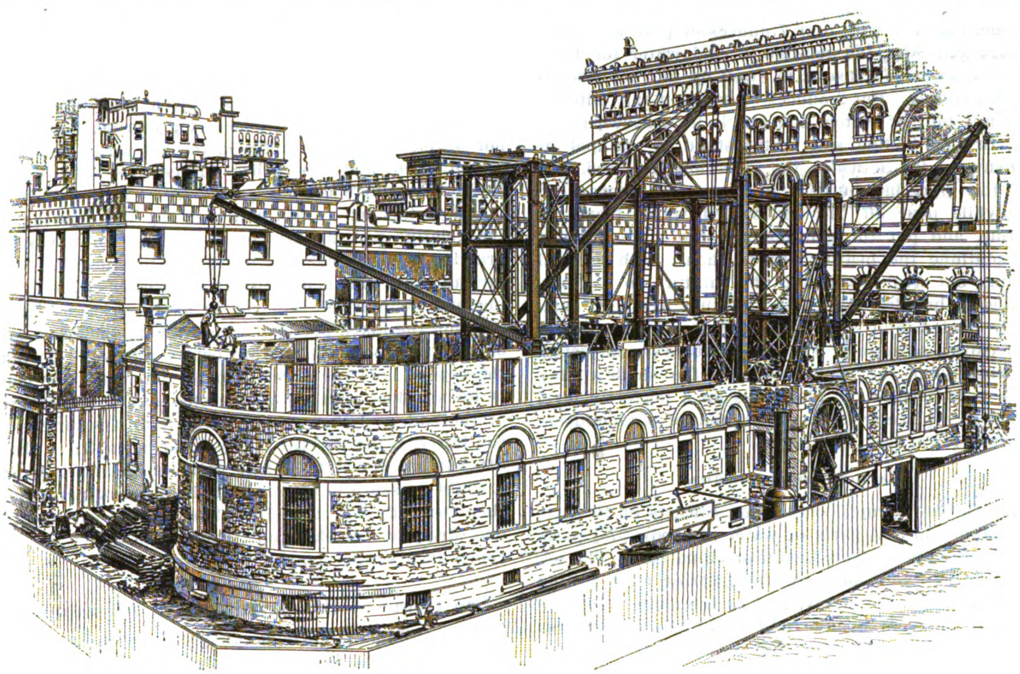
In writing specifications nothing that can aid should be disregarded. Blank forms or former specifications should be read over; books of reference about the different subjects should be studied; notes of special points should be made from the drawings, besides which a "tickler" containing every heading possible to be thought of should be close at hand. A piece of blank paper should also be convenient, so that when writing or dictating items occurring to the mind but not then possible to consider may be jotted down. With these precautions and aids the possiblity of omission is reduced to a minimum, and yet that it always exists I found out to my sorrow a short time ago, when, advising the plumber about the position of the supply pipe to a house, he informed me that it was not mentioned at all, and yet the specification distinctly required the testing of all fixtures before reception.

While lucidity should be the one great ear mark of all specifications, there is nothing to prevent them having some literary merit as well. I do not mean that they can ever become theses on romantic adventures or blood curdling novels, but the dullest item with a little care can be made to bear both instruction and interest. A specification, however dressed up, is but a specification after all, and I imagine that both writers and readers will, whatever its merit, be always glad to lay it aside for something more congenial, as the school boy does his lesson books. I trust, however, that the few words above may ease a bit the burden of it.

TOWER DERRICKS IN PRISON CONSTRUCTION.

ONE of the interesting features in connection with the erection of the new city prison on the site formerly occupied by what was so long known in New York City as "the Tombs" is the style of derrick employed for hoisting the various forms of heavy materials into place. While the idea of a tower derrick is not new, its peculiar adaptability for such a building was speedily recognized by J. P. Carlin, the engineer for P. J. Carlin & Co., the contractors, and the results since attained prove that this style of derrick was vastly better for the work than any of the other recognized forms. Owing to the confined space in which the builders were operating it was not possible to use stiff legs advantageously, and it was almost impossible to use a guy derrick. They were therefore compelled to adopt some apparatus which from its first position would admit of the boom swinging freely through 360 degrees, and would also allow a tower to a corresponding plate on the other side, both of which are securely bolted to the corner of the tower. On the other corners similar plates are used to insure a proper degree of stiffness on all sides.

This arrangement insures absolute rigidity, which would have needed nothing further to sustain the derricks when they were operating against each other, but since they could each turn through 270 degrees, it was, of course, necessary to clamp the base of the tower to the supporting floor beams. The first and fourth stories of the building are 12 feet high, and the second and third are 36 feet in hight; hence the mast and towers were made 50 feet high, so that in the vertical position of the boom it would set all of the material of the first story, and when those beams were set the boom could be raised and clamped by a patent device of John J. Carlin's, and used in that position to complete everything



Tower Derricks in Prison Construction.

vertical adjustment by which the boom could be lowered or raised to suit the progress of the building.

It was also necessary to use at least four derricks, because of the area covered, the plan of which closely resembles a race track—two semicircular curves connected by two straight lines—and secondly, because the entire building is faced with Pochuck granite ashlar, and it required a number of derricks to handle and set the stone. The appearance of the derricks in position is indicated in the accompanying illustration, which is made from a photograph taken especially for the purpose.

The towers were built of 12 x 12 inch timbers in four sections, with eye bar pin connecting diagonal braces, and the total hight was 50 feet. The entire structure, including the two masts on the diagonal corners of the tower, rested upon double cross sills of yellow pine. To further stiffen the base and form a support for the engines, additional timbers were laid parallel to the double sills. The device for securing the masts, which is the key to the use of the tower derricks, consists of a ½-inch plate, reinforced by angle stiffeners, with two holes bored at either end of the plate. One of these holes is made to receive the gudgeon pin of the mast and the other receives an eye bar, which runs diagonally across the top of the up to the third story. Then by simply removing the lower cross sills and detaching the masts and booms they could be used as gin poles to raise the tower to the third, from which position the building would be completed.

The economy of the plant has been well demonstrated, and its utility on the City Prison has attracted the consideration of prominent builders. The capacity of the derricks in the present instance showed a minimum of 4 tons when in their worst position, and a maximum which depended solely on the strength of the boom. By simply using one of the derricks as a guy placed exactly opposite the lifting derrick a load of 10 tons was raised.

There is no doubt that the tower derrick will come into general use, as already several have been noticed in course of construction about New York, and all with the same general features as that described above.

A PARTY furnished material to contractors who were erecting a building for another, and received as security an order on him to be paid out of the last payment due under the contract. This order was accepted, but the money paid to the contractors under a new contract that such final payment did not leave sufficient to pay the order. The court held he was liable for full amount of order.

MAKING A HECTOGRAPH.

ONE of the methods of duplicating drawings is by means of the hectograph, which consists of an absorbent pad of a gelatinous nature which absorbs a certain amount of a specially prepared ink with which the drawing or written matter is made, and by laying sheets of paper on the gelatine surface and applying a slight pressure a number of copies, one after the other, can be obtained from a single negative. In this process it is apparent that the copy on the gelatinous surface is a negative, and that the copies obtained are positives, or *fac-similes*, of the original drawings. There are several formulæ for preparing the gelatinous compound, some of which, taken from an English journal, are given below. Any one with a little skill can make the apparatus, all that is necessary being a shallow tray of tin or other material into which the gelatinous compound is poured, and when set it is ready for use. One of the compositions which may be used consists of the following ingredients: One ounce good edible gelatine, together with 6 or 7 ounces of pure glycerine. Preparation: Soak the gelatine in cold water for 10 to 12 hours, so as to cause it to swell up but not lose its form separately. Put 2 ounces of common salt (kitchen salt) in 1 pint of water, and put it in a saucepan to boil. In this boiling salt water stand a gallipot or earthenware jar in which the glycerine is placed, and heat the glycerine until it is about 200 degrees F. Meanwhile pour off the unabsorbed water from the gelatine, and put the gelatine into the hot glycerine, and continue the heating for an hour, with careful stirring; but avoid whisking the mixture to a froth, or causing bubbles. When the mixture has been sufficiently heated, add 20 mimims (20 drops) of essential oil of cloves, so as to prevent the mixture decomposing, and then pour the compound into the shallow tray which is to receive it. Place this on a perfectly level surface in a place free from dust, and let it remain undisturbed for at least five hours.

Various Compositions.

Another hectograph composition consists of 10 parts of gelatine and 37½ parts of water (soaked); 37½ parts of glycerine and 5 parts kaolin or china clay. The addition of the kaolin prevents the gelatine from setting or gelatinizing too quickly, and at the same time renders the compond opaque and of a milky whiteness which effectually disguises the actual composition of the compound.

A cheap hectograph compound may be made of 10 parts of glue, 5 parts of glycerine, 2½ parts of barium sulphate and 37½ parts of water.

Still another compound is composed of 3 ounces of glue, 15 ounces of glycerine, ¾ ounce of kaolin and 11¼ ounces of water.

If the gelatine be of poor quality, the compound will not "set" or gelatinize; in such a case, less glycerine should be used with such gelatine. The compound, however, thus prepared need not be wasted, but reheated, and a little more swelled gelatine added. When once you have prepared a suitable compound, take special note of the proportion of ingredients, and also the exact particulars which were followed in preparing same. The object in using a salt water bath is to obtain a higher temperature—salt water boils at a higher temperature than fresh water—and also to prevent it being vaporized too readily, for such vapor would be absorbed by the gelatine compound, and consequently liquefy it too much.

Before using the gelatinous pad thus prepared, pass a wet sponge lightly over the face of the gelatine, and allow it to nearly dry before taking the first copy. If this precaution be not observed, the surface of the gelatine will be ruined by the first copy taken, as the gelatine will stick to the paper, and in lifting it up it will more or less tear away the gelatine and produce a rough surface. The pad becomes worn out in time, but it need not be cast aside, as all that is required is to remelt the compound.

After taking the required number of copies, wash the surface of the gelatine with a wet sponge so as to absorb out of it all the ink that remains therein; but if the gelatine pad is not required for several days, this washing is not necessary, as the ink will become absorbed out of the compound, and thus not interfere with a fresh drawing being laid on it.

To use this pad, make the drawing with any of the special inks here described.

No. 1.—Ingredients: One ounce of aniline violet or blue (2 R. B. to 3 B.), 7 fluid ounces of hot water, 1 fluid ounce of spirit of wine, ¼ fluid ounce of glycerine, a few drops of ether, 1 drop of carbolic acid to prevent decomposition. Dissolve the aniline color in the water, and, on cooling, add the spirit and other ingredients, and put in well stoppered bottle for use.

No. 2.—Black: One part of nigrosine soluble in water, 14 parts of water, 4 parts of glycerine. More glycerine, sugar or gum arabic may be added to render it more copying.

No. 3.—Blue: Six ounces of cotton blue (aniline),C. B., 1 ounce of glucose, ¼ ounce of glycerine, 1 quart of hot water. Rub up the blue in the hot water until dissolved; then add the other ingredients, and strain through muslin while hot.

Allow the ink to dry, and then lay the drawing on the gelatine pad; slightly press the back of the paper drawing, so as to cause it to become in immediate contact all over; then gently lift up one corner of the drawing and strip it off the pad so as to carefully avoid blurring the inked portion. The drawing should remain on the pad about one minute before removal. To take the copies, hold the sheet of paper on which the copy is to be taken squarely and evenly above the surface of the pad, and then gently lower it to the surface of the latter, being careful that you do not shift it about after it has come in contact with the gelatine. Apply a slight pressure to the back of the sheet of paper, and then carefully lift it off by taking up one corner first, and stripping the sheet off. Proceed to take the other copies in a similar manner.

The Home of the Architects in Washington.

The building known as the Octagon House, which will hereafter be the headquarters of the American Institute of Architects, in Washington, D. C., has clustered about it many memories of the past which render it especially fitted for the home of architects. As its name indicates, it is of peculiar shape and was erected, it is said, by Col. John Tayloe, one of the magnates of Washington in the latter part of the last century. Colonel Tayloe was an intimate friend of General Washington, and during the two years in which the house was building, from 1798 to 1800, General Washington visited it a number of times and made frequent suggestions regarding its construction.

The house was intended to equal, if not eclipse, anything in the country at that time. That it has stood for 100 years without any evidence of decay speaks well of the care and material employed in erecting it. The house is built of brick, as are the kitchen, stable and outhouses. Sandstone was brought from Aquia Creek, some 40 or 50 miles distant, in wagons hauled by oxen, to furnish the trimmings for the building.

The lot is triangular in shape, surrounded by a high brick wall, while the building and walls conform to the lines of the street. The vestibule is circular in form, of the circumference of the dome which surmounts it, the doors, sash and glass forming segments of the circle, and all are still in working order. The parlor was originally finished in white and gold. The mantel is made of a composition of cement, painted white, and the remains of the gold leaf are still in some if the relieved parts. Leading into the back hall and dining room are two secret doors, across which the chair boarding runs, no keyholes, hinges or openings showing on the blind side.

THE ART OF WOOD TURNING.—V.

BY FRED. T. HODGSON.

IN sandpapering beads, quirks or moldings more care must be taken than when sandpapering long, straight work. Sometimes the finger will fit nicely in a hollow, when the paper may be wrapped around the finger and applied, this giving a hint which the smart workman will doubtless appreciate. In quirks it may sometimes be necessary to simply fold the paper, sanded side out, in order to get into the bottom of them. Such a process would be necessary with the quirk at A, Fig. 35, and between the beads in the necks of the examples shown. The projecting beads must be sandpapered with care, as they will be ground out of shape before the operator is aware of it, and nothing gives the young turner away quicker than to have his beads ground flat instead of leaving them with a semicircular section, or having the angles which should show clear and sharp ground down to a semiellipse. A little practice will soon discover to the careful workman the best methods of sandpapering his work.

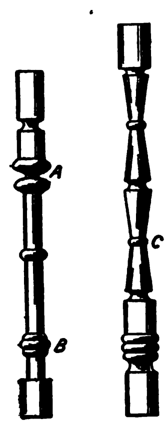


Fig. 35.—Designs for Balusters

The two designs shown in Fig. 35 are intended for balusters for a balcony, or for a railing around a veranda or stoop. They offer a number of good motives for practice. At B there is a square surmounted with a bead, the outer portion of the bead having a diameter equal to that of the base and entailing a precaution on the part of the operator at the commencement of his work not to cut away too much stuff. At C the reverse obtains. Here the bead springs from the junction of two conical sections, and has a diameter no greater than the larger end of the section. In order to make perfect either of the examples at B and C requires considerable practice and a firm command of the tools employed.

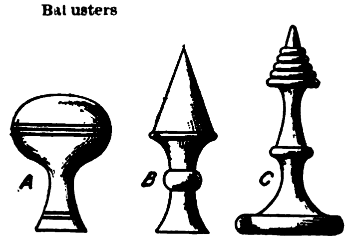
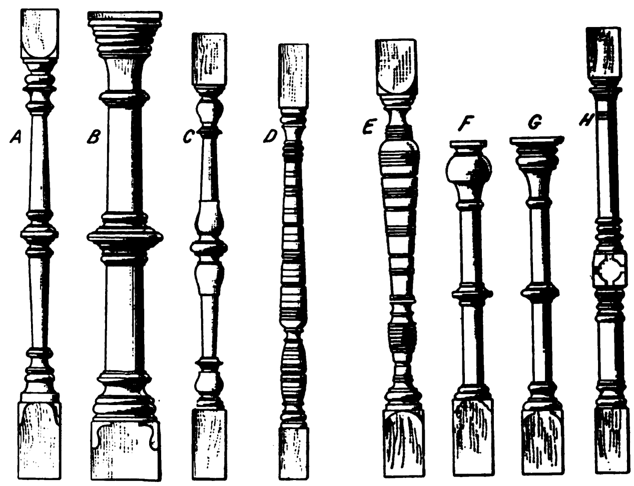


Fig. 36.—Three Designs of "Terminals."



Figs. 37 and 38.—Designs of Turned Work which Secured Prizes at a London Exhibition.

The Art of Wood Turning.—Examples for Practice.

While the operator may depend to a large extent on his own taste and skill in the designing of some kinds of work, these qualities alone will not answer in preparing elaborate designs or in following some given form where the measurements must be exact. In the latter case a full size pencil or ink drawing should be made, showing all the members, quirks and shoulders with the exact lengths and spaces well defined. From this a rod should be made, especially if there are many copies wanted, and all the members should be shown or marked off on it so that all of the dimensions may be transferred to the stuff to be wrought when in the lathe. Sometimes when a great number of pieces of the same pattern are required it is better to put steel points into the rod where the marks are and file them sharp, something like the points of a marking gauge, making the points all in line. When the wood to be turned, or that portion which is to be operated upon, is brought to a cylindrical shape in the lathe the rod with the steel points in it may be applied to the revolving wood, gently at first, and with greater pressure afterward, when the points will cut a series of rings or grooves in the wood at exactly the points where the beads, moldings, quirks and shoulders are required. In this way all the points will be given at one operation.

The full size sketch or design should be tacked up just in front of the turner, so that he may see at a glance if he is following it, and at the same time it will help him to locate the various moldings, for it may be that beads, quirks, ogees and scotias may be so close together that without the design before him the operator will become confused by reason of the numerous lines. The thickness or diameter of the work must be gauged by the calipers, which should always be within convenient reach. When the diameters vary it is well to have two or three pairs of calipers at hand, set to the various diameters, in order to save time, for it might be very inconvenient to set and insert them each time a new diameter is wanted. It will be well, however, to see that each caliper is different in size or shape from the other, as then the turner will not be so likely to pick up the wrong one.

The ability to turn out work like that shown in the examples given, which shall be complete and perfect in every respect, argues quite an advance in the art so far as what is called "plain turning" is concerned, and the operator should find no difficulty, or at least very little, in turning the terminals shown in Fig. 36. The one at A may be made altogether with the gouge, except the shoulder and the grooves in the neck and around the bulb, these being formed with the long point of the chisel, which is held in such a position that the blade will stand on its edge on the rest, the long point cutting the wood on a line with the top of the rest, while the handle of the chisel stands out horizontally with the top of the rest. If a V-groove is desired the handle of the chisel may be held at a slight angle with the line of the work. The terminal B is a little more difficult of execution, as the bead on its largest diameter will be found to interfere with the proper working of the chisel while finishing off the cone. In this case the gouge should be used to make the cove or hollow mold between the beads and the wood for the beads might be left square until the other portions of the work are nearly completed, when they can be better rounded off and with less danger of having the tool dig into them. The beads may be rounded off with the heel or short end of the chisel, the edge reposing on the rest during the operation, the workman moving the handle in suitable angles to meet the requirements. The direction of these movements of the cutting edge of the chisel can only be discovered by experience, but a few attempts at bead making with the short end of the chisel will teach the workman instinctively how to manage the tool so that good clean results may follow.

In turnings like B the point should be the last part to finish, as the chisel can be made to work off the point to a nicety after the shoulder has nearly been cut through and the other part of the work finished and sandpapered. We may say just here that frequently experts turn their beads with a gouge, but the author would not advise the beginner to try this plan, as he would likely find trouble in working down a clean angle. The terminal shown at C, though looking more elaborate than B, will be found easier to work, as it consists altogether of coves and beads, except the "teat" at the top, which must be treated in the lathe the same as suggested for the point of B.

In Fig. 37 are shown four examples of turned work that will require a greater exercise of care and skill than have as yet been demanded in the formation of any of the previous cases. These designs, as well as those shown in Fig. 38, carried off prizes at an exhibition of turned work, which was held in Carpenter's Hall, London, England, some years ago, not because of their being well executed, but because of their classic designs and beautiful proportions. It is partly on account of these qualities that the author makes use of them as examples in this connection, and because they furnish excellent material for lessons. If the learner will take a piece of birch, maple, cherry, or any other suitable wood, 2 feet 6 inches long and 3 x 3 inches dimensions, and attempt to make a spindle or baluster similar to design A, he must first have it carefully centered in accordance with one of the methods previously shown, and properly secure it in the lathe. This being done he will rough off the corners with a large gouge, being careful not to cut the corners in that part designed to be left square. It is better to use a chisel to mark off the shoulders at the points where the squares begin, and to round the piece up to a cylinder between the shoulders. Having rounded the work, leaving the diameter as great as the wood will permit, mark off the various members, leaving the middle cluster in one piece until later on.

Let us suppose that the top A is the end at our right hand. We first measure off the first member from the shoulder, which is a fillet. This will have a face of about ¾ inch, and which will be made by the use of the chisel alone. The dimensions of these parts must, to some extent, depend upon the artistic instincts of the operator. The next member is a very flat ogee, measuring about 1 inch on the face. This must be made with a gouge—a medium sized flat gouge answering quite well for the purpose. After this is a groove, which may be made with a parting tool, or with a very narrow chisel having a square edge. The large half-round, which has a face of about 1¼ inches, may be formed with the chisel, and the fillets underneath, which will tax the careful qualities of the turner, must be made with a small gouge having a pretty long pointed cutting edge. The cove following must also be made with a gouge, but the fillets and the other neck moldings must be made with a chisel. It will be noticed that a gradual reduction of diameter takes place as we approach the lowest member in this group, and it is to this feature that much of the beauty of the work may be attributed. Therefore, the calipers should be applied often while the work is in progress.

Having finished the cluster of moldings at the neck we must finish, or nearly so, a portion of the taper column, the diameter of which is three-sevenths of the largest diameter obtainable from the material employed. This being done we attack the center cluster, first cutting the shoulders down on each side until we arrive at the central column, which, at that point, measures in diameter a little over half that of the largest diameter of the fillet in the center of the work. We here have a torus molding—a small fillet on each side of a half-round—next, a sharp cove finishing with an offset on a quarter-round which finishes on the central fillet. In this case a chisel must be employed in making the torus, the offset, the quarter-round and the fillet, while a gouge may be used for the remainder. The column or plain part may now be finished. The other or lower half of the baluster may also be finished, care being taken that the difference in the size and shape of molding be closely followed. Another thing that must be attended to before the work is taken out of the lathe is the "easings" on the square portions. A glance at the top square at A will show that the corners have been turned off some little distance, indicating a semicircular line on each face of the square. This is easily accomplished with the gouge while the work rotates in the lathe. On the lower square the work is made to show an ogee on the face of the square. These "easements" tend to give work of this kind a light appearance. They may be made in many forms according to the skill and taste of the workman.

The column shown at B is a little more elaborate, but the instructions given for forming A will apply to B with a few variations, which will present themselves as the work advances. In this case the neck moldings show a small fillet surmounting a reverse ovolo or quarter-round and reinforced underneath by two fillets formed as offsets. The central cluster shows some little difference in design, as does also the base, but the learner will have but little trouble in forming these after he has practiced a little on the examples already given. The "easement" at the base of example B shows another style of finishing. The example at C offers several methods of treatment not before introduced. One is the flat ogee moldings shown at the ends and in the center. These are carefully finished and continued until the central column is made, after which the shoulder or offset is made and the column finished to it. The shoulders at the squares are finished without easements. Example D is ornamented with beads and flat bottomed grooves, with a little change at the base and neck and a refined subbase, consisting of quarter-round, double cove and fillet. A chisel and gouge are the only tools necessary in the formation of this example. The shoulders at the top and bottom are left square.

Four other examples, designated as E, F, G and H, are shown in Fig. 38, these varying somewhat from those preceding. Example E shows the taper of the column reversed, the largest diameter being above. In turning this the operator should commence in accordance with the instructions given for making example A of Fig. 37, measuring off and marking the points where the moldings are to project. The moldings on the column consist of small beads or reeds and flat bottomed grooves. These grooves may be formed by first cutting in the shoulders with the long point of the chisel and taking out the center core with an ordinary carpenter's paring chisel of the proper size, or they may be made with the parting tool, finishing with a paring chisel the same as before. There is nothing in this example the operator cannot overcome by the exercise of ordinary care. Examples F and G, while being different in design, offer no serious trouble to the turner who can execute those already given. The difference in design consists in the form of cap and neck, also the columns are perfectly parallel cylinders, with the moldings planted on, as it were. The easements offer new shapes, which may be of value to the turner. The example shown at H is not a part of the prize exhibits, but is presented as a contrast, which we are sure every workman of taste will appreciate. It is a stock example taken from a trade catalogue, and while good enough in its way, is entirely deficient in artistic qualities.

RAISING A BRICK BLOCK.

BY JAMES F. HOBART.

A VERY interesting operation has just been successfully carried out in Pittsfield, Mass., in the shape of raising a portion of the Central Block, a building, 106 x 46 feet, with an extension, or ell, about 40 x 60 feet. The buildings raised form part of a department store, and also contain some manufacturing business. The raising was done without stopping the machinery for a single day, or interfering with the trade of the store.

The parts raised were originally built upon a lower level than the front of the block, and, through the extension of the department store, it was necessary to raise the stated portions nearly 7 feet, a sort of mezzanine floor being built in to utilize the room gained by raising the upper stories of the building.

In Fig. 1 is shown two sides of a part of the structure as it appeared when loaded on screws, ready to be raised. The blocking is on the ground floor of the building, which is entirely occupied thereby. No other portion of the structure is disturbed, except the cellar and a vertical strip where the part to be raised is cut free from the rest of the block. The disposition of the timbering is plainly shown in Fig. 1, where it is seen to be

The blocking shown in Fig. 2 is only temporary, and was put in for the purpose of getting the heavy timbers into position overhead. The timber used for loading the building will be used in framing the extra floor that is to be put in. Fig. 3 shows the same bent as that in Fig. 2, but with the permanent blocking in place and the screws all set ready for raising.

The screws are cast iron with cast threads and all ready for use. I believe they were made in one of the suburbs of Chicago. The screws are ½-inch pitch and have a safe lift of about 15 inches. A flanged collar forms the nut, the threads of which were also cast in. Two pieces of hardwood plank, 2 feet long and 6 inches wide, have a half-circle band-sawed out of each to fit the nut above described. A row of these pieces of plank can be seen in Figs. 1 and 3 beneath the screws. As the building is raised these pieces of plank are followed up by cob house blocking so arranged that only one screw in a place will be extended to any considerable distance.

The scheme for raising was for ten men to do all the work of turning the 500 screws, and of course turning them all alike. Each screw was numbered and a runway of staging built so a man could pass easily from

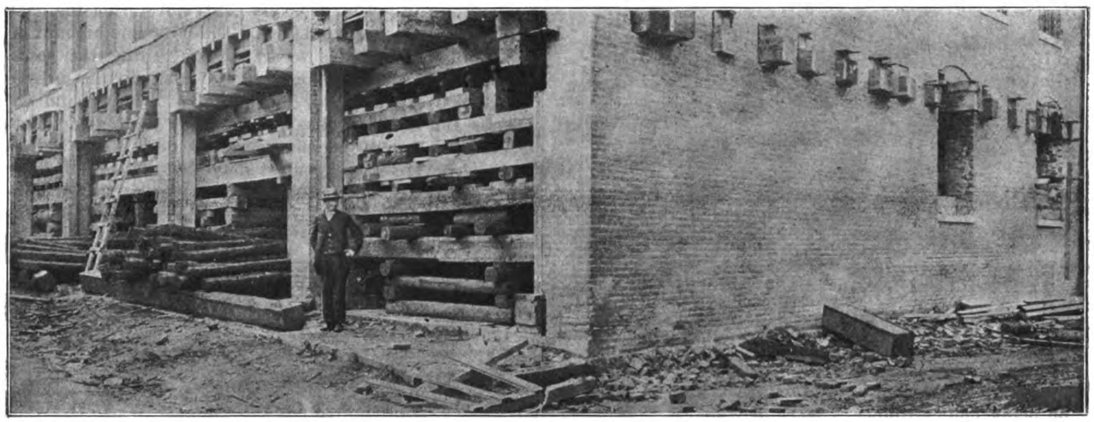


Fig. 1.—View Showing the Building Supported on 500 Jack Screws Ready for Raising.

Raising a Brick Block in Pittsfield, Mass.

in two levels, both sets running completely through the building and crossing each other, thus forming a net work or "gridiron" all over the building, immediately under the second floor. All the blocking is cut into the inside of the wall 8 inches, and the rear of each "cob house bent" is supported upon posts set in the cellar.

It will be noted that the blocking is carried up just inside of the wall, only the supporting timbers projecting. By this arrangement the building can be followed up by the new section of brick wall, without moving a single piece of blocking; the wall is to be built between the supporting timbers, then the latter removed and the remaining portions of the wall built up.

A peculiarity of the raising of this building was the method of supporting the interior during the upward journey. Fig. 2 shows the method of getting the timbers into place. It also shows some of the interior supports, both iron columns and brick piers. These can be removed entirely as soon as the screws take the weight of the building, for the screws being placed close to the inside of the wall, all the weight must come on the timbers outside of the screws. This has a tendency to lift the inner portions of the timbers, using the screws as fulcrums. It is expected that this internal lifting action will carry that part of the building which was carried by the columns and piers, thus making unnecessary any screws in the interior of the building.

one screw to the other. Beginning at No. 1, which was marked with paint conspicuously on the screw, and giving that screw one-fourth of a turn, the man proceeded to No. 2 and gave that a one-quarter turn also. This plan was followed by the men until they had given each of the 500 screws a quarter turn.

If a man was called away to dinner, or at night, he made a note of the number on the last screw he turned. and when he commenced again he knew just where to begin. By making each of the ten men travel continuously as above there was no chance for one section of the building to be screwed up more than another section because one man could not get ahead of his neighbor if he tried to do so.

Fig. 1 also shows the method of timbering a blank wall. The holes were cut in the brick work by means of short crowbars sharpened to square points and used without hammers. The bars were quite heavy, being 1¼ inches in diameter and at least 4 feet long. A man could pick a hole through a 20-inch wall with this tool much quicker than with cold chisel and hammer.

The cutting free of the part of the building to be raised was effected by erecting a light scaffold of 2x4 inch stuff and about 8 feet square at the place where the cut was to be made. A single man with one of the bars described above started at the top of the building and in about two days cut a space more than a foot wide from top to bottom of the brick work, a distance of four good stories.

A timber was run vertically from top to bottom of the detached portion of the building, one on either side, and a rod on each floor was run through from timber to timber to check any tendency of the building to spread when cut free from the main structure.

Considerable difficulty was met with in getting the heavy timbers into place and in holding them there until the permanent blocking was in place. The first timbers had the space underneath them almost completely filled with false or temporary blocking, but later

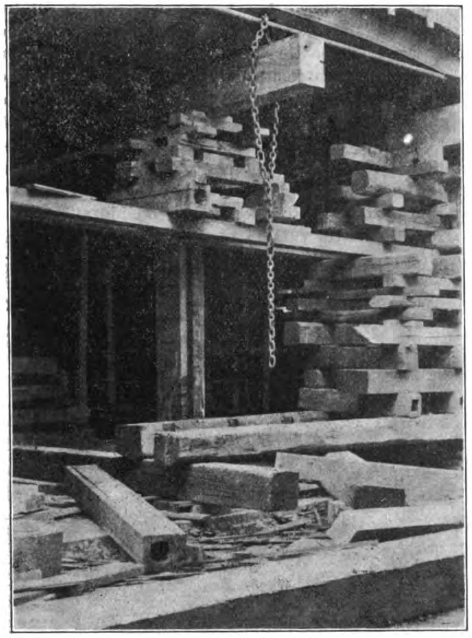


Fig. 2.—View Showing Timbering and Temporary Blocking.

the scheme of using differential chain tackle was used, supplemented by jack screws set on plank hollow timber, a piece of which is seen in the foreground of Fig. 2. Different lengths of these were nailed up of sinch plank, and a screw could be set on the ground and connected in short order with any overhead timber by means of a piece of this handy hollow blocking, and it could be done quickly, too.

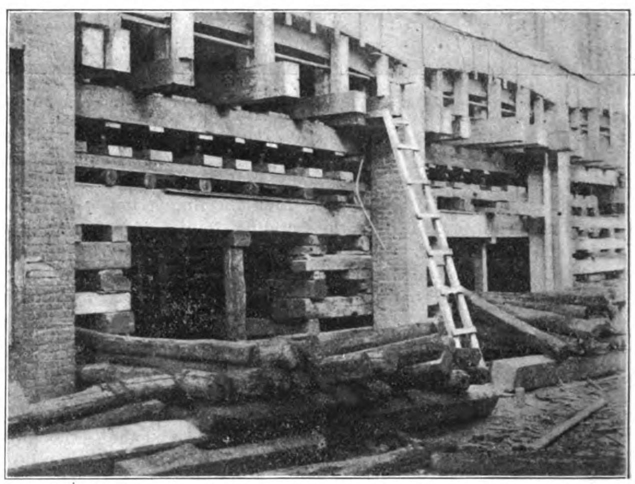


Fig. 3.—View Showing the Method of Placing the Screws.

Raising a Brick Block in Pittsfield, Mass.

Heavy Sills in Balloon Frames.

A writer in one of the architectural journals, discussing the question of heavy sills in balloon frames and the fact that they are rapidly going out of use, says he is not prepared to acknowledge " that the discontinuance is accompanied with good results. Running the ends of the joists to the outside of the wall, and then running a ribbon scantling on their tops to form the sill, cannot be called good construction, though it may be cheap. The whole weight of the building falls on this ribbon piece, and in many cases the studs stand over the space between joists. Particularly is this so where the studding is placed on the sides of windows or doors, and as these studs bear more weight than those between windows it is evident the pressure on the sill is greater, and any settlement at that point is sure to make trouble with the plastering. While we believe in the old fashioned sill, we are free to confess that the construction of a balloon frame when the joists run out to the face of the wall and rest on two rows of bond timbers, and when the studs run down the sides of the joists to the outer bond timber and are nailed or spiked to the joists, is good and solid, so long as the building remains where it is first built. The bond timbers, in all cases, should be well bedded in mortar and left level and true."

Some Statistics of the United Brotherhood of Carpenters and Joiners.

The following interesting figures were made public at the tenth annual convention of the United Brotherhood of Carpenters and Joiners, recently held in New York City:

The report of General Secretary-Treasurer P. J. McGuire embraced the two financial years ending June 30, 1897, and June 30, 1898. It showed that the total receipts during the time came to $154,013.36, and the total expenses to $135,275.15, leaving a balance of $18,738.21 in the general fund on July 1. There are 428 local unions in good standing, having a membership of 31,508 members in benefit. Added to these should be counted 8221 members not six months in arrears and not in benefit, which gives a total of 39,729 active members on the rolls.

During the two years funeral and disability benefits amounting to $84,183.44, were paid, and during the past 15 years the general office paid claims to the amount of $528,706.14, while the local unions during the same period paid $683,644 for sick benefits, making nearly $1,225,000 expended for the benefit of widows and orphans and in aid of disabled, sick and distressed union men. The funeral benefits were $59,108.44.

There were also expended since 1883, $354,293 in support of strikes and trade movements to get better conditions for carpenters. In that period there were 1026 strikes and lockouts, of which 998 were successful, 61 lost and 67 compromised. During the last two years there were 83 strikes, of which 64 were won, 7 compromised and 2 lost. The expenditure on account of these strikes was $8697. Adding to this the sum of $120,000 expended by the local unions in local strikes during the same period, makes a total of $354,293.

IN a house where a good deal of attention has been given to the ventilation there is a small ventilator in the ceiling and one in the base board of each room. The latter is connected with a pipe which goes to the kitchen chimney. The heat creates a continuous current, thus drawing out the stagnant air at the floor. When the hot air register is open the ceiling one needs only to be slightly open to secure excellent ventilation.

WHAT BUILDERS ARE DOING.

THE closing months of the building season show, in the main, a promising tendency to greater activity, the record being an improvement over that of the same period of last year. Builders generally are looking forward to a season of "prosperity," reflections of which from other lines of business are beginning to be felt.

The season has practically closed without any serious labor disturbances at its latter end, and with a marked tendency on the part of the workmen toward the adoption of some method which shall establish the relations between themselves and their employers on a more harmonious basis. Arbitration and joint agreement between the two are slowly gaining ground and each successful experiment adds to the firmness of their hold upon both sides as the only means of securing permanent harmony between the two.

Baltimore, Md.

A slightly better feeling seems to prevail among the builders of Baltimore owing to a tendency to greater activity which is manifesting itself. Among the new projects is one for the erection of 24 dwellings at Peabody Heights to cost about $60,000. The new Massachusetts Building has supplied work to a large number of workmen, and employers and workmen are both better satisfied than they were last month.

The members of the Builders' Exchange recently presented to Everett J. Dowell, building inspector, a testimonial of their regard in the form of a gold badge, bearing a relief of Baltimore's Battle Monument and set with a large diamond. The presentation, which occurred in Mr. Dowell's office in City Hall, was made the occasion of felicitous speechmaking by E. Hall Haswell and S. B. Sexton for the Exchange, and Mayor Malster on behalf of Mr. Dowell and the city.

Boston, Mass.

There is no material change in the condition of the building business in Boston from that reported last month. A fair amount of work is being done in the residence parts of the city, but no new contracts of any importance have been recently let, save that for a new high school building in East Boston, which was let for $203,000. Considerable criticism of the School Committee has been occasioned on account of this contract, it having been let to a bidder whose estimate was not the lowest, and no adequate reason for this rejection of the lowest bid having been given.

With the exception of a few finishing touches here and there, the work of reconstructing the Bulfinch State House may now be said to be complete. Of the original sum of $375,000 raised by loan, fully $40,000 remains unexpended, and will not be used. The original appropriations did not contemplate the furnishings (which good judges said would cost $200,000, and which Everett & Austin, the architects, estimated at $75,000, but which really cost $65,000), and a good many other things have been added by requests of departments, &c., so that it can truthfully be said that of the money appropriated for the direct work of reconstruction $125,000 was left when that work was completed.

The labor unions of Boston are making a strenuous effort to obtain the introduction of a clause in all contracts under control of the School Committee providing for the employment of union workmen only.

An attempt is being made by the Mayor of Boston to divert the Franklin Fund from the purpose to which it was voted by the executors (*i. e.*, the erection of a trade school) to the erection of public baths in various parts of the city. The Mayor's purpose is meeting with strong opposition, and the Master Builders' Association, among others, is taking active measures to prevent the diversion of the fund to any other use than that already decided upon.

Chicago, Ill.

Chicago builders are generally of the opinion that comparatively little new work will be let before snow flies. Since the first of November there have been issued permits for the new Schlesinger & Meyer Building, to cost upward of half a million, and for the erection of the remainder of the McCormick Buildings on Michigan avenue.

A hopeful feeling prevails as to the opening of next season, it being generally felt that conditions will be improved over the close of the present season. The permits issued in October amounted to $1,799,450, against $1,543,570 during the same month last year.

It is stated that Mayor Harrison recently pledged his support to the labor unions in their effort to secure the prohibition of employment of non-union workmen on municipal work of any kind.

Detroit, Mich.

Indications point to an improvement in building generally in Detroit, and contractors are beginning to feel that the long period of dullness shows signs of breaking. The amount of new work projected during October, as indicated by the estimated cost of buildngs for which permits were issued, shows very marked improvement over the record for last year, the amount for 1898 being $486,200, against $295,900 for 1897. One of the most serious causes of complaint during the past year was the fierceness of competition, work being taken so low that a profit was almost out of the question. A number of serious complications affecting well-known contracting firms have resulted from this condition of affairs and its effects have been universally felt to a greater or less extent in all branches of the business.

Denver, Col.

During the month of September building in Denver showed decided symptoms of improvement. There were taken out permits for new structures and for making additions to buildings already erected amounting to $187,700. It is safe to say that these permits will represent at least $225,000 invested before the buildings are competed. At least two of the permits were for basements only, and one of these, the Union Pacific, Denver & Gulf freight depot, while it calls for $2000 for basement, really represents $50,000 that is to be invested in that building. The number of building permits during October was 88, representing an estimated cost of $163,000, against 66 in 1897, costing $117,700.

As compared with the previous five years, October's showing was excellent. Corresponding months for three years are as follows: 1897, $117,700; 1896, $88,300; 1895, $68,300; 1894, $71,000, and 1893, $26,580. The million and a half mark has already been reached in building permits for this year, and there are some who are sanguine enough to claim two millions before the year is over.

Cleveland, Ohio.

October building permits in Cleveland showed a perceptible gain over the figures for last year. The number of permits issued was 265, for buildings to cost in the aggregate $358,720, against 275—$322,490 for the same month in 1897.

Kansas City, Mo.

During the month of September there were issued 71 building permits in Kansas City proper and 30 in the annex, against 80 permits in the city proper and 28 in the annex for the corresponding period of last year. The estimated cost of the buildings for which permits have been obtained in the city proper was $470,895 and in the annex $77,225, making a total of $548,110. No estimates of cost were made in connection with building permits for the corresponding period of last year. The largest building undertakings of the month were the Massachusetts office building, on the corner of Charles and Fayette streets, and a block of residences costing $60,000, to be built on St. Paul street, in the northern annex. During October the total number of permits issued was 363, estimated to cost $281,380, against 209, to cost $147,220, in 1897, a gain of nearly 100 per cent. The building formerly owned and occupied by the Builders and Traders' Exchange is now being used as a barracks for the soldiers of the Third Regiment, formerly in quarters at Fairmount Park.

Lynn, Mass.

Contractors and builders of Lynn are feeling much encouraged over the report that a syndicate of outside capitalists has been formed to develop property along several of the principal business streets, now occupied largely by old fashioned wooden buildings. It is stated that the plans are already drawn for one large building on Oxford street next to the Telephone Building, and that others are in process. It is understood that several hundred thousand dollars will be spent in improvements, and that an effort will be made to make Oxford street one of the principal business streets of the city.

Louisville, Ky.

The latter end of the building season in Louisville shows a marked improvement over the same period of last year. October permits represented building to the amount of $158,182, against $108,692 for October, 1897. The increase represents work, a large portion of which was confined to dwelling houses and smaller business buildings, the number of large individual contracts being comparatively small.

Milwaukee, Wis.

The members of the Builders and Traders' Exchange have begun active preparations for entertaining the delegates to the twelfth annual convention of the National Association, which is to occur in Milwaukee during the second week in February, 1899. Henry Ferge is chairman of the committee having the matter in charge, and nothing will be left undone that would contribute to the comfort and pleasure of the visitors.

No marked change in the volume of building in Milwaukee has occurred since the last report, and there is little prospect of any work of importance being done before next spring. During October permits were issued for 112 operations estimated to cost $279,799, against 122 operations costing $276,893 in 1897.

Minneapolis, Minn.

Building in Minneapolis during October showed a considerable improvement over the same month of last year; the total cost of improvements, as indicated by the permits, being $245,120 in 1898 and $170,445 in 1897. It is expected that little new work will be offered before spring.

New Orleans, La.

Building still continues dull in New Orleans, and contractors do not seem warranted in hoping for much improvement in the immediate future. The estimated amount of building work done in October was $86,588, an improvement over the amount of work done in the same month last year of about $17,000. Most of this work was confined to residences and alterations.

New York City.

It was reported about the middle of November that an agreement had been reached whereby the Building Trades Council and the Board of Walking Delegates had adjusted their differences, which have been the cause of the majority of the strikes in the city during the past ten months. It was stated that the unions composing the two central organizations were united in the belief that there should be but one central body for the government of all the unions in the building trades in the city. At the time this was being written it was said that a joint committee from the two organizations was at work forming a single body which should represent the whole. While it is not so stated it is tacitly understood that the creation of the new central body will divest the business agents of the unions to very considerable extent of the extensive powers to order sympathetic strikes so liberally made use of by the Manhattan Board of Delegates in the past.

The new central body will also mean previous application to the unions interested for permission to order sympathetic strikes, and the commencement of consistent efforts to bring about settlement of disputes between employers and employees by arbitration. Its existence, it is said, will be a triumph for the principles to realize which the Building Trades Council was organized—*i. e.*, joint agreement with the employers' associations so far as practicable and opposition to unrestricted sympathetic strikes.

Just at present building interests are quiet, the majority of work now coming from the architects being alterations and improvements in buildings that need modernizing in order to compete with those erected during recent years. A comparison of the estimated value of all building operations in the Boroughs of Manhattan and Bronx during the month of October shows a very slight gain over last year so far as the amount of capital involved is concerned. The estimated value of improvements in October of this year is given as $6,038,065; in October last year $5,470,954.

Pittsburgh, Pa.

The report of Superintendent J. A. A. Brown of the Pittsburgh Bureau of Building Inspection for the month of September shows that the total number of permits issued for new buildings during the month was 166. Ninety of these were for brick buildings, 66 for frame, six brick and stone, two brick and frame and two for iron. The total cost of these new buildings was $470,486, a decrease of about $5000 as compared with the same month last year, but there was an increase of three in the number of buildings. Permits were issued for 50 additions, with a total cost of $83,190, while the cost of 45 permits for alterations and repairs was $10,645, making the total cost of all the permits issued $564,321.

During October 133 permits were issued for new buildings estimated to cost $482,278, a considerable falling off from the record of the same month in 1897, which overran the million mark.

Operations for the expired ten months of the year show gratifying progress, not alone in the number and cost of improvements but in their character and general appearance. Taking into the account reconstructions and repairs, of which there was a large number, and some of them costly, the ten months' operations would exceed $3,000,000.

Philadelphia, Pa.

The report of the Bureau of Building Inspection of Philadelphia for the month of October showed that 1175 permits were issued, covering 1411 operations, whose estimated cost was $1,410,420. This is an increase over the same month last year of 305 permits, but a decrease of 150 in the number of operations, and of $778,475 in the estimated cost. As compared with September there was an increase of 411 in the number of permits and 276 in the operations, but the estimated cost fell off $252,745.

From January 1 to the first of October, 1898, the record of the Bureau shows that 5879 permits had been issued, authorizing 10,270 operations, with an estimated expenditure of $18,374,355. The records show that included in the work for which permits were granted were 3337 two-story brick dwellings estimated to cost $5,304,400; 1277 three-story brick dwellings at $5,196,950, and nine four-story dwellings at an estimated cost of $94,500.

Portsmouth, N. H.

The Portsmouth *Herald* of November 4 makes the following statement: "Carpenters are much needed in this city, and builders find it difficult to get all the men they require to complete work now under contract. Several carpenters from Dover have been obtained this week to fill vacancies in the gang of men employed on Thomas A. Ward's new house caused by some of the workmen being required in the navy yard. Building in this city at the present time is very brisk. More masons are needed here also, the work on the power house having exhausted the supply of mechanics of this grade. Although the present year has been one of great activity in the building line it is predicted that next season will see more buildings erected than for many years.

Rochester, N. Y.

Secretary J. Herbert Grant of the Builders' Exchange of Rochester writes that there has been a perceptible improvement in building over last year, but that there is little to warrant an anticipation of further gain before next year. General business of all kinds appears to be in a better condition than it was, and builders are hoping that its effect will be felt by them.

San Francisco, Cal

The record of building during October shows a continuation of the long period of dullness from which the city is suffering. Building permits for the month show an investment of $252,209, against $357,728 in 1897 and $818,270 in 1890. Since 1890 the record of building for the first ten months of the year, with the exception of a brief revival in 1895 and 1896, has steadily declined from $9,593,014 to $3,052,012 in 1898.

It was confidently expected that the month of October would produce a good total of building contracts, but in this respect the figures are very much of a disappointment. Both in numbers and value is the record lower than for many years past. The building fraternity express the hope and belief that operations will be more actively resumed after election matters have been settled and forgotten. The poor record for the month helped to pull down the total for the year to date, so that the value is smaller than for any similar period since 1882.

Springfield, Mass.

The builders of Springfield, Mass., early in November perfected the reorganization of the Builders' Exchange. The following officers were elected: President, L. O. Eaton; vice-president, T. D. Gilbert; secretary and treasurer, W. A. Webster; directors, C. J. Blackstone, E. W. Shattuck, J. S. Sanderson, W. D. McKenzie, L. H. Scott, W. A. Newton; Membership Committee, G. M. Burnham, W. A. Newton, E. T. Davis.

It was voted to hold meetings once a week and also to reduce the initiation fee from $10 to $5. Those members who had paid their dues at the time the organization began to omit its meetings some time ago will be considered members, and an effort will be made to get them back into the organization again.

Washington, D. C.

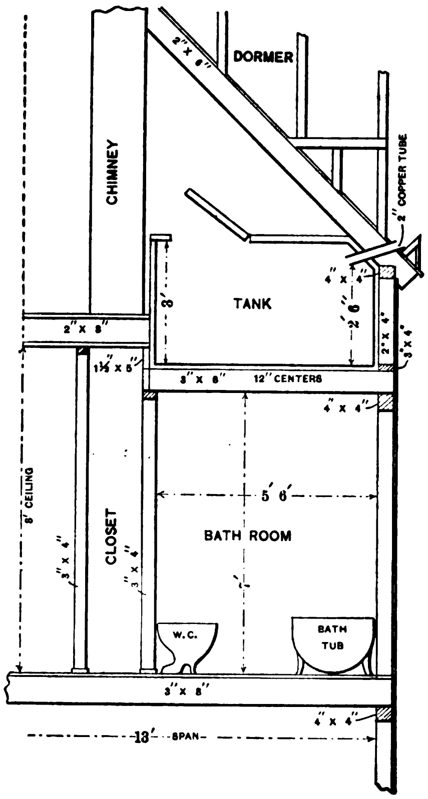
The damage to the Capitol at Washington occasioned by the explosion of gas and resulting fire appears to be less than at first feared. The most serious damage seems to have been to walls and foundations in the vicinity of and under the Supreme Court chamber. The document room, adjoining the chamber, containing manuscripts and transcripts from the lower courts, was seriously damaged, the ends of the tightly folded papers being badly charred. It was thought at first that the great dome might be affected by the disturbance to the foundations, but up to the time of this writing no authoritative statement that its security is menaced has been given out. The cause of the explosion and fire seems unquestionably due to a gas leak in the pump room, which is in the basement.

About $400,000 worth of new buildings is reported for the month of October, an amount comparatively satisfactory in view of the record of previous months of the year.

CORRESPONDENCE.

Some Questions in Plumbing.

From N. H. D., *Newburgh, N. Y.*—I submit to the readers of *Carpentry and Building* a problem which I hope some who have had experience in the line indicated will solve for my benefit and for the possible interest of others. The sketch which I inclose represents a section through the attic portion of a building, including the bathroom and tank which is to supply the bathroom fixtures, as well as the range boiler in the kitchen. As will be seen, the tank is placed over the bathroom and is the full size of the ceiling, 5 feet 6 inches wide, 6 feet 7½



Some Questions in Plumbing.

inches long and 3 feet deep. It is 2 feet 6 inches from the inlet tube to the bottom of the tank, with the overflow on a level with the inlet. The hight of the ceiling of the bathroom is 7 feet, or 1 foot less than the ceiling of the other portions of the attic, all as shown in the sketch. The location of the tank inlet and bathroom fixtures is also clearly indicated, as well as the chimney shaft and closet. Enough is also shown to indicate my idea of framing that portion of the building.

The first question is, how many gallons of water will a tank of this size hold, and what will be the weight of the tank when full of water?

2. Will 3 x 6 inch floor beams placed 12 inches on centers and bridged, with one end resting on a 4 x 4 inch tie, the other end resting on a 3 x 4 inch partition, the partition having 3 x 4 inch plate and sill, be sufficiently strong to carry the load when the tank is full? The floor beams under this partition are 3 x 8 inches placed 16 inches on centers and the span 13 feet, the floor beams having two rows of cross bridging of 1½ x 3 inch spruce.

3. What is the best plan for plumbing from tank to boiler and other fixtures, the soil or waste pipe to be of 4-inch iron and run down alongside the chimney to the cellar, the sink to be set about 8 feet to the right of the chimney on the sketch? I should like to know the size of pipe and the best kind for the purpose.

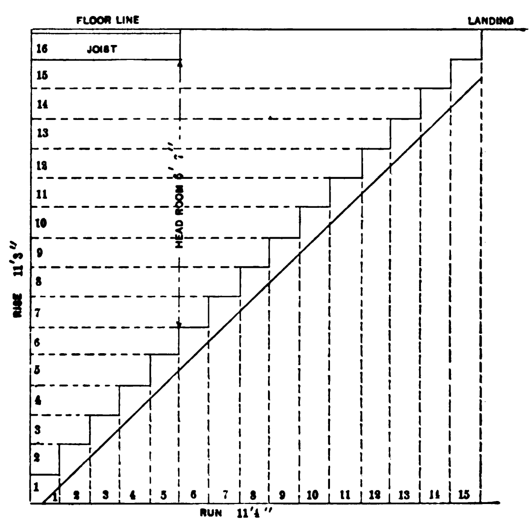
4. Which would be the better plan, to run the overflow pipe to the leader at the back of the tank or into the soil pipe, the latter extending through the roof? The gutter on this side would run the full length of the house—that is, 38 feet. The inlet from the gutter to the tank to be of 2-inch copper pipe with stop or shut off, and to be from 12 to 24 inches from the leader, the leaders being of 4-inch galvanized iron.

5. Will the gutter shown be large enough to carry off the water from the roof, the longest rafters being 16 feet, the others averaging 14 feet in length. I would mention that the gutter is 5 inches deep and 8 inches wide at the top. If some of the readers of *Carpentry and Building* will answer the above questions they will confer a favor on me and no doubt will afford valuable suggestions to other readers of the paper.

Finding Treads and Risers with the Steel Square.

From A. K. C., *Cuyahoga Falls, Ohio.*—If the editor can spare me a little space I will endeavor to aid "E. O. J.," St. Martinville, La. Take the hight, 11 feet 3 inches, and divide it into any number of equal spaces, say 16, giving 16 risers of 8 7-16 inches each. Divide the run, 11 feet 4 inches, into one less space—that is, 15—giving 15 treads of 9 1-15 inches each, or 9 1-16 is near enough in most cases. Then 8 7-16 on the tongue and 9 1-16 on the blade will give the cut for the string boards, or horses, as they are sometimes called. I inclose a diagram which if followed in cutting out the opening for the stairs will prevent any bumping of heads on account of scant head room. The diagram is so clear that I think it explains itself.

From H. A. F., *Port Antonio, Jamaica, W. I.*—In the October issue of the paper I notice "E. J. O." asks how to find with the steel square the treads and risers when a limited space is given. Having in view the dimensions which he mentions, I would say get a strip of pine or any other wood 1¼ inches wide and ¾ inch thick and



Finding Treads and Risers with the Steel Square.

make in it at each end a slot so that the steel square will pass through. This is called a fence. Then set the fence to 9 1-16 inches, or nearly so, on the blade of the square and 8 7-16 on the tongue. Screw the fence so that the square will not slip and then move along the plank of which the stringpiece is to be made, taking care to hold the square tight to the plank so that it will not slip. Spacing off the required distance the operator will obtain by this means 15 treads and 16 risers.

Softening an Oil Stone.

From G. P. O., *Dubuque, Iowa.*—Do you or any of the readers know how to soften an oil stone so that it will cut? I have ground it off, but it does not take hold.

Note.—If the stone has become so gummed that it will not cut it can be readily cleaned by washing with kerosene oil. If, however, as our correspondent states, he has ground it off so as to expose a new surface, and still it will not take hold, we would strongly advise throwing it away and getting a new one. We lay the question before our readers, however, and shall be glad to have them discuss it in the light of their own experience.

Plans for a Modern Carpenter Shop.

From S. & H., *Bowmanville, Ontario.*—Will some of the practical readers furnish in *Carpentry and Building* plans for a modern carpenter shop to contain power and the following machines: Surface planer, buzz planer, sticker, shaper, circular, band, jig and swing saws, lathe and vertical borer and mortiser? The plans should also show bench room for half a dozen men. I think this is a subject of interest to quite a number of readers, and I should like to see all who have had experience in this line send in plans for publication together with such information as they possess. What is wanted is a shop with machinery located so as to economically handle such work as is necessary in a good class of houses.

Strength of Roof Trusses.

From P. C. D., *Richmond, Maine.*—I would like to know the strength of the two trusses shown in Figs. 2 and 3 of the sketches which I send and if they are safe to sustain the roof indicated in Fig. 1. The pitch of the roof is 1½ inches to the foot and the span of the trusses is 28 feet between bearings. They are placed 12 feet apart. The trusses are made of 2 x 8 plank, the chords of three pieces and the struts of two pieces spiked together as indicated in the end view, Fig. 4. In the building, which is 28 x 200 feet, are eight rooms and the roof is to be put on so that the ridge will be at right angles to the walls. If some of the readers will give a rule for figuring the strength of a truss I would like to have it.

Answer.—The inquiry of our correspondent was submitted to Mr. F. E. Kidder, the well-known consulting architect, who furnishes the following in regard thereto: The trusses shown will support the roof and ceiling for a number of years, but will probably sag considerably, and in time the shallow truss may give way owing to the drawing of the spikes. Both trusses contain sufficient material, if properly arranged and secured, to make them absolutely safe, but the design is not a good one for wooden trusses, although quite suitable if steel is employed. The direction of the trusses produced in the braces and uprights of both trusses shown in Figs. 2 and 3 is indicated by the arrows which have been drawn on the sketches submitted by the correspondent. The braces marked T are in tension—that is, they pull up on the lower joint—and the uprights P act as posts instead of ties.

In a truss built up of planks in this way it is better to have the tension members vertical, as indicated in the trusses shown in Figs. 5 and 6, which are properly proportioned to sustain the roof shown with a snow load of 30 pounds, and a plastered ceiling on the tie beam, assuming that the roofing material is iron or tin. Even these trusses are objectionable if they are spaced as far apart as in the building in question, owing to the fact that the stresses transmitted by the braces are very considerable and it is difficult to hold them securely by means of spikes. Moreover, spikes draw out more or less from the warping of the planks. Experience shows that trusses built of planks spiked together sag much more than trusses built with rods, as shown at the right of Figs. 5 and 6. These latter trusses are much to be preferred to the plank trusses. The 4 x 8's and 6 x 8's may be built of plank spiked together if desired, as in this case there is little to force the planks apart. One great advantage of the rods is that they enable any settlement due to loosely fitted joints or to shrinkage to be taken up. In all of these trusses the planks of the bottom chords should be in one length from wall to wall. For the top chords it is not so essential that this should be the case.

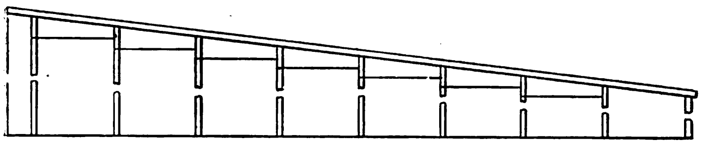
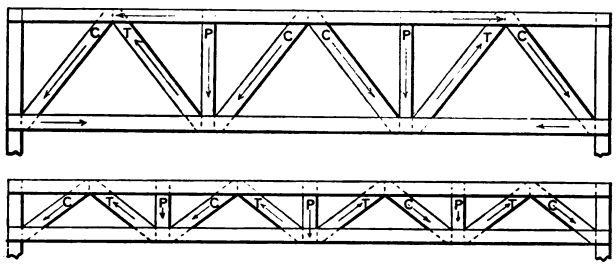
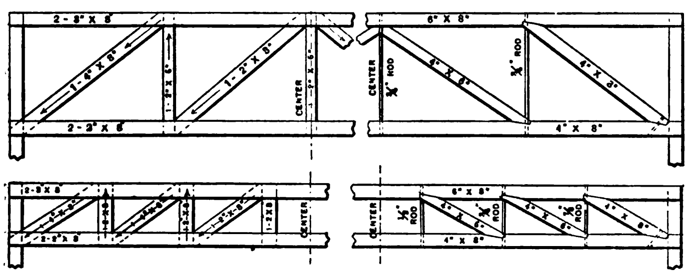


Fig. 1.—Section of Half of Roof.



Figs. 2 and 3.—Views of the Two Trusses.—Scale, ⅛ Inch to the Foot.



Figs. 5 and 6.—Views of Trusses as Suggested by Mr. Kidder.—Scale, ⅛ Inch to the Foot.

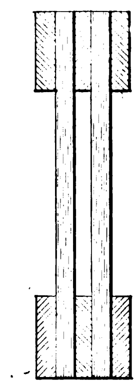


Fig. 4.—End View of Truss.

Strength of Roof Trusses.

Filing Cross Cut and Rip Saws.

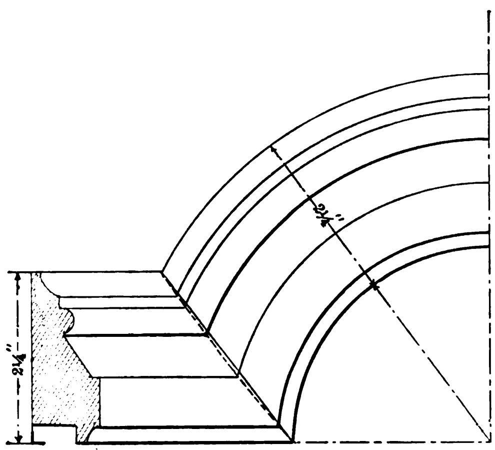
From G. T., *North Adams, Mass.*—Will you kindly tell me what sizes of files to use for cross cut saws having 11 teeth to the inch and 9 teeth to the inch; also a rip saw with 6 teeth to the inch? Is it best to file toward the handle or point?

Note.—This question opens up a good deal of a discussion, for the reason that there are good filers who advocate different methods of doing the work. With regard to the size of file to be employed it is better to use one about as small as can be and yet not cause one tooth to lap while the filing is being done on another. As to the last question asked by our correspondent, there are advocates of both methods, some arguing it is better to file toward the point, and others equally experienced who argue in favor of filing toward the handle. If the filing is done toward the handle the file is apt to catch on the edge of the tooth and cause it to "chutter," and the cutting edge of the tooth will be found to be a little rounded. If the filing is toward the point there is less vibration of the tooth and the feather edge will be carried out, consequently leaving the edge of the tooth sharper.

We, however, submit the questions of this correspondent to our readers, and shall be glad to have the expert saw filers express their preferences as to the methods of filing.

Obtaining Miter Line for Straight Molding Meeting a Curved Molding of Same Profile.

From J. M. S., *Madera, Cal.*—Will you please explain through the columns of the paper whether there is any rule for mitering a straight molding meeting a curved



Obtaining Miter Line for Straight Molding Meeting a Curved Molding of Same Profile.

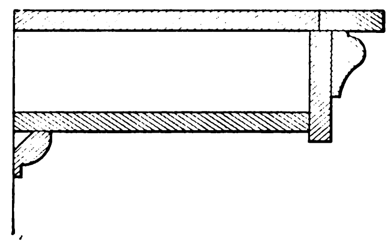
molding of the same kind and width, so that all the lines will member? I inclose sketch, from which it will be seen that the inside lines do not member.

Answer.—In all cases where a straight molding is intersected with a curved molding of the same profile at whatever angle, the miter is necessarily other than a straight line. The miter line is found by the intersection of lines from the several points of the profile as they occur respectively in the straight and the curved moldings. In order to find the miter between two such moldings, first project lines from all of the points of the profile indefinitely to the right, as shown in the elevation of the sketch. Now, upon the center line of the curved portion, or upon any line radiating from the center around which the curved molding is to be carried, set off the several points of the profile, spacing them exactly the same as they are in the elevation of the straight molding. Place one leg of the dividers at the center of the circle, bringing the other leg to each of the several points upon the center line of the curved molding, and carry lines around the curve, intersecting each with a horizontal line from the corresponding point of the level molding. The dotted line drawn through the intersections at the miter shows what must be the real miter line.

If our correspondent desires especially to make a straight miter line, the profile of the curved molding can be raked or modified to suit the requirements of the case.

Rake and Level Moldings.

From J. P. B., *Princeton, Ill.*—In a recent number of *Carpentry and Building* is a diagram showing how to join rake and eave moldings without using two kinds. There is no explanation given, but as I understand the engraving it gives a very narrow fascia on the eave cornice. I do not like its appearance very well, and I send



Rake and Level Moldings.—Fig. 1.—Sectional View of Raking Cornice.

two sketches, Figs. 1 and 2, showing a method I have often employed, one of which is adapted to any pitch of roof and any style of molding, and looks well when built. The style shown makes a handsome cornice, and, when properly constructed, is a solid job. Cut the rafter so that the fascia can be put on plumb; then tip the crown and the bed molding out until they stand square with the pitch of the roof. Take off the back of the molding so that it will fit against the fascia. I have often made drawings for eave moldings to stand plumb and miter with those on the rake, but have found that it is so much work to get them out, especially if the pitch of the roof is steep, that I do not make them any more. One would hardly recognize an ogee eave molding made to fit a half-pitch roof, as it would be so much distorted.

Words for the Young Builder.

From L. J. AIMAR, *Port Richmond, N. Y.*—In reply to "E. J. O.," St. Martinville, La., I would like to say that I am pleased to know he has found "Words for the Young Builder" of interest, and I trust others will so find them, as it will cancel some of my many obligations to *Carpentry and Building*. His proposition that I submit a few words each month shows his appreciation of my past efforts. While I cannot see my way clear to comply with his request just at present, I may promise that he shall hear from me occasionally. Space, it must be remembered, is valuable, and I doubt if the Editor would permit me to monopolize it. Meanwhile I would advise the correspondent to give ear to the letters

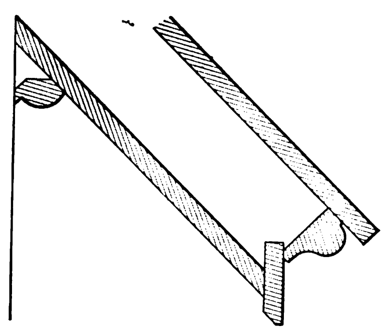


Fig 2.—Sectional View of Eave Cornice.

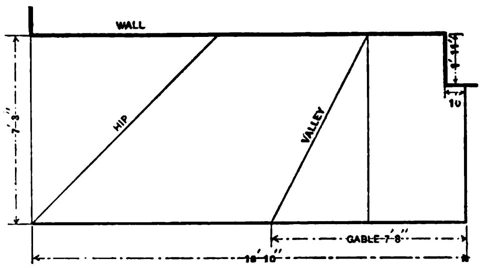
brought forth through "Words for the Young Builder," as the chances are he may learn a few points from them also.

His request for my opinion as to the best works upon the steel square I would answer by saying—to be square with him—that I consider the work by Fred. T. Hodgson as good as the best. It can be had of the publishers of *Carpentry and Building*, if I am not mistaken.

I am much pleased with the letter from "Architect," New London, Conn., and must thank him for the way in which he has stood by me. I want to say for "Words for the Young Builder" that they were written just as they occurred to me without previous thought or correction. Could I have foreseen the interest that they appear to have awakened I should probably have presented them differently—in better form, perhaps, though I seriously doubt if my forte is that of a writer. Writers, like poets, and I think true architects, are born—never made. There are many things that I have not touched upon which might have proven of interest. Some day perhaps I shall submit a sequal to "Words for the Young Builder," giving actual experiences with—well, never mind what with.

Lengths and Cuts of Rafters for Porch Roof.

From D. R., *St. Thomas, Ontario.*—Will some reader of the paper be kind enough to tell me through the Correspondence Department how to get the lengths and cuts of the principal valley and jack rafters of the



Lengths and Cuts of Rafters for Porch Roof.

porch, a sketch of which I inclose? The veranda roof has a rise of 2 feet 5 inches.

Fisher's Sliding Bevel.

From J. F. S., *Moffatt's Creek, Va.*—Can any of the readers of *Carpentry and Building* tell me where I can buy a sliding bevel that was patented by W. T. Fisher in 1868? It has a blade 12 inches long, and has a protractor on it so that it can be set to any degree. It also has a level glass in the stock. I have seen two or three of them, but I cannot find where they are to be obtained, so I thought I would come to you, as some of the many readers of the paper might be able to tell me what I want to know.

Finishing Coat for Walls.

From PROSPECTIVE BUILDER, *Troy, N. Y.*—Is there any plaster better than ordinary lime? It has always been my purpose to use a good plaster but to give the walls no finishing coat. When the rough coat of good plaster is dry I intend to cover it with wall paper instead of a white or finishing coat of plaster. Such wall paper would, of course, crack in course of time, but would it not be as cheap or cheaper in the end than putting on a finishing coat of plaster, only to be obliged in a year or two to cover it with wall paper?

Note.—We see no reason why our correspondent should not obtain entirely satisfactory results with ordinary lime in making his plaster. Whether it is the best material for the purpose which the market affords is a question on which there is likely to be a difference of opinion. If he desires to paper the wall, we see no necessity for the finishing coat of plaster provided the work is carefully done. We, however, lay the matter before our readers to the end that they may express their individual opinions in the light of their own experience.

Truss for Self Supporting Roof.

From C. K. S., *Wayland, Iowa.*—On page 225 of the current volume of the paper "J. C. B." of Hickory Corners, Mich., asks for more definite information relative to the roof truss about which I inquired. I would say that the roof is intended to cover a hall 36 feet wide. The main auditorium will be 36 feet wide by 44 feet long, with a stage at the rear running the length of the building, and 16 feet deep, thus making the entire building 60 feet long. The ceiling is 14 feet in hight. We want to put on a tin roof. The walls are plastered and the ceiling is ceiled. I will be very glad if the correspondent named, or any other, would furnish drawings for some such building to be published in the columns of the paper, as I think they would be of great interest to many readers.

Cleaning Copper Cornices.

From CORNICE MAN, *Missouri.*—I should like to learn of a solution to clean planished copper. I have made a copper bay window, and have cleaned it with dilute vinegar and muriatic acid, which has left it with such a variation in color that I will have to go over it again with something better. Will some of the readers tell me what to use?

Should a Front Wall Trap be Used?

From T. R. W., *Port Gibson, Miss.*—I would like a little information in reference to the use of a front wall trap. There is in a house here a washstand, bathtub and siphon water closet, and the waste from the bathtub to the washstand properly trapped and back aired, the back air pipes running independent through the roof and the waste connecting with a 4-inch soil pipe. This 4 inch pipe also receives the water closet connection and extends through the roof. The soil pipe runs to a terra cotta elbow about 1 foot below the surface of the ground, and this pipe runs to a cesspool about 100 feet distant. What I desire to know is, is it necessary to put in a running trap of terra cotta where the iron pipe connects with the terra cotta to prevent the entrance of sewer gas, which might force itself through the trap seals in the fixtures? Is sewer gas likely to be formed in the cesspool? Would it be a good plan to leave out the trap and put a fresh air inlet in the top of the cesspool, so that a current of fresh air would be continually circulating through the cesspool, the terra cotta drain and the soil stack? By this means a current of air would be passing through the system and out of the pipe above the roof continually.

Note.—There is a difference of opinion among good plumbers about this point. The larger part favor the use of the front wall trap to serve as a barrier against the entrance of odors or gases that are likely to form in the cesspool. They would connect a fresh air inlet from out of doors only with the house drainage side of the running trap. Fresh air then would circulate through the waste system in the building without the possibility of the air from the cesspool entering to increase the danger that might arise from a leak in the pipes. In the decomposition of the matter discharged into the cesspool there will be a generation of gases and odors which it is not desirable to have pass through a building. It is desirable, however, that the vent pipe should connect with the cesspool to allow whatever may be generated to pass off harmlessly to the atmosphere. The discharge end of such a pipe should be high enough and so located that its harmlessness is certain.

Rule for Finding Capacity of Tanks and Cisterns.

From H. E. M., *Roland, Man.*—Kindly give me through the columns of *Carpentry and Building* a rule for building a cistern or tank, either square or round, to hold any number of barrels, as I have some tanks to build that must hold about 20 or 25 barrels and have no rule to figure dimensions.

Answer.—When the number of barrels which the tank is to hold is known it is best to find the number of gallons first. For example, if the tank is to hold 25 barrels, and 40 gallons is taken as the capacity of the barrel, it will be seen that the tank must hold 1000 gallons. It is easier to figure the dimensions when the contents of the tank are known in cubic feet, and as there are 7.48 gallons in a cubic foot it is only necessary to divide the 1000 gallons by 7½ to find that the tank will have a capacity of

133 cubic feet. As a rule, the depth of such a tank or cistern is of importance, owing to the space which the tank must occupy, or the depth to which a cistern must be sunk in the ground. Consequently, by dividing the cubic contents by the depth, which we will assume in this case to be 6 feet, it will be found for a tank to hold 133 cubic feet that its area must be 22 square feet. By extracting the square root of 22 it will give the exact length and width which the tank must be made, or by making the tank 4 x 5½ x 6 feet deep it will hold exactly 1000 gallons. It is probable that a somewhat larger tank would be better, to allow for emergencies. If a round cistern is preferred, the 22 square feet should be divided by 0.7854, which will give 28, and by extracting the square root of 28 the diameter of the tank will be found to be a few inches in excess of 5 feet. If the tank is to be built of wood or sheet iron it is necessary that it should be supported on a firm foundation, and that in addition to being tight it should be built so as to be strong, with stays and braces provided for the purpose. If the cistern is to be of masonry and in the ground it is well to have a strong bottom made of several courses of brick laid in cement mortar, and the thickness of the side walls will be governed by the size of the tank. It is not well to have less than 13-inch walls, and the walls should be laid in cement mortar and grouted to make sure that all spaces between the bricks are thoroughly stopped. The bottom and the inside walls of the cistern, whether round or square, should be pargeted with cement mortar. For cisterns built in the ground the round form is usually looked upon as preferable, and in some instances they are drawn into a dome shape at the top, leaving a comparatively small opening through which the water can enter and the pump be inserted, and also to afford opportunity for a person to enter the cistern and thoroughly clean it as often as occasion requires.

Paper Under Tin Roofs.

From C. K. S., *Wayland, Iowa.*—I would be very much pleased if some of my brother carpenters would give me their opinions on the following question: In 1896 there was built in this town a small storeroom which was covered with IC tin. The boards were first overlaid with common building paper on which was placed the tin, the boards being quite wet. Now the tin roof is rusted through in a number of places from the under side. Did the paper cause it? I hope some of the readers will give this matter attention as the building has caused a good deal of expense. I would also like to ask if paper should ever be used under tin.

Note.—The question raised by our correspondent is one which has attracted no little attention in the trade and about which there seems to be some diversity of opinion. Paper is often placed beneath the tin of a roof, not so much, perhaps, to absorb moisture as to prevent the warm air of the building coming in contact with the cold metal and thus condensing the moisture under it. In the case of a new building there is a much greater amount of moisture in the wood, plaster and brick than there will be after these have had ample time to dry out. Then, too, very much depends upon the contents of the room as to the amount of moisture produced. In the case of the building to which our correspondent refers it is possible that the moisture from the wood caused the paper to become damp, thus resulting in the rusting of the tin of which he complains. We lay the matter, however, before our readers and shall be very glad to have them express their views.

Suggestions for Roof Plan.

From A. J., *Topeka, Kan.*—I inclose sketches, Figs. 1 and 2, showing the roof and attic plans, in answer to the inquiry from the correspondent signing himself "'Way Down East," and which appeared in the November issue of the paper. The plans will, I think, explain themselves. The correspondent will notice, however, that I have made a slight change in the second story, which does not materially alter the floor plans, but makes the second story correspond with the first and does away with the blank appearance shown on his second-floor plan. It will make the closet and storeroom a little smaller, and yet leave them sufficiently large. He can readily secure the two chambers wanted in the attic and a large storeroom in addition. If the correspondent objects to the change, he can frame the roof to the dotted lines shown on the roof plan. If he makes a square cornice it will not look bad, but it will not, however, make as neat a roof in appearance, and I should like to hear from some of the other readers on this subject, as there seems to be a great difference of opinion regarding roof designing.

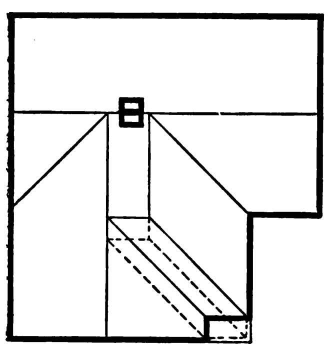


Fig. 1.—Roof Plan Submitted by "A. J."

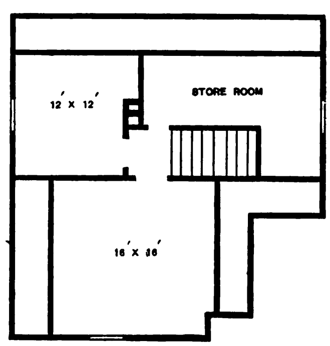


Fig. 2.- Plan of Attic.

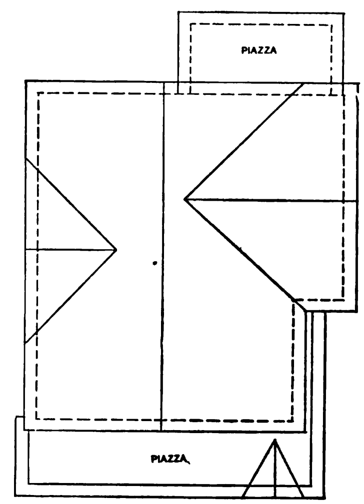


Fig. 3.—Roof Plan Contributed by "W. B. L."

Suggestions for Roof Plan.—Scale, 1-16 Inch to the Foot.

From W. B. L., *Corning, N. Y.*—In reply to "'Way Down East" I inclose plan for a roof, Fig. 3, which, I think, will give him the desired space in the attic. It will be seen that it is drawn with several gables and is for one-half pitch.

Self Feeding Hay Houses.

From L. F. S., *Ellinger, Texas.*—Will some of my brother chips who have had experience in building self feeding hay houses please furnish designs through Correspondence department of this paper? I want a place in which hay may be stored, and so arranged with racks that the cattle may eat the hay away and then more will slide down without a man having to go and fill the racks.

How to Build a House.

One of the interesting features of the second year's course at the School of Housekeeping, Boston, Mass., is a series of lectures and demonstration lessons covering various subjects of value to the students. The opening lecture, delivered the first week in November, was by Charles F. Wingate, who talked about "sanitation" in its application to the question, "How to Build a House." Some parts of the discourse are of such general interest to our readers that we present them herewith:

The first care in building a home, said the lecturer, is in the selection of a proper place. There is between each large city and its outlying suburbs a belt which may be termed the malarial line. One condition is found on one side of a street, while exactly opposite entirely the reverse perhaps exists. Malarial districts may be discovered and bad sanitary conditions avoided, as should also be hollow places or those near natural holes and excavations. Get as high as possible in the choice of land so that a fine sweep of air may be had. The modern methods of making thick walls render it possible to defy the elements, which otherwise might seem severe in high places. Clay or any absorbent soil is bad for buildings, and one should choose rather a soil that is dry or sandy.

Care should be taken also regarding neighboring buildings, like stables, business places and the like. High buildings shutting off light and having other disadvantages are not desirable as neighbors. In selecting a home in a house already built, the main point is to guard against damp conditions. These cannot be too forcibly recognized and studied. Most old homes are more or less damp and cellars have too little in the way of good sanitation. Not enough care is taken regarding surface drainage in keeping rain water away from cellars.

Mr. Wingate advises that all cold air boxes be raised 5 or 6 feet above the ground in order to prevent dampness from being carried by this means into an otherwise dry place. All unpainted metal work, like pipes, the furnace, gas and plumbing work, should be watched, and, if they be rusty, dampness exists. Floors, posts, other wood work and plaster also show the conditions of dryness or dampness. Cellars should have excellent ventilation secured by free circulation of dry air. The effects of dampness in a cellar will be felt by dwellers in even the tenth story of an apartment house. Pipes, wells and other means carry odors and dampness easily to all parts of a building.

In regard to plumbing, the average modern small house was declared to be better equipped than the elegant mansions built perhaps 20 years ago, with more or less of repairing of plumbing instead of entirely new modern systems. The first essential is that of visible plumbing, easy to be seen and to be reached when it is out of order. Isolation should be avoided, having one set of pipes here and another there, an addition in one part of a house and some new improvement in another place, whereas all plumbing should be concentrated as far as possible, and heavy metal materials should be used, especially since the introduction of electricity, which has such a destructive effect upon pipes. Builders now recognize the economy of buying the best materials as being far cheaper in the end. How pipes should be arranged and placed to secure free ventilation was explained, and the necessity of having a current of fresh air, with bottom as well as top ventilation, was emphasized.

Mr. Wingate urged the use of potash in boiling water to free the pipes from collections of grease and to clean them generally. Traps should be opened and examined periodically and well cleaned. Speaking of filters, in which the lecturer believes, if a good and sensible one be properly used, he said that there is an almost unlimited number in the market, each being advertised as "perfect" and "ideal," almost none of which is such. Filters should be cleaned from day to day, otherwise they become merely collectors of dirt and foreign matter. Regarding heating, Mr. Wingate advised open fires first and furnaces next, placing steam heat last in point of sanitation. Open fires can of course be regulated, and they afford excellent ventilation as well. Furnaces should be large enough not to need any driving to secure as much heat as is desired. Steam heat is not employed ordinarily under sanitary conditions, a good test being that of trying if plants will thrive in a room where it is used, or if birds live well and happily. What is good or bad for them is the same for people.

What rooms should have the most sunlight is an important matter, which finds its solution in Mr. Wingate's experience in giving the kitchen the preference in point of location. This and the nursery need more sun than do other rooms; and incidentally, he stated that a nursery should not be used for a living room by day and for sleeping in at night. It should be kept distinctly for one or the other, not for both uses. The dining room comes next in order, then chambers, while parlors may do without sunshine better than other parts of the house. Windows and doors should be higher, more in keeping with the ceiling, which need not be much above the top of windows, because the air in the top of a room becomes stagnant. As much window space as possible and as few curtains, especially such as collect dust, is a point to be desired. Bare floors and rugs were advocated as in the line of health. All these points and many more, briefly explained, made the lecture one of instructive interest.

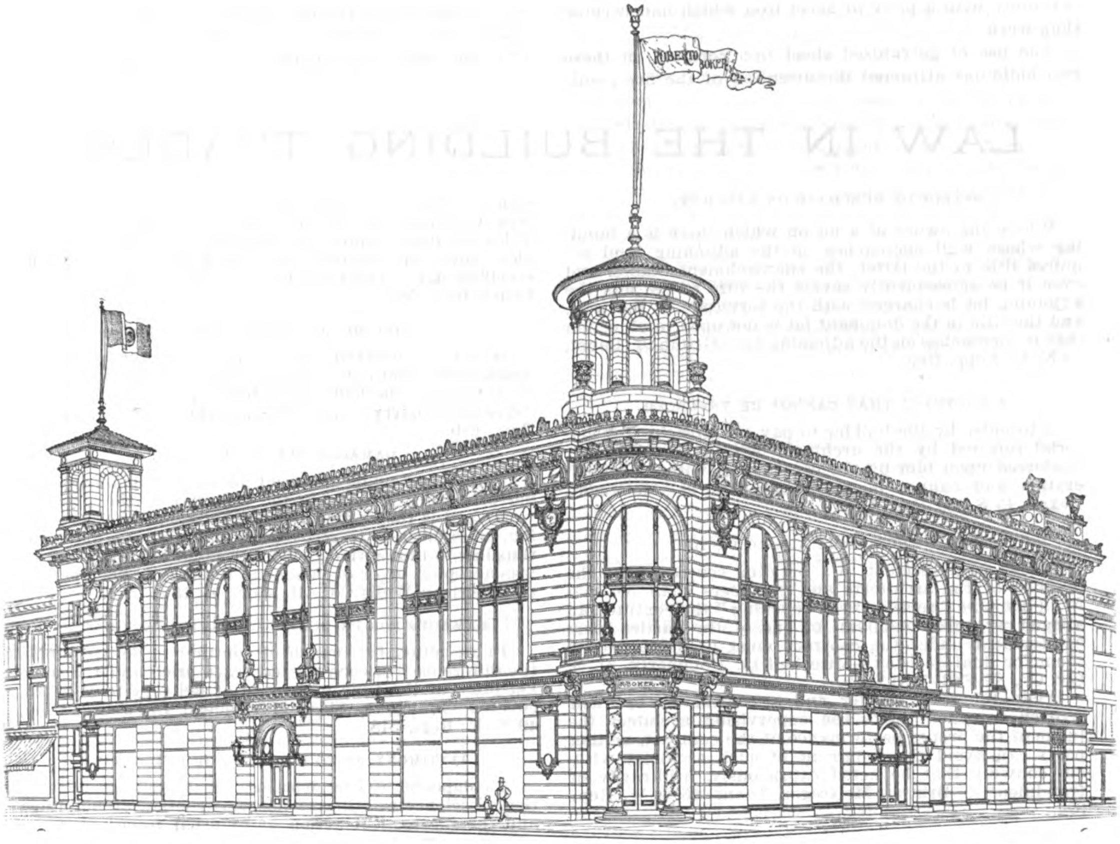
Advanced Technical Education in Saxony.

A report on the "further developing" schools of Saxony has been made to the State Department by United States Consul Monaghan at Chemnitz. With a population of 3,788,000 that kingdom has 1953 of these schools, with 75,358 boys and 1699 girls in attendance. Besides these, there are 39 higher industrial schools, with 10,660 scholars; 122 industrial technical schools, with 10,119 scholars; 44 commercial schools, with 4781 scholars, and 18 technical schools for girls, with 2445 scholars. Saxony's wonderful wealth, says Mr. Monaghan, her industrial greatness and the fact that she sends out to other parts of the world millions of dollars' worth of all kinds of wares, toys, textiles, tools and machines, attest the importance of these schools. To explain just what is meant by the term "further developing," the consul states that the system of common school education, under which boys and girls were given an ordinary education and manual training up to their fourteenth year, was found inadequate. Therefore, compulsory technical education was established for graduates of the common schools. The hours of attendance are early in the morning or a certain number of afternoons in each week. Manufacturers, merchants and other employers are made responsible for the attendance of the boys in their employ, and the latter make a special study of the trade or calling in which they are engaged.

IF the man who painted a station sign at Harper's Ferry 30 years ago is alive, there is a fine opening for him in the paint manufacturing business. The sign in question, which is now on exhibition at the rooms of the Western Society of Engineers in Chicago, was placed in position at the Harper's Ferry station of the Baltimore & Ohio Railroad at the time the line was completed to that point. In all these years it has passed through the summers' heat and winters' storms with the luster of the paint undimmed. The words "Harper's Ferry" stand out as boldly as on the day they were inscribed on the board, although the wood around the letters has been worn away about 1-16 inch by the sand beaten against it by the force of the wind. It is claimed that no paint manufactured nowadays is equal in durability to that which was applied to this sign, and the engineers are using every effort to find out who mixed the paint and used it 30 years ago.

A HANDSOME MEXICAN STOREHOUSE.

THERE is now in process of construction in the City of Mexico, in accordance with plans drawn by architects in this city, a storehouse for a local hardware concern, which embodies many points of interest to architects and builders. A peculiar feature in connection with the work is that owing to the nature of the soil the weight per square foot could not exceed 500 pounds, and this necessitated footings of concrete extending not only under the entire area of the building but 10 feet beyond the outside walls. Another peculiar feature is that on account of the poor drainage of the city ground water appears at a depth of 2 or 3 feet, consequently there are no cellars or sub-structures. The building, of which a general view is presented in the accompanying illustration, covers an area 150 x 160 feet, out the interior of the building. The plaster models for the cut stone ornaments on the exterior are being made by Ellen & Kitson, Twenty-sixth street and North River, New York City. The interior finish is of Mexican mahogany, the main floor being of tiling and the other floors of maple. The building is being erected for R. Boker & Co. of the City of Mexico, an old concern engaged in the hardware and machinery business, the architects being De Lemos & Cordes of 130 Fulton street, this city. The grillage for the foundations and all the structural and ornamental iron work is being furnished by Milliken Brothers; the fire proof floor construction by John A. Roebling & Sons; the elevators by Otis Brothers; the plumbing fixtures by the J. L. Mott Iron Works; the water proofing by the Neuchatel Asphalt Company, and



A Handsome Mexican Storehouse.—Robert Boker & Co., Owners.—De Lemos & Cordes, Architects, New York City.

and is of the skeleton frame construction. On account of frequent earthquakes in this section of the world no cast iron work is used, consequently the frame of the new building is entirely of steel. It is supported by a grillage composed of 7 and 8 inch I-beams bedded in 3 feet of concrete extending, as stated above, under the entire area of the building. The exterior of the structure is faced with white Mexican limestone, and the style of architecture is modern Renaissance, somewhat adapted to the Spanish ideas at present prevailing. As will be seen from the engraving, it is three stories in hight, but at the rear is a fourth story intended for club rooms and for the living apartments of the clerks. The roof is of flat tile and the windows are of Pittsburgh plate glass. A feature of the building is the elaborate frieze under the main cornice, composed of onyx ornamentation. There are also onyx columns at the main entrance as well as through- the carpentry work is being done by J. Hamilton & Son, all of New York City. We understand that the amount of the entire contracts is $150,000 in gold.

The Durability of Cornices.

Many who are now working at the business are not aware how cornices came to be used and to be popular in the United States, says a correspondent in a recent issue of *The Metal Worker*. The building construction in the early '50's was such that the cornices for whole rows of buildings in New York City were on one level, and in many cases above the ceiling and under the roof was an open space which was unbroken for the length of a block. When a fire broke out in a building anywhere along the block smoke could be seen coming out from the cornices and eaves at each end, so that firemen had difficulty in locating a fire. This led to a custom of continuing the partition walls up and breaking this open space.

Much trouble, however, was still experienced from the use of wooden cornices, and in 1855 a galvanized sheet iron cornice was put on a building at 52 Beekman street, where it can still be seen by those who visit that section of the city. The material used was charcoal iron, and much stress is laid upon the character of the material by those who have noticed its durability. Almost a half century of exposure finds it still in good condition, with the exception that one of the modillions which were soldered to the cornice proper has become detached slightly, but yet sufficiently to be seen from the street. Two years after this cornice was put up a cornice was put on the *Times* Building of the same character, and up to the time that that structure was torn down to make room for a newer building a few years since this cornice withstood the ravages of time so well that a piece of sheet iron cut from it compared very favorably with a piece of sheet iron which had become shop worn.

The use of galvanized sheet iron cornices on these two buildings attracted the attention of the fire insurance companies, and as an incentive to a more general use of galvanized iron cornices a lower rate of insurance was offered on buildings where they were put up. This attracted some attention from Western cities, and among the first to send representatives to New York to inquire for expert cornice makers was St. Louis, and the West was the first section of the country to begin the manufacture of cornices as a business in a scientific way. Those who had made cornices up to this time were tinsmiths, and the method of cutting miters was of the cut and try character. Since that time, however, the modern cornice shop has been developed, employing a man who is thoroughly conversant with the art of cutting patterns of sheet metal that may be formed into the irregular and ornamental shapes in general use. Under this intelligent management metal cornices have become a prominent feature in the adornment of some of the handsomest modern structures and the method of constructing them has greatly improved. In some all parts are riveted and locked together, so that solder is not necessary. Such cornices will pass through a fire and only need repainting to continue serviceable.

LAW IN THE BUILDING TRADES.

EFFECT OF PURCHASE ON EASEMENT.

Where the owner of a lot on which there is a building whose wall encroaches on the adjoining land acquires title to the latter, the encroachment ceases, and even if he subsequently severs the title to the lots the adjoining lot is charged with the servitude of the wall, and the title to the dominant lot is not open to objection that it encroaches on the adjoining lot.—Griffin *vs.* Baust, 50 N. Y. Supp. Rep.

A CONTRACT THAT CANNOT BE ENFORCED.

A promise by the builder to pay a contractor for material rejected by the architect, within the authority conferred upon him by the contract, is without consideration and cannot be enforced.—Brin *vs.* McGregor, Texas, 45 S. W. Rep., 923.

WHEN ARCHITECTS ARE TO DECIDE.

Under an agreement in a building contract that the decision of the architects and engineers shall be final in all disputes "relative to or touching" the contract, an alleged wrongful dismissal of one of the parties from employment under the contract must be submitted to them for final decision.—Mitechell *vs.* Dougherty, U. S. Cir. Ct., 86 Fed. Rep., 859.

And: Where a builder and a contractor, by their written contract, make the supervising architect the judge of the proper performance of the contract, neither party can avoid the judgment of such architect without showing that he acted capriciously, arbitrarily or fraudulently.—Brin *vs.* McGregor, Texas, 45 S. W. Rep., 924.

WHEN LOWEST BIDDER CANNOT RECOVER DAMAGES.

The lowest bidder for the construction of a building, who fails to execute a bond, or to sign a contract for the erection of the building, as he understood he should, cannot maintain an action for damages for breach of contract upon his bid.—Hogan *vs.* Shields, Mont., 52 Pacific Rep., 55.

COMPENSATION FOR EXTRAS.

Where a contract for the erection of certain buildings for a lump sum provides "No new work of any description done on the premises, or any work of any kind whatsoever, shall be considered an extra unless a separate estimate in writing for the same, before its commencement, shall have been submitted by the contractor to the architect and the ordinary, and their signatures obtained to the same," no claim for extra work can be sustained unless it was done in compliance with such conditions.—Heard *vs.* Dooly County, Ga., 28 S. E. Rep., 986.

WHEN CONTRACTOR IS NOT LIABLE FOR DELAY.

Where, under a building contract, the builder agrees to complete certain specified work by a specified date under a penalty for delay, and also undertakes to execute any additional work that may be ordered, if the owner orders any additional work which necessarily delays the completion of the work he cannot recover penalties for delay, unless the builder has agreed to complete both the specified work and the extras by the specified date.—Dodd *vs.* Churton, England, 1 Queen's Bench Rep., 562.

PRICE OF MATERIALS FOR BUILDING.

Where one ordered stone, which in the order he designated as "footings," he can only be compelled to pay for it the price he had contracted to pay for "footings." —Grafton Quarry Co. *vs.* Vieths, Mo., 71 Mo. App. Ct. Rep., 619.

DAMAGES DUE CONTRACTOR.

Where one under contract to furnish material and perform work transports the material to the place of work, and is then prevented by the other from performing, he is entitled to recover the value of the materials thus lost to him, although there was nothing done which was accepted by or of benefit to the other.—So. Pac. Co. *vs.* American Wells Co., Ill., 49 N. E. Rep., 575.

DAMAGES FOR FAILURE TO DELIVER MATERIALS.

In an action for breach of contract to deliver stone, the difference between the contract price and the market price at the time and place of delivery may be recovered.—Smith *vs.* Sloss Marblehead Lime Co., Ohio, 49 N. E. Rep., 518.

TESTIMONY AS TO COLLAPSE OF BUILDINGS.

A competent expert witness, speaking upon a question of science relating to the construction of buildings and the mechanical action of external forces upon an edifice constructed in a particular manner, may properly be asked, in presence of the given fact that the building collapsed, of what causes that collapse was the result.—Quigley *vs.* Johns Mfg. Co., 50 N. Y. Supp. Rep., 98.

RIGHT TO LATTER SUPPORT.

Where two houses are built together, the right to mutual latter support exists only so long as the wall continues to be sufficient for the purpose of such support and the buildings remain in a condition to require it, and if they be torn down and be not at once restored the parties may assert their unqualified title to the division line. Where a party owning such buildings sells one the right to mutual support is not lost, the legal presumption being that he reserves to himself such right, and at same time grants to the new owner the same right.—Moore *vs.* Shoemaker, Dist. Col., 10 App. D. C. Rep., 6.

One of two adjoining land owners, who, on excavating for a cellar up to the division line, on which the other had built a cellar wall, undertakes, for compensation from the other, to remove the parts of the existing wall projecting over the line, is responsible for injury to the wall arising from his failure to protect it therefrom, as persons of ordinary care, skill and prudence would have done under the same circumstances.—Lapp *vs.* Guttenkunst, Ky., 44 S. W., 924.

The Builders' Exchange

Directory and Official Announcements of the National Association of Builders.

Officers for 1897-8.

President,
Thos. R. Bentley of Milwaukee, Wis.
First Vice-President,
Wm. H. Alsip of Chicago, Ill.
Second Vice-President,
Stacy Reeves of Philadelphia, Pa.
Secretary,
Wm. H. Sayward of Boston, Mass.
Treasurer,
George Tapper of Chicago, Ill.

Directors.

Baltimore, Md.	S. B. Sexton, Jr.
Boston, Mass.	C. Everett Clark.
Buffalo, N. Y.	Charles A. Rupp.
Chicago, Ill.	Wm. M. Crilly.
Detroit, Mich.	John Finn.
Lowell, Mass.	Wm. H. Kimball.
Milwaukee, Wis.	W. S. Wallschlaeger.
New York City	Chas. A. Cowen.
Philadelphia, Pa.	Geo. Watson.
Portland	George Smith.
Rochester, N. Y.	John Luther.
St. Louis	P. J. Moynahan.
Worcester	John H. Pickford.

The Twelfth Convention.

Secretaries of constituent bodies are reminded that the twelfth annual convention of the National Association of Builders will be held in the city of Milwaukee, Wis., during the second week in February next, beginning on the first Tuesday in the month.

It is important that all suggestions of topics for consideration, and all subjects which the local exchanges desire to bring before the convention should be in the hands of the national secretary as soon as possible. All matters concerning any of the relations sustained by contractors in the conduct of any part of their business, whether with architects, competitors or workmen, that need consideration and action should be formulated and forwarded to the national secretary, in order that provision for the same may be made in the programme of the meeting.

Local secretaries are reminded also of the fact that the amendments to the constitution adopted at the last convention provide for representation on a basis of 50 members or fractional part thereof in excess of ten. This action restores the representation to virtually the basis upon which it stood prior to the amendments adopted at the Baltimore convention.

All constituent bodies are urged to send large delegations in order that all discussions may be as comprehensive as possible, and may represent the voice of each exchange as fully as may be.

An effort will be made to introduce only matters of vital importance to the builders' interests into the business of the meeting, and it is expected that the convention will be one of unusual importance.

The official circulars will be issued as soon as possible in the customary order.

To Unaffiliated Exchanges.

Exchanges not affiliated with the National Association of Builders are invited to send representatives to the twelfth annual convention of the association, which will be held in Milwaukee during the second week in February.

Preparations are being made by the Milwaukee Exchange to extend a cordial welcome to visiting builders, whether members of constituent exchanges or not, and no effort will be spared to provide every facility for builders who may attend from exchanges not now members of the national body.

The coming convention promises to be much more interesting to builders whose exchanges are not members of the association than the last two or three, which were largely devoted to the consideration of changes in the constitution, and will offer a better opportunity for obtaining an insight into the real nature and scope of the work of the association than any meeting in its recent history.

Visitors Welcome.

Visitors will gladly be given seats in the convention hall and accorded all the privileges of the regular delegates, except, of course, the right to vote. They will also be included in whatever entertainment may be offered by the members of the Builders and Traders' Exchange of Milwaukee, who will be the hosts of the occasion.

The congregation of a large number of builders, all of whom are members of an exchange, and all of whom have had experience in organization, affords an unequaled opportunity for obtaining a thorough insight into the means and methods by which the errors of ill advised action may be avoided and the benefits of proper organization permanently assured. The fact that a majority of the delegates present are men that have been chosen from the exchanges they represent because of their fitness to consider and act upon questions affecting the welfare of the building fraternity as a whole, is in itself sufficient warrant for the assumption that these conventions offer the best possible means for defining and making clear the surest means for obtaining the best possible results from organization. In addition to the guidance and protection offered by the experience of the exchanges forming the National Association, as made clear in the discussions of the delegates, the personal contact with a large number of builders from the prominent cities of the country is in itself of great interest and benefit, providing, as it does, for the thorough and informal consideration of all questions of interest to the fraternity, under the most favorable conditions.

Members of Other Exchanges.

Officers and members of exchanges which do not belong to the National Association who desire to increase the usefulness of their organization and the benefits it can confer upon its membership, or who desire to share the honor of providing builders in cities where no organization now exists with the means for protecting themselves and their business from the dangers by which they are constantly menaced, should make a point of attending the Milwaukee convention for the purpose of ascertaining the real nature of the association's work and the benefits and privileges to be enjoyed from membership in it.

Secretaries or other members of unaffiliated exchanges are urged to communicate with the national secretary (Wm. H. Sayward, 166 Devonshire street, Boston), for information regarding the meeting, transportation arrangements to Milwaukee, &c.

The Builders' and Traders' Exchange of Chicago, Ill., will shortly hold a meeting to select seven delegates to represent the exchange at the coming convention of the National Association of Builders, at Milwaukee, in February.

A Remarkable Piece of Work.

The skill and patience of the mediæval artist or the Japanese or Chinese craftsman have been rivaled by a Massachusetts man who has recently completed a wonderful table which has taken 16 years in the making. The story is told as follows by the Boston *Herald:*

After 16 years of labor, off and on, Llewellyn Cunningham of 184 Adams street, Dorchester, has recently completed a table which stands unique as a specimen of handiwork with carpenters' tools. When it is stated that in the construction of this piece of furniture the maker has utilized over 160,000 separate pieces of wood, the reader will have a slight idea of the magnitude of the task. It is not alone in this, however, that the interest in the table lies, for, included in the immense number of pieces worked into its construction there are 270 different species of wood, from all parts of the world, as well as relics from railroad disasters, floods, big fires, battlefields, and old Government ships and others commemorative of important events.

The central design in the top is a checker board, which contains the largest pieces to be found in the table. These are 1½ inches square. The finest work, into which are worked the smallest pieces, figures about 120 of them to the square inch. Of the various soft woods a very small piece of each has been utilized. Of the hard and rare woods many pieces of the same kind were used. These woods were obtained at considerable expense and labor, and came from every State and Territory in the United States, as well as from Nova Scotia, New Brunswick, Prince Edward Island, Cape Breton Island, British Columbia, Quebec, Montreal, Manitoba, Mexico, Chili, Peru, the Andes Mountains, Bolivia, United States of Colombia, Honduras, Venezuela, the Guianas, Ecuador, Brazil, Argentina, Rio de Janeiro, Trinidad, Russia, China, Japan, Siberia, Asia Minor, Turkey in Asia, Constantinople, Austria, Hungary, Prussia, Poland, Sweden, Lapland, Italy, France, Spain, Portugal, England, Ireland, Scotland, Norway, Greece, Cyprus, Sicily, Sardinia, Borneo, Sumatra, Singapore, Arabia, Persia, Madagascar, Liberia, Australia, Zanzibar, Africa, Cairo, Tasmania, Sandwich Islands, Society Islands, Samoa, Cuba and Porto Rico.

Among the many important events from which relics are worked into its construction are the railroad disaster of Ashtabula, August 29, 1876; Spuyten Duyvel, January 13, 1882, and the Quincy wreck, August 19, 1890; also the big fires of Portland, Maine, in 1860; Chicago, in 1871; St. John, N. B., in 1877; Boston, in 1872, and Seattle, Wash., in 1889, and the floods of Mill River, 1874, and Johnstown, in 1889.

Other interesting souvenirs are from the old Government ships "Ohio" and "Merrimac;" a piece of the Benedict Arnold house, in New Haven, Conn.; a piece of the Judges' cave and the old Yale fence in the same city; a piece of shrub near Ledyard monument, on the hill opposite New London; a piece of the old Liberty elm, Boston, and the old Washington elm, Cambridge; a piece of a wrecked car at the Pittsburgh riot in 1877; a piece of the stock of a rifle shot off at Gettysburg, July 1, 1863, and a piece of the deck load of the barkentine "Herbert Fuller," when she lay in Halifax harbor.

An Extensive Plumbing Job.

The plumbing and heating in the Hotel Sterling at Wilkes-Barre, Pa., was done by Peter Forve & Bro. of that city and some idea of the extent of their work can be gained from the following account of it:

The water supply is taken from Market and River streets mains through 3-inch pipe and runs to various outlets in the cellar and to water tanks in the engine room. From this point it is run to the 38 rising mains and to fixtures on the several floors. At every floor two fire valves are placed, fitted with 50 feet of linen fire hose on bracket reels. The hot water tank supplying all the hot water for the baths and lavatories is located in the basement. The capacity of this tank is 500 gallons. It is heated by live and exhaust steam in such a manner that the entire contents may be raised to a temperature of 200 degrees in 12 minutes. Connected with this tank is a circulation system arranged so that hot water may be drawn from any faucet in the building three seconds after opening the faucet. Each column of fixtures has independent risers for hot, cold and circulation system, with stop and drop valves at the base of each column.

All main lines of waste pipes are of extra heavy cast iron and galvanized wrought iron pipe, and all waste lines are carried through the roof and all fixtures are back vented. The total amount of fixtures in the building is as follows: One hundred and seventy eight marble lavatories, 55 bathtubs, 80 water closets, 6 urinals and 6 sinks. The lavatories are all of polished Italian marble, with nickel plated pipes and faucets. The bathtubs from the second to the fourth floors are the solid porcelain tubs with nickel plated pipes and faucets. On the upper floors the tubs are porcelain enameled with nickel plated fixtures. All the fixtures are supplied with stop valve so as to control each fixture independently.

The heating of the building is by exhaust and live steam from two 100 horse-power boilers in the cellar, these supplying power for electric lighting, laundry machinery, elevator, pump and refrigerator plant. The heating system installed in the building is the Warren Webster Company vacuum system. Every room in the building is heated by direct radiation, which required a total of 322 radiators. A feature of this plant is what is called the down feed, the main steam pipe being taken to the attic and being distributed from there to the various radiators on the lower floors, the plan doing away with all large steam pipes in the cellar. Each radiator is provided with a radiator valve and vacuum valve, the vacuum being formed by a pump in the engine room. By this system it is possible to regulate the heat in the radiators to any temperature that is wanted. To complete the plumbing, heating and gas fitting in the building required about 10 miles of pipes, 6000 fittings, 1200 valves.

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