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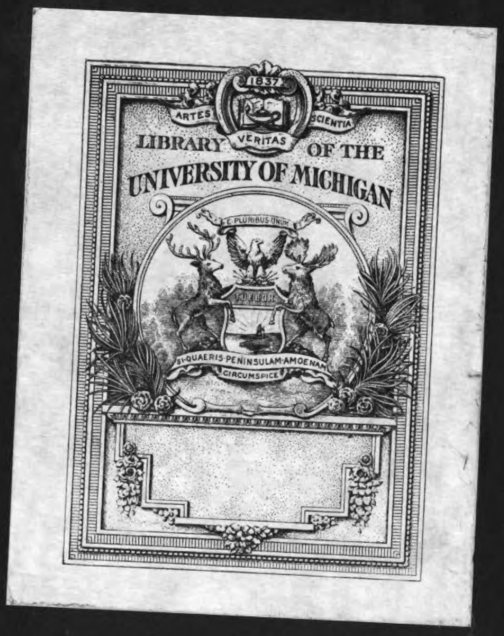
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CARPENTRY AND BUILDING.

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Builders' Convention.

President Edward E. Scribner has issued an announcement to the effect that the National Association of Builders will hold their fourth annual convention in St. Paul, Minn., on January 27, 28 and 29. The national secretary has issued circulars of information covering the programme of the convention, transportation facilities and other matters of interest to members in this connection. From the programme mapped out this meeting is designed to prove more than usually entertaining and instructive, and important results are likely to grow out of its deliberations.

American Institute of Architects.

According to announcement made in these columns a short time since, the American Institute of Architects and the Western Association of Architects met in joint convention at Cincinnati on the 20th and 21st of November for the purpose of perfecting arrangements looking to the consolidation of the two societies. The result of their deliberations was the accomplishment of the end sought under the title of the American Institute of Architects. The former rules of government of the two associations have been replaced by a newly constructed constitution and by-laws, the policy and platform of the younger organization being adopted for the management of the new association while retaining the charter and title of the older body. The proceedings of the convention were of an extremely harmonious character, and the feeling is that the influence of this movement will be felt in American architecture for many years to come. The officers of the new organization are as follows: President, Richard M. Hunt, of New York; first vice-president, W. W. Carlin, of Buffalo; second vice-president, J. W. McLaughlin, of Cincinnati; secretary, John W. Root, of Chicago; and treasurer, S. A. Treat, of Chicago. The next convention will be held in Washington, D. C., and the profession is likely to be more numerously represented than at any previous assemblage of architects in the history of the country.

Exhibition of Drawings.

On the evening previous to the day of the meeting of the American Institute of Architects in Cincinnati was the display of architectural drawings and sketches given under the auspices of the Architectural Club of that city. Commenting upon the exhibit a local paper says: "It was a national exhibit in every sense of that word. The works of the best architects in the United States were then placed before the public. Yet the public, which rushes madly after a much-advertised painting by a foreign artist or an illustrated lecture on foreign ruins, refuses to look at the wonders of art which the architectural artists of America placed before it. It missed the great object-lesson which was there taught—the process of growth of the builder's art in the New World and how far that art has advanced. It certainly cannot be for lack of interest in architecture, for the American traveler is the most indefatigable gazer upon the architectural beauties of cities he visits. And every American is more or less interested in building affairs, since each plans to build a home at some time or other. And it certainly was not the fault of the exhibit, for there could not have been a better exhibit—one more distinctively and excellently American. However this may be, the exhibit has passed and an opportunity has been lost. Every large city in the United States was represented by the architects who are filling the streets with solid public buildings, with magnificent churches, with elegant and graceful private houses, and who are building the rich men country homes or 'cottages' by sea and lake and on the mountain which make the palaces of Greece and Rome seem barbaric combinations of incongruity. One who strolled from exhibit to exhibit in Pike's Opera House fully realized why architecture has been called crystallized poetry. Here combinations of colors, standing for brick and stone of various kinds, represented to the eye a thousand poetic thoughts embalmed in the immortality of matter."

Pratt Institute.

The interest which is being developed in all parts of the land in the subject of manual training is of such a character as to give an increased value to the Founders' Day number of the *Pratt Institute Record*, recently published by Pratt Institute, Brooklyn, N. Y. From it we learn that while organized but a short time since, the work of the institution has progressed so rapidly as to call for increased facilities, and to this end something like 20,000 feet of floor-space has been added during the past summer. The institute at present occupies three main buildings thoroughly equipped in every department for the education and training of its pupils. In its technical high school department the aim is to fit students for higher institutions of learning, especially advanced scientific schools, and to give the best preparation possible within the limits of a three-years' course. In the art department free-hand, architectural and mechanical drawing, wood-carving, clay modeling and design are the general divisions of study, the school year being divided into three terms. The department of mechanic arts is devoted for the most part to educational work, but in order that each step may be fully comprehended the principles of tool operation have been emphasized, and the work further assisted by the use of models and drawings, combined with lectures on the properties and production of the materials dealt with. It is proposed for the future that a part of the regular course of this department shall be the study of elements of mechanism and principles of construction. Other departments of the institute include one devoted to domestic science, one to phonography and type-writing and one to music. A technical museum containing 3800 specimens of minerals and rocks, 1500 technical specimens and 40 pictures, maps, &c., is an important feature of the school. There is also connected with it a library and reading-room, containing on July 1, 1889, something like 20,000 volumes. During the year just brought to a close the number of individual pupils in attendance at Pratt Institute was 2199.

Forestry.

There is a growing public interest in forestry which is in large measure the result of the persistent efforts of State and national forestry asociations that have been striving for a wiser administration of the woodlands. We have received from the secretary of the American Forestry Association a printed copy of an address delivered at Philadelphia last October by the Hon. Carl Schurz, in which he discussed the need of a national forest policy in the United States. He described the barren districts of Asia and the sterile parts of Spain where agriculture had prospered before the forests were destroyed. Next he told about the affairs in this country and showed how rapidly the forests were disappearing, not alone in marketable lumber, but in flame and smoke as well, for it is a sad fact that large areas of wooded lands are annually stripped by fires carelessly or criminally started. The prevention and control, where possible, of forest fires is a necessity only too evident to all who have looked into the matter. But it is the indifference of public opinion to all the stealing, the waste and the injudicious cutting down of the woods that the speaker looked upon as the evil most needing correction. This, however, is a slowly lessening evil, and it is a pleasure to learn that beginnings, however small, are making toward the conservation of the forests on this continent. Experience bears ample witness to the harmful results that follow the general deforesting of a country, but even were there no experience to learn from, common sense should teach a people that their enduring interests depend upon a sufficient acreage of wooded lands. Public opinion is the only whip that will drive legislatures into the making of just, wise and effective forest laws, and in the building up of public opinion every one takes part.

Scaffold-Building.

One of the latest competitions in the building line which has come to our notice is that announced by the Union Syndicate or Master Builders' Association of Brussels, who offer eight prizes for the best devices for scaffolding of various sorts. The four competitions are designated A, B, C and D. The first prize in competition A is $100 and is

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given for the best scheme for a hanging-stage for the use of painters and for washing down and pointing walls of masonry. A second prize of $40 in this competition is also given for the second best plans for the same device. Competition B is for a staging resting on the ground to be used for the same purposes as the hanging-stage first mentioned. The subject of competition C is a general scaffolding for use where the weights to be supported are not large, and that of D a system for protecting workmen on roofs against accidents. One of the foreign exchanges in commenting upon this subject seems to be impressed with the idea that builders in America are rather behind the rest of the building world in the matter of scaffolding. It says: "Timber is cheap with them and they think they can afford to nail joists and boards together and destroy them in taking them down, where an English or French builder is obliged to use poles cleverly tied together with chain and ropes, so as to get as much strength as possible without injuring the materials." Pole and rope stagings, it may be remarked in passing, are rapidly superseding those of joists and boards in this country, and it is not at all improbable that the more economical method will soon become general. The builders in a new country often find themselves obliged to disregard economies in material because they have an abundance of it while lacking in those things that would tend to save its waste. Leaving scaffolds out of the count for the moment, compare a log-house with a frame house as commonly built. The one uses several times as much material as the other, the difference between the two being not a disregard of economy, but the lack of a sawmill and other building accessories.

Chicago Auditorium.

Some time since our readers were informed of the fact that a magnificent building was in process of erection in Chicago to be known as the Auditorium, the object of which was to provide a home for high dramatic and musical art. Within the past few weeks this building has been dedicated with imposing ceremonies and thrown open to public use. The idea of the Auditorium originated with Mr. Ferdinand W. Peck, who succeeded in organizing a company with a capital of $2,000,000. Work was first commenced three years ago, and at the present time the entire building with the exception of the hotel, which will be finished very soon, is completed. In order to give our readers some idea of the magnitude of this structure it may be interesting to state that it has a frontage of 162 feet upon Wabash avenue, 362 feet on Congress street and 187½ feet upon Michigan avenue. The walls of the building are of Maine granite and buff Bedford stone. Over 17,000,000 brick were used in its construction and 6000 tons of iron and steel. The building is provided with electric lights, of which there are nearly 10,000. There are 230 miles of electric wire and cable, 60,000 feet of polished plate-glass, 160,000 lineal feet of furring iron, 175,000 square feet of wire lath, 760,000 square feet of terra-cotta tile, arches and partitions, 50,000 square feet of Italian marble mosaic floors, containing over 50,000,000 separate pieces of marble, 1500 windows and 2000 doors. The stage and equipment, including iron curtain, cost over $175,000 and is fireproof. The total cost of construction and equipment of the building is estimated at $2,700,000. The building is provided with three elevators. The office portion of the building is ten stories in hight and contains 126 offices, finely finished in antique oak. The Auditorium recital hall is on the seventh floor and was dedicated October 12. The architectural features of the Auditorium have been studied with the idea of destroying the effect of immense space, and the manner in which this has been accomplished reflects great credit upon the ability of the architects, Messrs. Adler and Sullivan.

Labor Plots and Counterplots.

The American Federation of Labor at their recent session in Boston unanimously proclaimed in favor of asserting their demand that eight hours shall constitute a day's work. This measure is said to have been the chief object for which the convention assembled, and the 1st of May ensuing is adjudged to be the auspicious time at which to make the concerted movement to this end. The report of the committee as approved represents that while existing conditions do not justify the hope that all the crafts are prepared successfully to enforce the eight-hour system at the time specified, thus inaugurating "the greatest of industrial reforms," many of the trades are ready and more are preparing to make common cause in a strike which it is affirmed will be of huge proportions and paralyze the industries of the country if the demands are not sooner conceded. This concerted movement for the so-called "emancipation of labor" is liable to encounter several obstacles. One of the most obvious and threatening is the apparent impossibility of harmonious action in any course prescribed. At the very outset important divisions of organized labor find themselves in direct antagonism, and it is an accepted maxim that "a house divided against itself" is never formidable either for attack or defense. The explanation is volunteered that every department of labor is represented by the delegates who have undertaken to regulate the industrial interests of the United States and now profess to see the opportunity they have long been waiting for.

Disintegration of the Obelisk.

The famous obelisk which had lain in Egypt for very many centuries and which was brought to this country some ten years ago to be set up in Central Park, New York, for the edification of the natives, is having a sad time of it between the misdirected efforts of would-be friends and the persistent attacks of the North American climate. Shortly after it was placed in position many expressed doubt of its durability, exposed to the hot sun of the summer, the rain of the fall and spring and the extreme cold of the winter. For some time nothing was done until it was discovered that these deteriorating influences were doing permanent injury, and then the monolith was experimented upon with indifferent success. The latest reports from it indicate that its surface is rapidly eroding under the combined influence of water, heat and frost. The hieroglyphics which decorate, if they do not adorn, the sides are fast fading into a level nothingness, and unless some radical means are speedily taken to preserve the remnants of this ancient carving the next generation will see the inscriptions in imagination only. It seems strange that the people in authority do not recognize the fact that this Egyptian obelisk is not a thing that can be replaced at any cost, and that the supply of such curiosities is quite limited. If, instead of permitting experimental attempts toward its preservation, they had at the outset so housed it as to keep off the water and preserve the atmosphere at an equable temperature, the stone would not have wasted. A glass house or a permanent structure of some sort would have been no great expense, and suitably inclosed the obelisk would have lasted a couple of more thousand years, even in this harsh climate. It is shameful that a piece of stone preserved to us through the clemency of Egypt's atmosphere for so many centuries should now be permitted to disintegrate and crumble away through the want of a little care and expense.

THE PLATES.

In Plate I we present this month a design for a low-cost house, the author of which is Mr. Frank M. Snyder, of Chicago, Ill. Our readers will no doubt remember the neat study by this gentleman published in the October issue for last year, and will find much to interest them in the one now presented for their consideration Extracts from the architect's specification are given on page 9.

Plates II and III are devoted to the presentation of a five-room house designed by C. Powell Karr, of New York. Particulars of this design are presented on page 9 of this issue.

Plate IV represents the front elevation of a structure recently erected in Jersey City, N. J., and is a good example of the application of galvanized iron to the fronts of buildings. A detailed description of the work as executed will be found on page 11.

IT IS ANNOUNCED that the plumbing in Ogden Goelet's new house at Newport will be all silver-plated and will cost $50,000.

A RECENT ISSUE of a Troy paper contains a very complimentary reference to the novel effect produced by the use of iron for decorating the interior of the Dutch Reformed church in process of renovation at West Troy, N. Y. When the question of treating the ceiling came up the trustees recommended Lincrusta Walton, but finally the firm of Reardon & Ennis, of Troy, were asked for an estimate for metallic ceiling and siding. The figures being satisfactory the contract was awarded and the work has been completed. The ceiling is finished in panels of handsome design surrounded with belts of embossed-metal work. Where the sheets come together they are covered with moldings. The four sides of the church, from the wainscoting to the ceiling, are covered with embossed metallic siding, the upper part consisting of three belts. The lower one is of a chain pattern, while the middle portion is diamond shape. Above this the course consists of belts set in squares, but of a pattern different from the others. The main entrance is also trimmed with the same style of embossed work. The metallic ceiling employed was that manufactured by H. S. Northrop, of 18 Rose street, New York City.

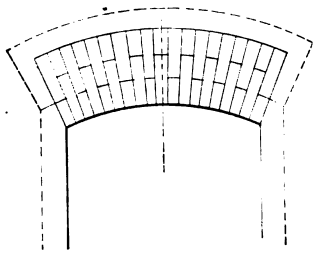
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BRICK-LAYING.

Brick-Work and Brick-Laying.—VI.

BY ARTHUR SEYMOUR JENNINGS.

We now come to consider the important subject of gauged arches, or those which are formed of bricks cut in such a way that the mortar-joints between them radiate in every case to the centers from which the curves are struck. This rule for the radiation of the joints is an important one, and should not be departed from excepting under peculiar circumstances. Where a curve is other than the arc of a circle, such, for example, as the semi-elliptical arch, the joints should all be normals to the curve—that is, at right angles to tangents taken at the various points. The attempt is sometimes made where an elliptical arch is constructed to radiate the joints to a common center, but the effect is far from pleasing.



Brick-Work and Brick-Laying.—Fig. 1.—Segmental Gauged Arch.

In forming a gauged arch the bricklayer should always make a full-sized drawing of one-half of it, in order to obtain the exact shape of each individual brick. For this reason we will first consider the method of setting out gauged arches and afterward give some account of the manner in which they are constructed. It will be understood that the depth of any gauged arch does not exceed that of the jamb or reveal of the opening over which it is turned. Where a reveal, as is commonly the case, is 4 inches, the gauged arch will also be 4 inches in width, and behind it will be turned what is practically a second arch, having the same curve but constructed of rough, uncut bricks. The segmental gauged arch, therefore, shown in Fig. 1 represents a front view of the opening over which the rough arch, represented in Fig. 1 in my last paper, was turned, and the dotted lines indicate the position in which the back jambs and back arch come. The method of finding the lines in a gauged segmental arch is very simple. Having drawn the

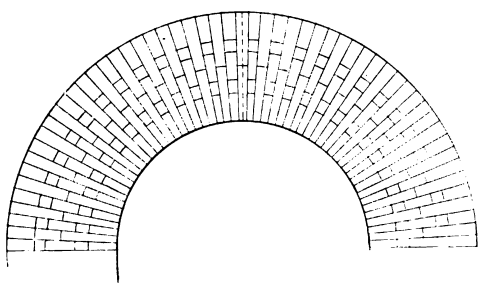


Fig. 2.—Semicircular Gauged Arch.

intrados and extrados, or the inner and outer curves, and having set in the skew-backs so that they radiate to the proper center, proceed to mark upon the space within them the lines of the bricks. It is very necessary that all gauged arches shall have a key-brick, or one exactly in the center, so that a mortar-

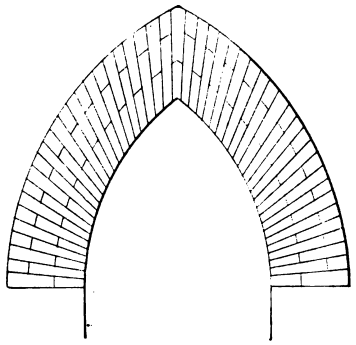


Fig. 4.—Lancet Arch with Mortar-Joints Radiating to Center.

joint is avoided at that point; and also that the arch may finish alike on each skew-back. First draw the center line by erecting a perpendicular from the center as shown in Fig. 1, and then set off on each side of the center line 1 inch, making 2 inches for the width of the brick in that position. Taking 2 inches in the compasses, mark that distance off along the outer curve in both directions, and having done so proceed to draw in the joints, all radiating to a common center. In practice it will be found simplest to drive a pin at the center point and to rest a straight edge against it. In setting off the 2-inch distances it will, of course, frequently happen that an equal number of bricks will not exactly fit in, in which case all that is required is to slightly close the compasses, making each brick a fraction less than 2 inches in width at its upper part. It will be observed that gauged arches differ materially from rough, inasmuch as all the bricks are laid alternately headers and stretchers, and these are drawn in by dividing the space into the proper number of parts and drawing alternately in different divisions. In setting out the width between the inner and outer curves care must be taken that due allowance be made for the portion of the bricks which has to be cut to curves.

The construction of a gauged semicircular arch, as shown in Fig. 2, is the same as that of a segmental one. In the case illustrated an arch equal in depth to two bricks is shown, and it will be noticed that in order to produce the proper bond the insertion of closers, or half-bricks, becomes necessary. It might, however, be observed in actual practice these are frequently omitted. But there is the same necessity for them as there is in two-brick piers as referred to in a previous paper. On carrying out arches of all kinds it should be remembered that proper bonding is necessary just the same as in ordinary straight work.

There is much controversy as to the proper manner in which pointed arches should be finished. Some maintain that the rule of radiating all joints to the center of the curves should be invariably followed, but this brings about an awkward joining at the head, as shown in the equilateral arch illustrated in Fig. 3. In this case joints are set off in the same way as in the previous case, but the head not only looks awkward, but is undoubtedly weak. A

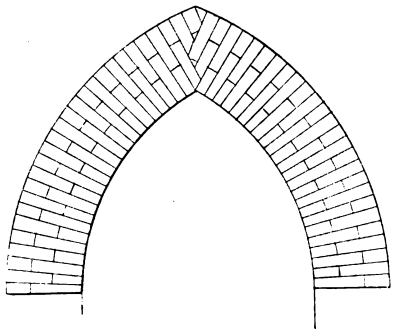


Fig. 3.—Equilateral Arch.

second method of forming the joints, as applied to a lancet arch (Fig. 4), is that of radiating the joints to a single center taken

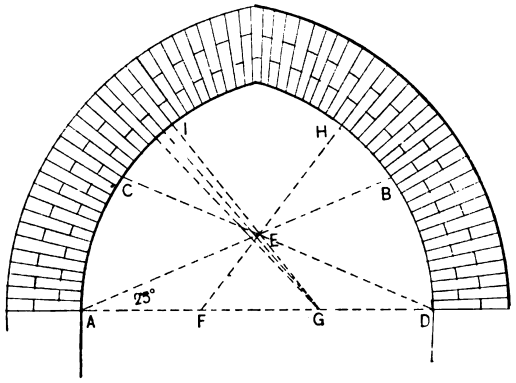
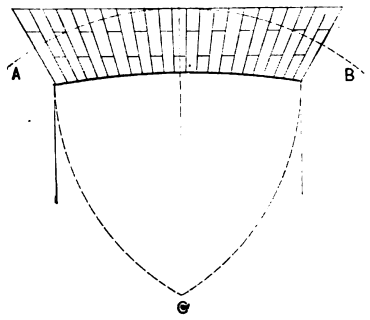


Fig. 5.—Pointed Gauged Arch, Showing the Best Method of Radiating the Joints.

in the middle span at the point A. But while this removes the objectionable joining at the head, it has the effect of apparently increasing the hight of the arch, while to some extent it mars its symmetrical portions. The objections of both of these methods may be removed by effecting something of the nature of a compromise, and this is illustrated in Fig. 5, as applied to the obtuse-angle arch. In this case proceed as follows: Having drawn the outline of the arch, set up from both points of the abutment an angle in either direction of 25°, as shown by the dotted lines A B C D, which intersect at the point E. Then from the centers F and G draw lines through E, producing to H and I. The mortar-joints of the arch from the abutments A to I and D to H are radiated to their proper points from which the curves are struck—namely, F and G, but above those points they are radiated to the

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center E, the result being an arch in which the rules already laid down are followed almost entirely, while the greatest strength and symmetry are obtained. Where this method is employed in the case of other arches, either more acute or more obtuse than that illustrated in Fig. 5, the center E will be varied according to the proportions of the arch; for example, in an equilateral arch the lines set up to indicate the center E will be 45° instead of 25°, as in the example shown.



Brick-Work and Brick-Laying.—Fig. 6.—Flat Gauged Arch.

In some districts the old-fashioned flat form of the gauged arch (Fig. 6) is still largely used, and it is frequently of service when introduced in brick buildings having ornamental fronts. The method of setting out this arch is the same as that already explained as referring to Fig. 1, excepting that the widths of the brick are set out along the curve A B, which is struck from the center C. The angle at which the skew-backs are set will depend upon the width of the opening. Where it is from 3 to 4 feet wide an angle of 60° will answer the purpose, but when the opening is smaller the angle must be greater; while if it is very wide, 45° or even less will be required, in order that the bricks may be sufficiently wedge-shaped to prevent their dropping out. To counteract the effect of sinking in the arch, and also to overcome the apparent bulging along the lower line,

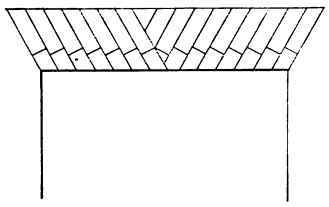


Fig. 7.—French or Dutch Arch.

which is caused by ocular aberration, it is advisable that a slight camber should always be given to the intrados. Where this rise is considerable the cross-mortar-joints are struck in from the same center, and the arch is then known as camber-arch. In other cases the cross-mortar-joints are put in horizontally. In some classes of work where the flat form of arch is used the bricks are laid as shown in Fig. 7, forming what is known as a French or Dutch arch; but this form of construction should never be used in any good work, as the strength of the arch depends wholly upon the adhesive power of the mortar.

One of the most graceful and ornamental arches we have is that known as the Gothic elliptical, which is represented in Fig. 8. In order to produce proper symmetrical parts the rise of this arch must bear a certain proportion to its span. The method of setting it out is as follows: First draw a line representing the width of the opening; divide this into three parts as marked by the letters A B C D. From A, with radius A C, describe the arc C E, and from B C and D describe similar arcs intersecting in the two points E and F. Through F B draw a straight line and through C and E a similar straight line, bisect the span of the arch in the point G and raise a perpendicular. The intrados of the arch is now drawn in by describing arcs first from B, then from C and then from E and F respectively. The extrados is obtained by striking arcs from the same centers, and the bricks are set out in the same manner as already explained in the case of other arches. In Fig. 9 is represented one form of the ogee arch, which is another characteristic feature of the Moorish style of architecture. Careful consideration of what has already been said of the subject of arches in general will make it unnecessary for any further explanation being given as to this arch in particular.

The brick layer who is called upon to construct gauged arches proceeds, as it has already been explained, to first draw the curves in the manner described. Having set out the lines representing the mortar-joints, he then proceeds to cut and rub the bricks to the required shapes. For this purpose a rough saw is employed to cut the bricks, which are afterward rubbed down to a smooth level surface by means

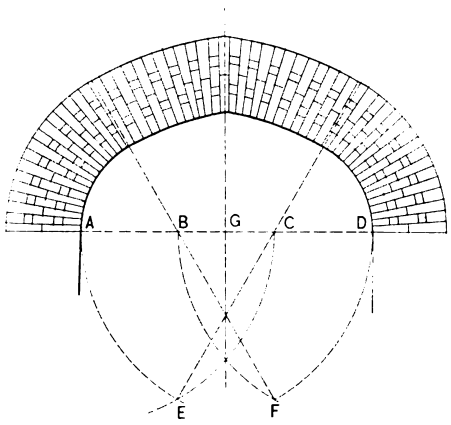


Fig. 8.—An Elliptical Gothic Arch.

of sand and water distributed on a piece of coarse stone. Frequent comparison should be made during the progress of the operations with the templets as marked out upon the full-sized drawing. Often molded bricks are introduced in the upper or lower part of the arch, and in that case there is practically no difference between the method of setting out the lines than those of which an explanation has already been given. The fact of the comparative ignorance of many brick-layers upon the subject of arch construction is accounted for to a great extent by stating that it is the custom in most of the large

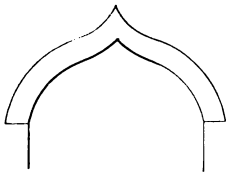


Fig. 9.—A Moorish or Ogee Arch.

cities to have all the principal gauged work rubbed out and cut at the brick-maker's yard rather than on the building. Where this is the case the methods do not materially differ from those described, excepting that in most cases special appliances are employed to assist in the operations. In order to produce a friable brick or one which is easily cut and rubbed, the brick-makers form a special class known as rubbers and cutters. Such bricks are made from clay with which a quantity of sand has been mixed. The bricks being soft are more suitable for reduction in form, yet the fact of their softness creates an objection to them as building materials, and on that account some brick-makers manufacture from ordinary clay wedge-shaped bricks of various forms suitable for arch construction.

In this connection it may be well to observe that what is sometimes known as steined work—that is, walls erected on a curve in plan—the bricks are sometimes cut to wedge shapes in order that the mortar-joints on the face may not be too wide, but where they are available, specially made wedge-bricks of ordinary clay are preferable. In any case it will be necessary that such work be constructed entirely of headers, as the length of a stretcher mars the proportions of a curved surface.

(To be continued.)

Quarrying in India.

There is in India a caste of people known as wudders, whom I may, in general terms, describe as the navvies of India, says a writer in one of the daily papers. They are of two classes—those who work in stone and those skilled in the manipulation of earth. The stone wudder is a hardy, sinewy fellow, whose stock in trade consists of a house, which, when on his travels, he transports on the back of his donkey, or else on the head of his wife (no remarkable instance of tyranny, since it consists of nothing but a mat and a few bamboo stays); then he has a heavy crow-bar, a few iron wedges, some earthen pots, a dog, and a small stock of rice. Arrived at his quarry, his first care is to lay in a stock of fire-wood, which he cuts in the jungle and moves by means of a bandy or cart, with low wheels of solid timber, drawn by a pair of buffaloes—an important part of his equipment which I omitted to include before in the list. The wood is piled in small quantities on the surface of the rock and ignited, usually during the night, their favorite time for work. After the fire has been steadily kept up for some hours the upper layer of the rock expands sufficiently to produce a separation from the sub-stratum. The separation is accompanied by a dull, bursting sound, and the extent of the severance is ascertained by a series of taps with the crow-bar, the reponse of which is conclusive to a practiced ear.

The next operation is to break up this loosened bed of rock into fragments of a size convenient for handling, and this is effected by means of a round bowlder of greenstone, as large as can be lifted to his head with the assistance of another man. This he dashes down with all his might on the rock, and sometimes succeeds in making a fracture with a single throw; but it often requires to be repeated many times, and it is wonderful, considering the clumsiness of method, with what success he turns out handsome square blocks of stone, of dimensions well suited for building. This, however, is more to be attributed to the natural tendency of the stone to square fracture than to the skill of the wudder

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Store Fixtures.

For some time past *The Iron Age* has devoted more or less attention to the arrangement and equipment of retail stores, and while dealing with the construction of the various fittings and devices employed for the proper display of goods, has presented illustrations showing many examples of work actually performed. The subject is one of such obvious interest and value to carpenters and builders in all sections of the country who are frequently called upon to execute work of a similar character, that brief reference to one of the examples published in the journal referred to may afford suggestions to many of our readers.

The example selected is that of the building occupied by John W. S. Pierson & Co., of Stanton, Mich., and the accompanying illustrations give a very clear idea of the general arrangement of the store and some of the fixtures with which it is provided. The store is two stories in hight and rests upon a strong foundation, capable of sustaining an edifice six stories high. The front is constructed of red Philadelphia brick, with rock-faced gray Ohio stone trimmings, and is supported by steel girders instead of iron columns. The basement, the plan of which is shown in Fig. 1, is reached by a wide stair-way under the upper-story stairs. It is 8 feet high and the same size as the salesroom excepting the extra width of the foundation walls. The floor is of 2-inch surfaced and sized pine laid over a bed of concrete 5 inches deep, with 4 x 4 inch stuff bedded in for the plank. The main salesroom, the plan of which is shown in Fig. 2, is 97 feet long, 23 feet wide in front and 21 feet wide in the rear and 14 feet 4 inches in hight. It is lighted in front by two large plate-glass windows and in the rear, which is supported by iron columns, by a full-sized glass store front. The second-floor plan is shown in Fig. 3 of the cuts.

The office on the main floor is 18 feet long, 8 feet wide at the entrance, narrowing to 4½ feet at the window in front, which is between two pilasters, and 7 feet 4 inches by 3 feet 4 inches, with a transom above. The sash partitions of plate-glass extending to the ceiling on two sides of the office afford to any one within a complete view of the salesroom. Fig. 4 presents a section of the office partition. The office is provided with an artistic fire-place of Philadelphia red brick with a mantel of Lake Superior stone, both of which with chimney are represented in Fig. 5. The office is finished in black ash and cherry, a part of the office ceiling being shown in Fig. 6.

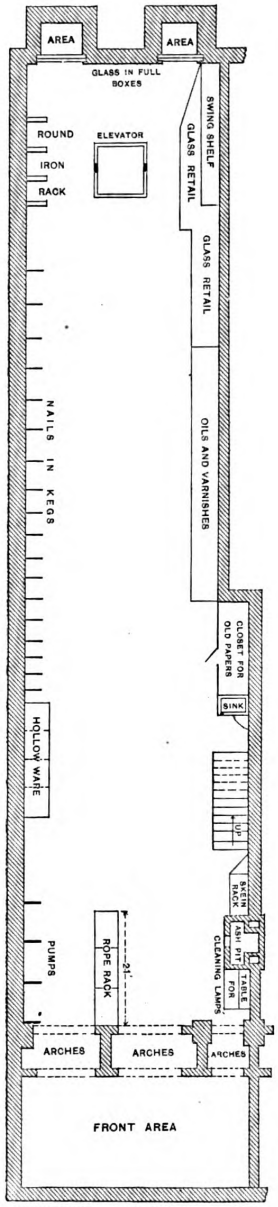


Fig. 1.—Basement.

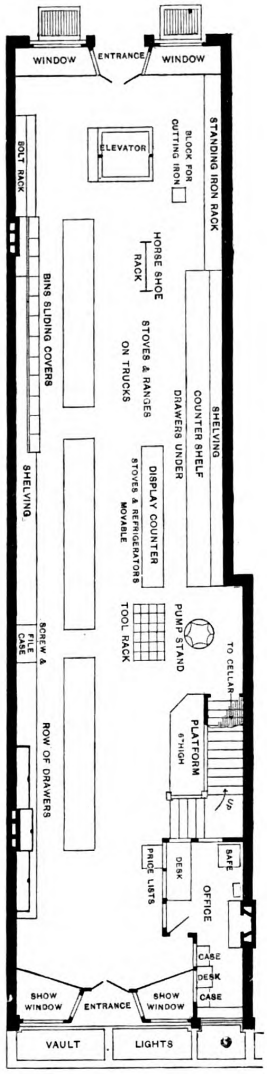


Fig. 2.—First Floor.

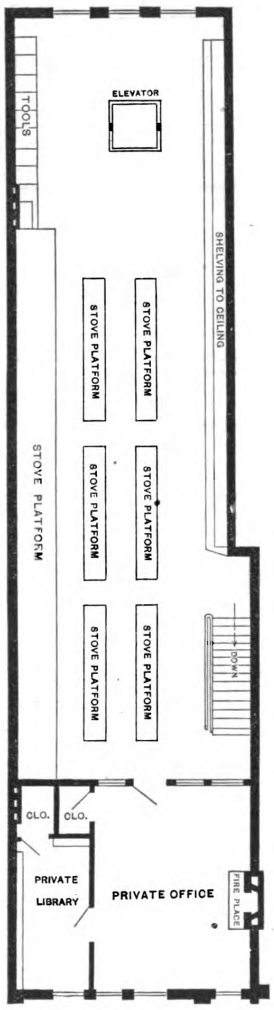


Fig. 3.—Second Floor.

Hardware Store of John W. S. Pierson & Co., Stanton, Mich.—Floor Plans.—Scale, 1-16 Inch to the Foot.—Watkins & Arnold, Architects, Detroit, Mich.

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The front right-hand show-window of the main salesroom has two panels, each 22 x 48 inches, made of ¼-inch pine covered with colored glazed paper and screwed in place. In the left window there is a box inclining in two directions, 28 inches in depth and tapering from 6 to 3 inches,

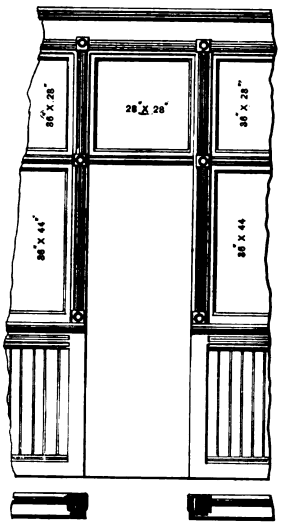


Fig. 4.—Section of Office Partition.—Scale, ¼ Inch to the Foot.

for displaying tools. On the side wall there is another box tapering from 7 to 2 inches and 4 feet high. Here, too, is a shelf 4½ feet long and 14 inches wide and supported by spindles 14 inches high. Above this, 6½ feet from the floor and extending to the show-window, is a strip with wooden pins for suspending goods. Commencing on the left-hand side of the salesroom, there are three large upright cases with glass doors. These rest against the wall and are supported by a counter-shelf 26 inches wide and are raised by weights, provision for which is shown in Fig. 7. An elevation of the cases and shelving is shown in Fig. 8 of the cuts. The first case is 12 inches deep, 4 feet wide and 4½ feet high. It has three shelves, each 8 inches wide and supported by brackets. The base inside the case is 4 inches high in front and 8 inches at the back, with a drop in the center. It contains four drawers, 13 x 10 inches and 1¾ inches deep. The second case is 5½ feet high and 12 inches deep, with a base 4 inches high. It has three shelves, each 9 inches wide, which rest upon brackets. The third case has no shelves, but in other respects is similar to the first. Figs. 9 and 10 give details of the cornice and finish above these cases.

Next along this side of the store is 53 feet of shelving, a detail of one of the columns of which is shown in Fig. 11. In Fig. 12 we have a section of the shelving showing the drawers underneath. There are seven rows of shelves, 7 inches apart and 16 inches deep, supported by cherry spindles. The finish of the cornice above this shelving is shown in Fig. 13. The counter-shelf extending under the shelving is 34 inches high and contains 14 tiers of drawers. There are three drawers in each tier, each measuring 33 x 22 inches on the inside and respectively 3¼, 5¼ and 7½ inches high. There is a base 9 inches high, beveled back at the bottom 4 inches, as shown in Fig. 12. Adjoining the drawers and under the shelving are 12 bins, having beveled fronts and sliding covers. Each bin is 24 inches wide, 24 inches deep, 23 inches high at the front and 32 inches at the back. An elevation of these bins is presented in Fig. 14, while Fig. 15 shows a sectional view. At the end of the shelving there is a space 5 x 4½ feet devoted to 42 wooden drawers, each 10 x 12 inches and 6 inches deep.

On the main floor are also three counters, a sectional elevation of one of which is shown in Fig. 16. The first is 19 feet long, 32 inches wide and 34 inches high. It has a closed front and four divisions on the back side. It has a beveled base 10 inches high to allow room for the feet in standing close to the counter. The second counter is 19½ feet long and contains 12 movable nail-bins. The third counter occupies the space immediately in the rear of the one just referred to. At the right hand is a line of shelving 32 feet long and, including the cornice, is 8 feet 2 inches high. The shelves are 16 inches wide and divided into eight sections, each 40 inches long. Each section has four shelves placed 11 inches apart and one shelf at the top 7½ inches. These are supported by strong spindles. The counter shelf is 36 inches wide, 34 inches high and has eight drawers. These are each 24 x 39 inches and 5 inches deep, making below eight spaces 20 x 41 inches and 36 inches deep. The portable

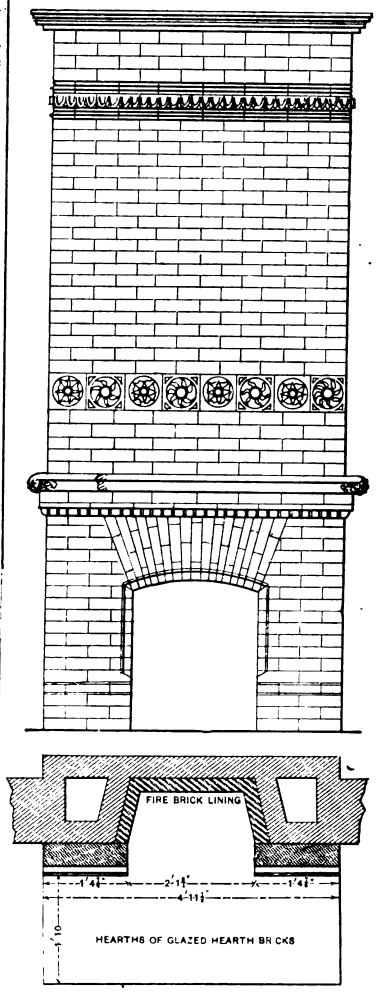


Fig. 5.—Office Chimney-Piece.—Scale, ⅜ Inch to the Foot.

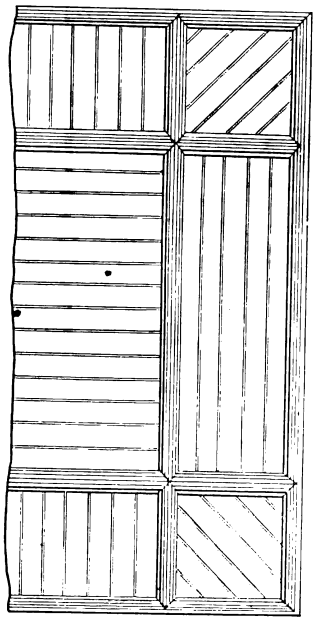


Fig. 6.—Part of Office Ceiling.

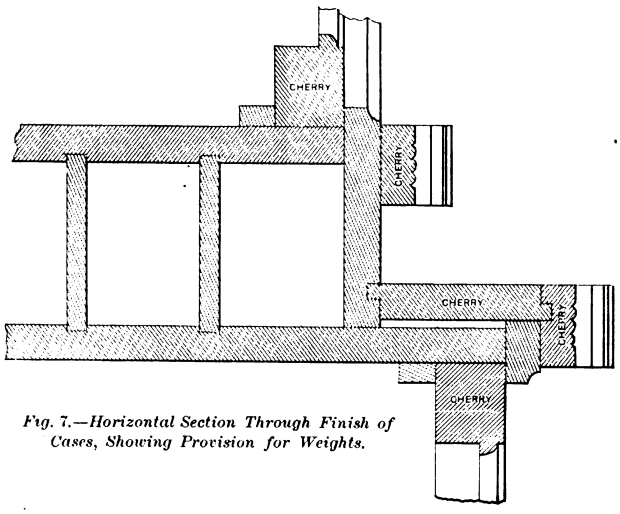


Fig. 7.—Horizontal Section Through Finish of Cases, Showing Provision for Weights.

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tool rack shown in floor plan (Fig. 2) is mounted on casters, and is 6 feet 3 inches by 4 feet 2 inches and 4 feet in hight. It contains 24 divisions, each 11 x 11 inches, inside boxed, each partition being full hight. The partitions are made of ½-inch stuff framed into 1½-inch stuff at top. Outside rim is 2½ inches wide, band at top is 6 inches wide and base 7 inches wide.

On each side of the salesroom and running its full length is a strip of ash 8 inches from the ceiling for the insertion of hooks. The ceiling is pine finished in hard oil. The entire wood-work of the store is of black ash and cherry in light hard oil finish. The floor is maple, laid in narrow strips, the joist being crowned, which gives solidity to the floor.

The stair-way commences just in the rear of the office, as show in the plan, Fig. 2, and is open, broad and easy of ascent, with a heavy baluster and rail extending around the opening of the second story. The finish of this stair-way is shown in Fig. 17. The second floor is devoted to the wholesale stock and stoves. It is the same size as the salesroom, only the private office in front is larger than the office below. The ceiling is 12 feet in hight. There are six stationary platforms, each 14 feet long, 30 inches wide and 7 inches high. They are so arranged as to allow room for stove trucks to run on either side. There is also a platform on the left-hand side 54 feet long, 41 inches wide and 7 inches high. These platforms being short, the heavy weight of goods does not cause the shelves to sag. The first four sections in front on counter-shelf are inclosed with two doors each and have two shelves, making four closets 24 inches high and 30 inches wide. Under these closets and counter-shelf are four divisions 7 inches wide, 24 inches deep and 44 inches high. Next are four sections 44 inches long by 30 inches wide and 24 inches deep, each having three shelves, the top shelf being 10 inches high, the next 14 inches and the bottom 18 inches. The remainder of the room under the

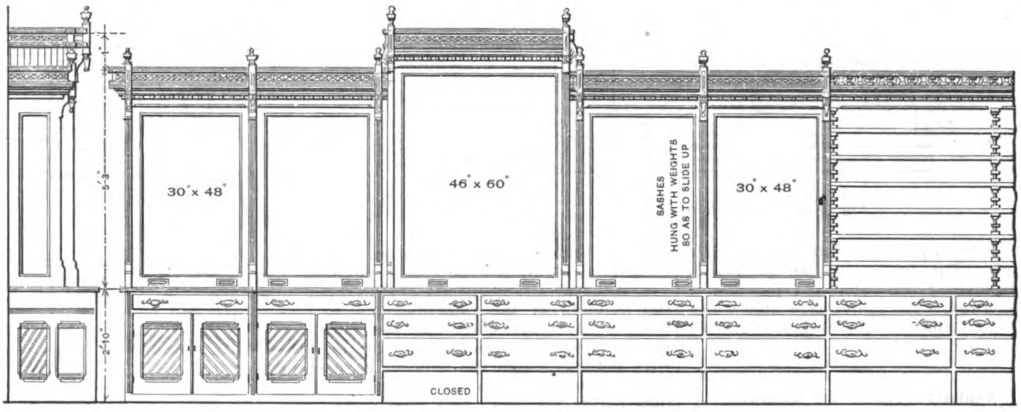
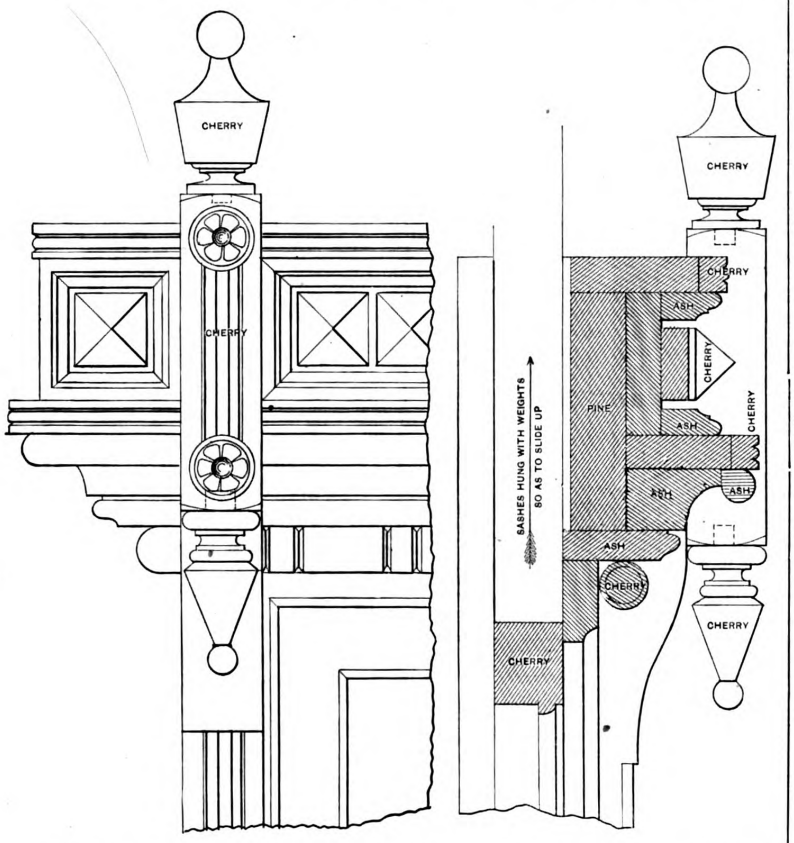


Fig. 8.—Elevation of Cases and Shelving.—Scale, ¼ Inch to the Foot.



Figs. 9 and 10.—Details of Cornice and Finish Above Cases.—Scale, 2 Inches to the Foot.

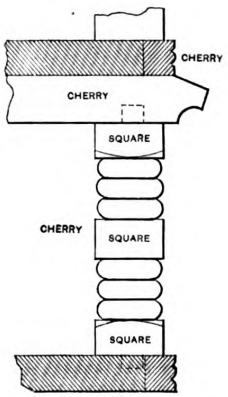


Fig. 11.—Detail of Columns of Shelving.

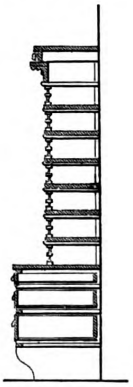


Fig. 12.—Section of Shelving, Showing Drawers.

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counter-shelf is divided into spaces 44 x 30 inches. All the shelving and platforms are made from ⅞-inch pine lumber except the top of the platforms, which is maple. The brick walls are painted in Milwaukee brick color and penciled in Indian red. The ceiling is painted white, the platforms for stoves being given a drab color.

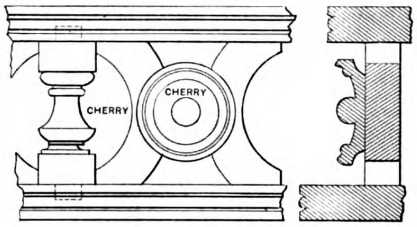


Fig 13.—Cornice Above Shelving.

Asphalt Filling in Masonry.

BY E. F. ZWIRNER.

At the end of the year 1853 the outer walls of the nave and transept on the south side of Cologne Cathedral had been raised as far as the under edge of the cornice lying above the principal wall-plate. This cornice consists of two courses of large coping-stones, 5¼ feet long, lying one upon the other, binding together the whole thickness of the outer walls; of which courses the lower one is richly ornamented on the outside with artistically sculptured foliage, while the upper forms the proper coping. This cornice, only 3 feet 7 inches high, constitutes the only complete horizontal binding over the pointed windows, 55 feet high, which airily pierce the outer walls and make them seem now like a delicate row of pillars. For the total hight of these piers, which descend to the floor of the church, amounts in all to 150 feet; and besides that cornice there occurs only one horizontal binding in the triforium, or middle gallery, which is very light and open. It was therefore necessary to exercise great care in the construction of the upper cornice. The large stones were tied together with iron clamps, which were laid in a heated state in holes previously hewn in the stones, and had natural asphalt poured round them; so that by this means all accession of oxygen was prevented, and consequently the oxidation of the iron forever provided against. Similar bindings of stone with iron, having asphalt copiously poured over it, have been frequently practiced in the building of the cathedral, and are much to be recommended; only they must not be applied externally, for if they were not only would the building be disfigured, but also, through the repeated influence of the sun's rays, the asphalt would be apt to run. All other substances used for filling round the clamps in the stone, as mortar, plaster-of-paris, sulphur and even lead, have failed at Cologne, as in other places; they have always allowed the iron to oxidate and forced the stones asunder by their expansion, as may be observed in many places in the old parts of the cathedral. On this account, wherever in the recent work asphalt could not be employed bronze has been used instead of iron for binding the stones, and the holes filled up with lead.

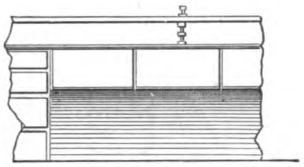


Fig. 14.—Elevation of Bins.

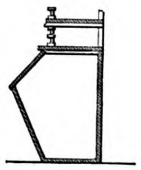


Fig. 15.—Section of Bins.

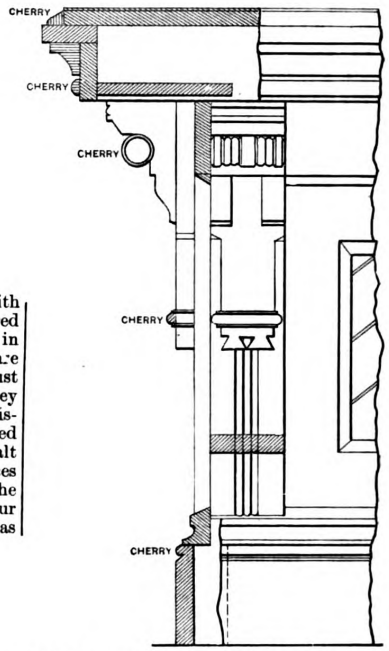


Fig 16.—Sectional Elevation of Counter.—Scale, ¾ Inch to the Foot.

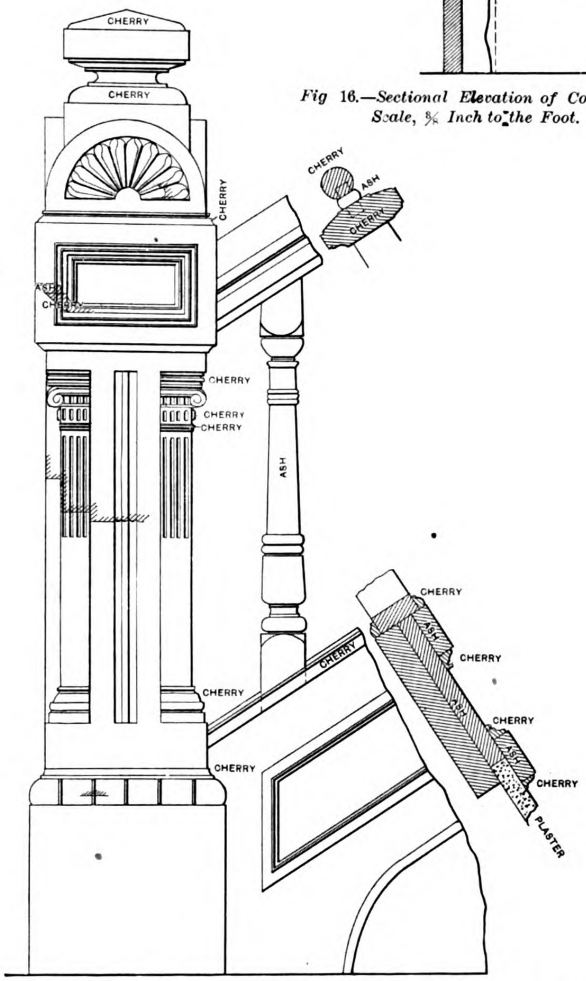
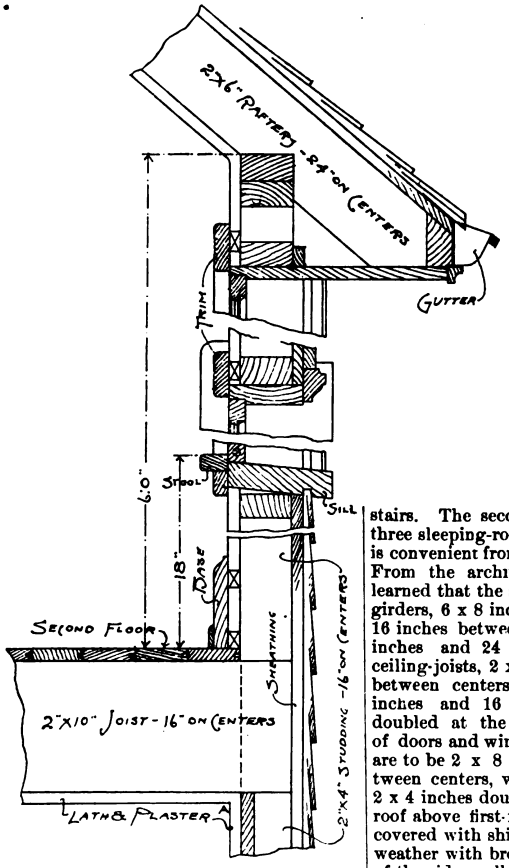


Fig. 17.—Finish of Stairway Leading to Second Floor of Store.—Scale, 1½ Inches to the Foot.

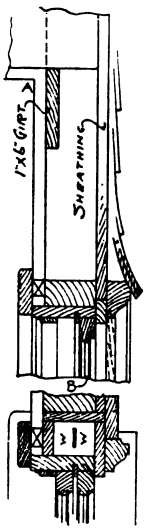
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A Low-Cost House.

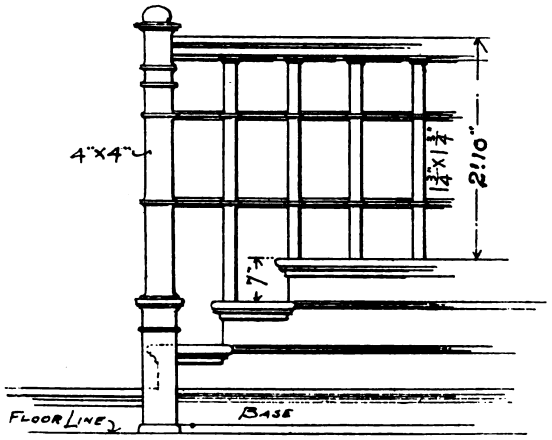
We present on this and the following page the floor plans and details of a low-cost house designed by Mr. F. M. Snyder, Chicago, Ill. The perspective view and two side elevations are shown in Plate I. It will be noticed that there are two rooms upon the first floor, consisting of a kitchen and living-room. Communication is established by means of a convenient pantry, measuring 6 x 7½ feet. The entrance to the house is from a small porch into a hall 7½ x 7 feet, from which leads the main stairs. The second floor is divided into three sleeping-rooms, access to all of which is convenient from the main flight of stairs. From the architect's specifications it is learned that the sills are to be 4 x 8 inches; girders, 6 x 8 inches; joists, 2 x 10 inches, 16 inches between centers; rafters, 2 x 6 inches and 24 inches between centers; ceiling-joists, 2 x 6 inches and 24 inches between centers; and studding, 2 x 4 inches and 16 inches between centers, doubled at the corners and at each side of doors and windows. The porch joists are to be 2 x 8 inches and 16 inches between centers, while the plates are to be 2 x 4 inches doubled. The side walls and roof above first-floor windows are to be covered with shingles laid 5 inches to the weather with broken joints. The shingles of the side walls are to be stained with Cabot's best creosote stain, the siding and all other exterior wood-work, except the roof, are to receive two coats of paint, while the front door and the hard-wood work of stairs are to be filled and finished with two coats of hard oil-varnish rubbed to a dead finish.



A Low-Cost House, by F. M. Snyder, Chicago, Ill.—Detail of Main Cornice and Section of Second Floor.—Scale, 1 Inch to the Foot. (For Elevation see Plate I.)



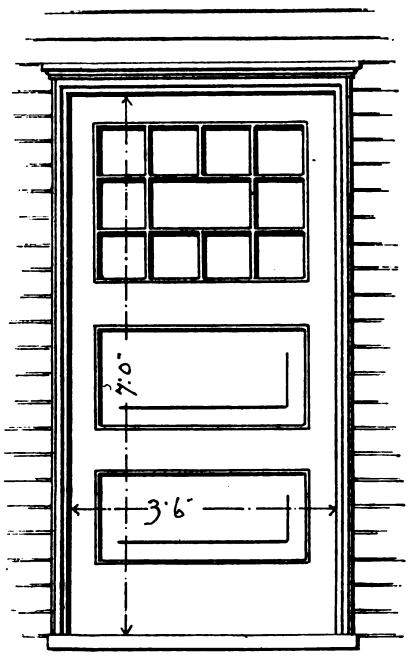
Belt Course and Section of Box Frame.—Scale, 1 Inch to the Foot.



Elevation of Stair Post and Rail.—Scale, ½ Inch to the Foot.

A Five-Room House.

In our double plate we present the perspective view, floor plans, elevations and details of a five-room house designed by C. Powell Karr, of New York City. From an inspection of the drawings it will be seen that there are two rooms upon the first floor and three upon the second floor. The house is designed for a small family who do their own work and no provision has, therefore, been made for a servant. The entrance to the house is protected both by a porch and a vestibule, the latter provision being designed for the purpose of dispensing with a hall. The kitchen is provided with a portable range, a dresser, a two-part stationary tub with all appliances and a commodious pantry. In this case the kitchen will necessarily be employed for dining purposes. A feature of the design is the stairway, which, it will be noticed, is built out into the living-room. In this room is provided a plain brick fire-place in which either coal or wood may be burned. The cellar is reached from the kitchen by means of stairs beneath the main flight. In the cellar is a coal or wood bin and hanging shelves. The second floor of the house is divided into two large and one small room. The large rooms are provided with closets, while off from the rear room is a smaller one which may be used for a trunk or storage closet. Entrance is gained by a sliding-door and light is afforded by a small window. The house faces slightly west of south, giving the best chamber a south-west exposure. On the northerly and westerly sides of the house are outside blinds. The only feature of the interior finish at all expensive is the main stairway, which has been elaborated for the sake of beautifying the living-room.

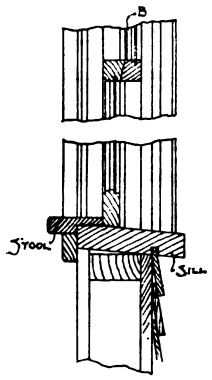


Elevation of Front Door.—Scale, ½ Inch to the Foot.

ONE OF THE MORE attractive buildings recently completed in St. Paul, Minn., is that just occupied by the *Pioneer-Press*, of that city. The structure is in the French Renaissance style of architecture, treated with all the simplicity consistent with

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good taste. The first two stories are built of St. Cloud granite cut in large blocks. Upon these solid walls rests the dark richly-colored pressed brick of which the building is constructed. It is stated to be an absolutely fire-proof edifice, the boilers and furnaces being in an adjoining building. It is 13 stories above the basement. A feature of the building is the two-story vestibule and stairs, which are constructed of Italian marble, and the rotunda, 36 feet square, extending upward for 12 stories. The building contains 160 business offices,

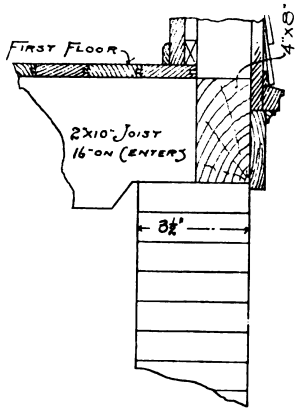


Low-Cost House.—Section Through Window-Frame.—Scale, 1 Inch to the Foot.

besides two magnificent banking apartments. There are five elevators, which run night and day, electric-light machinery in the basement for lighting purposes and boilers for heating the structure by steam.

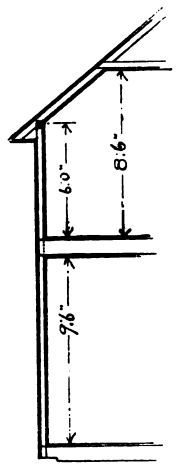
Derivation of the Word "Attic."

The low story or other superstructure so commonly found in modern buildings and in many of the architectural works of the Romans above a columnar ordinance and terminating a front or elevation is called an attic, and the reason given for that name is that it was used in Attica. But the popular authorities on such subjects generally add to this that such a thing as an attic story does not appear in any one of the existing specimens of Athenian edifices, and that, indeed, it was not known in Greek architecture at all. I had been so often asked, says W. Hosking in an English paper, why it was called by the name it bears if that were the case, and if it was not derived from the name of the country Attica what the word could mean at all, that I took some pains to discover what the best etymologists said on the subject, but with no avail, for they either omit all mention of it or give the ordinary absurd explanation. Architects are even more reserved, for Vitruvius does not use the term; Mr. Wilkins consequently omits it in his glossary of architectural terms appended to his



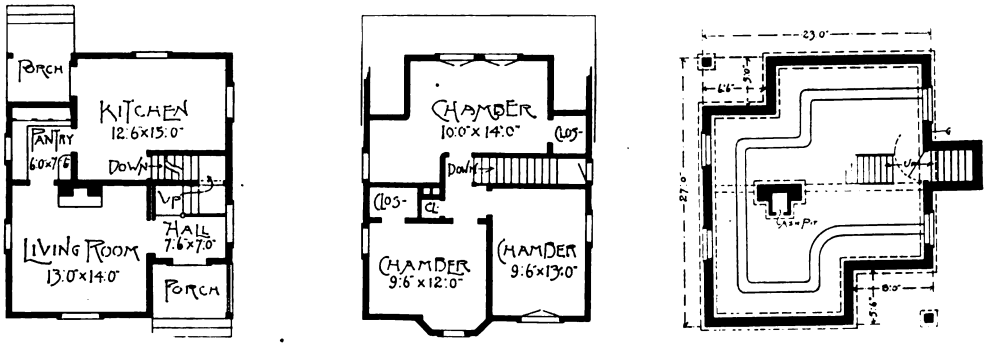
Detail of Water-Table.—Scale, 1 Inch to the Foot.

translation of that author, and Mr. Gwilt simply states what is meant or intended by it without inquiring why the term is so applied. I then had recourse to Roman buildings, in which low superstructures of the kind are common, but could from no analogy divine why they should be called attics, and was at length again driven to what I believe to be the genuine source—to the architectural works of the Greeks. Here the first difficulty to be surmounted was the absolute non-existence of anything in external elevation which bore the remotest resemblance to an attic. Internally, however, a superior story, or superimposed ordinance, is found in the upper range of columns of the hypæthral temple, as exemplified in the Temple of Neptune, at Pæstum. But the question immediately arises, Why should this be called an attic? In a Greek temple the walls of the cella stand in connection with and are of the same hight as the external columns, as they have mutually to support the ceiling of the lateral porticoes or outer aisle; and when there are internal columns, as in a hypæthral structure, they too, resting on the floor of the temple, are similarly connected with the walls in the support of the ceiling over the inner aisles, and are consequently of the same hight also. But the edifice being hypæthral, the nave or space between the inner ranges of the columns must not be covered; an upper range of columns, or attic, is therefore placed on each of these latter to receive the upper ends of the rafters, whose feet rest on the external entablature. Standing above the hight of the walls of the cella, and having none in connection with them, as columns on every other situation have, they form an ordinance Ἀτείχον, from the privative *a* and τεῖχος, a wall—without a wall or without being in connection with a wall. Hence the Latin *atticum*, and its application to a low superimposed ordinance was natural and easy, and thus we



Sectional View Giving Story Hights.—Scale ⅛ Inch to the Foot.

have the term attic. The ruins at Salonica, called "the Incantada," show the progress from the simple internal arrangement of columns in an Ἀτείχον to the regular external attic of Roman architecture, as they consist of an orthastyle or range of columns with their entablature in a manner not dissimilar to the attic in the Strand front of Somerset House, but that



First Floor. Second Floor. Foundation.

Scale Floor Plans, 1-16 Inch to the Foot.)See Plate I for Elevations, &c.)

in the former the interspaces are open and the latter has a finishing cornice instead of an architrave.

THEY BUILD FIRE-PROOF HOUSES in Buenos Ayres and Montevideo without thinking of it, says a writer in one of the local papers, and while using all the wood they can afford to they use neither iron nor the arch. Trees are scarce in the neighborhood, and timber has to be brought down from the upper waters in hard woods. Being dear, a little of it is made to go as far as possible. The floors and the roofs are supported by joists of hard wood, as

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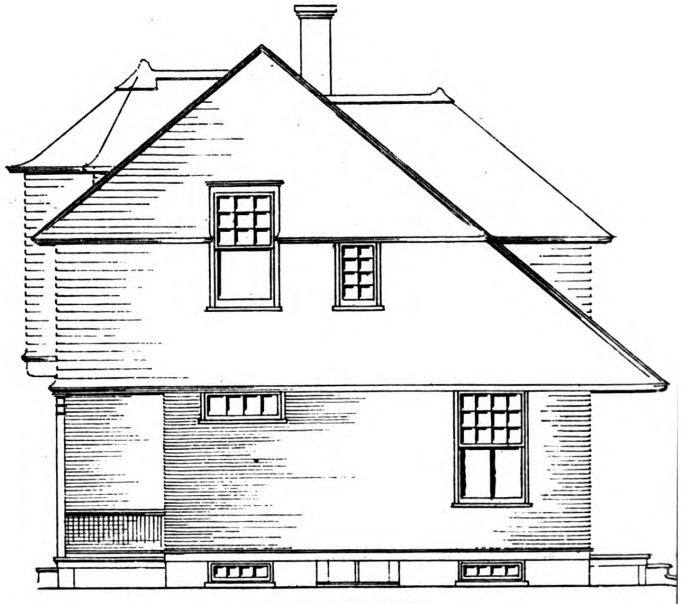
PERSPECTIVE VIEW.

A Low-Cost House.

FRANK M. SNYDER, ARCHITECT, CHICAGO, ILL.



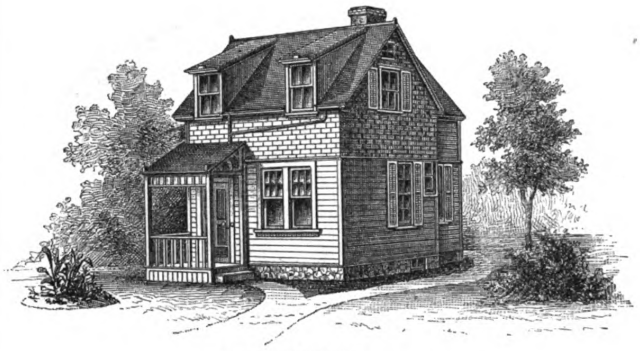
FRONT ELEVATION.



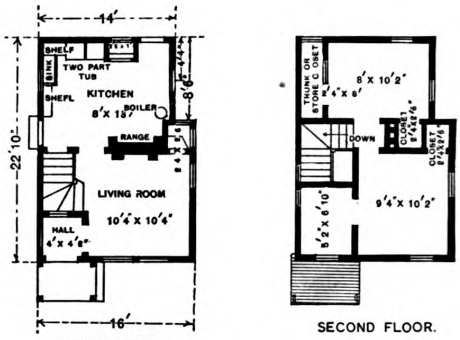
SIDE (FIGHT) ELEVATION

Scale, 1-8 Inch to the Foot.

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PERSPECTIVE VIEW.

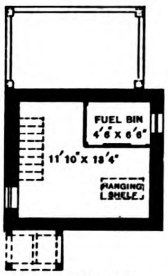


FIRST FLOOR. SECOND FLOOR.

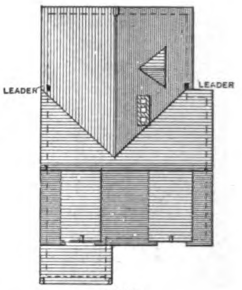
Scale Floor Plans, 1-16 Inch to the Foot.



SIDE (RIGHT) ELEVATION. Scale, 1-8 Inch to the Foot



FOUNDATION



ROOF.

Scale, 1-16 Inch to the Foot.

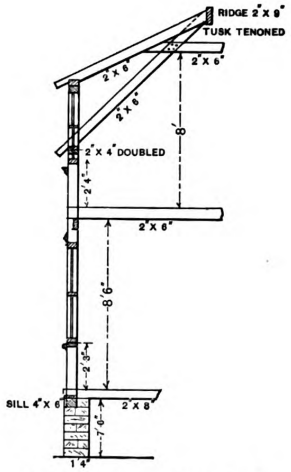
A FIVE-ROOM HOUSE.

C. POWELL KARR, ARCHITECT,

NEW YORK.



FRONT ELEVATION. Scale, 1-8 Inch to the Foot.

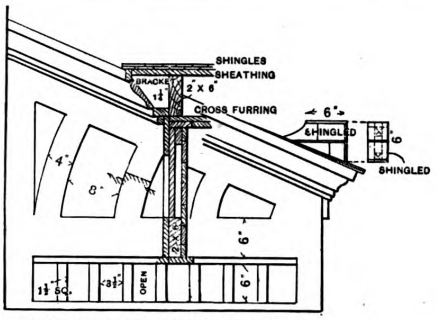


SECTION. Scale, 1-8 Inch to the Foot.

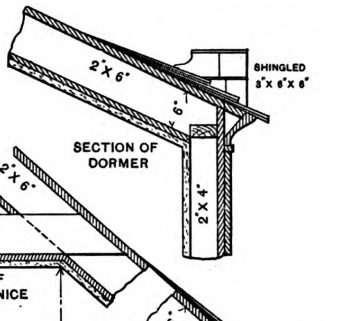


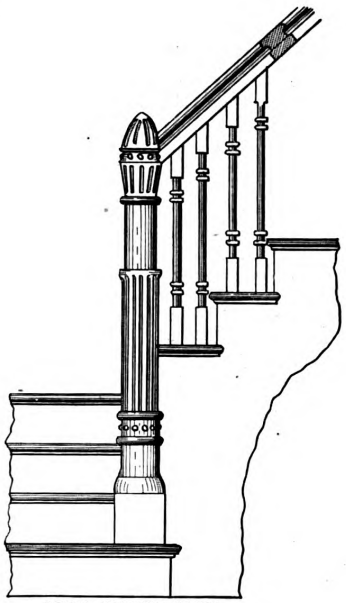
SIDE (LEFT) ELEVATION. Scale, 1-8 Inch

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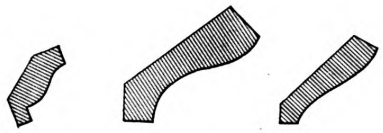


ELEVATION AND SECTION OF PORCH.
Scale, 1-2 Inch to the Foot.

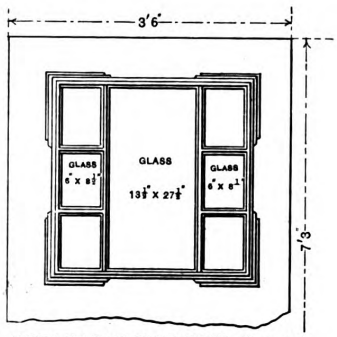




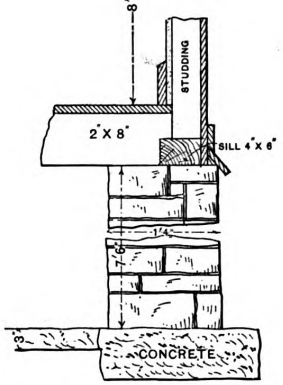
DETAIL OF MAIN STAIRS.
Scale, 1-2 Inch to the Foot.



PROFILE OF MOLDINGS. Scale, 1 1-2 Inches to the Foot.



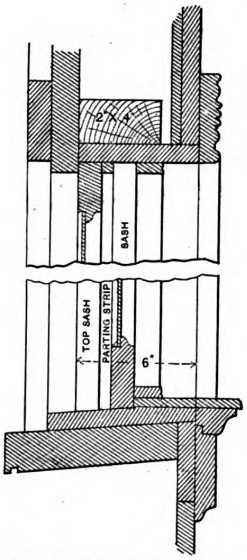
UPPER HALF OF FRONT DOOR. Scale, 1-2
Inch to the Foot.



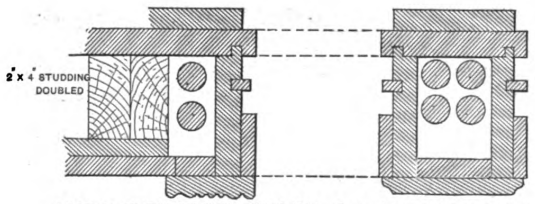
DETAIL OF FOUNDATION, BELT
COURSE AND MAIN CORNICE.
Scale, 1-2 Inch to the Foot.



o the Foot.

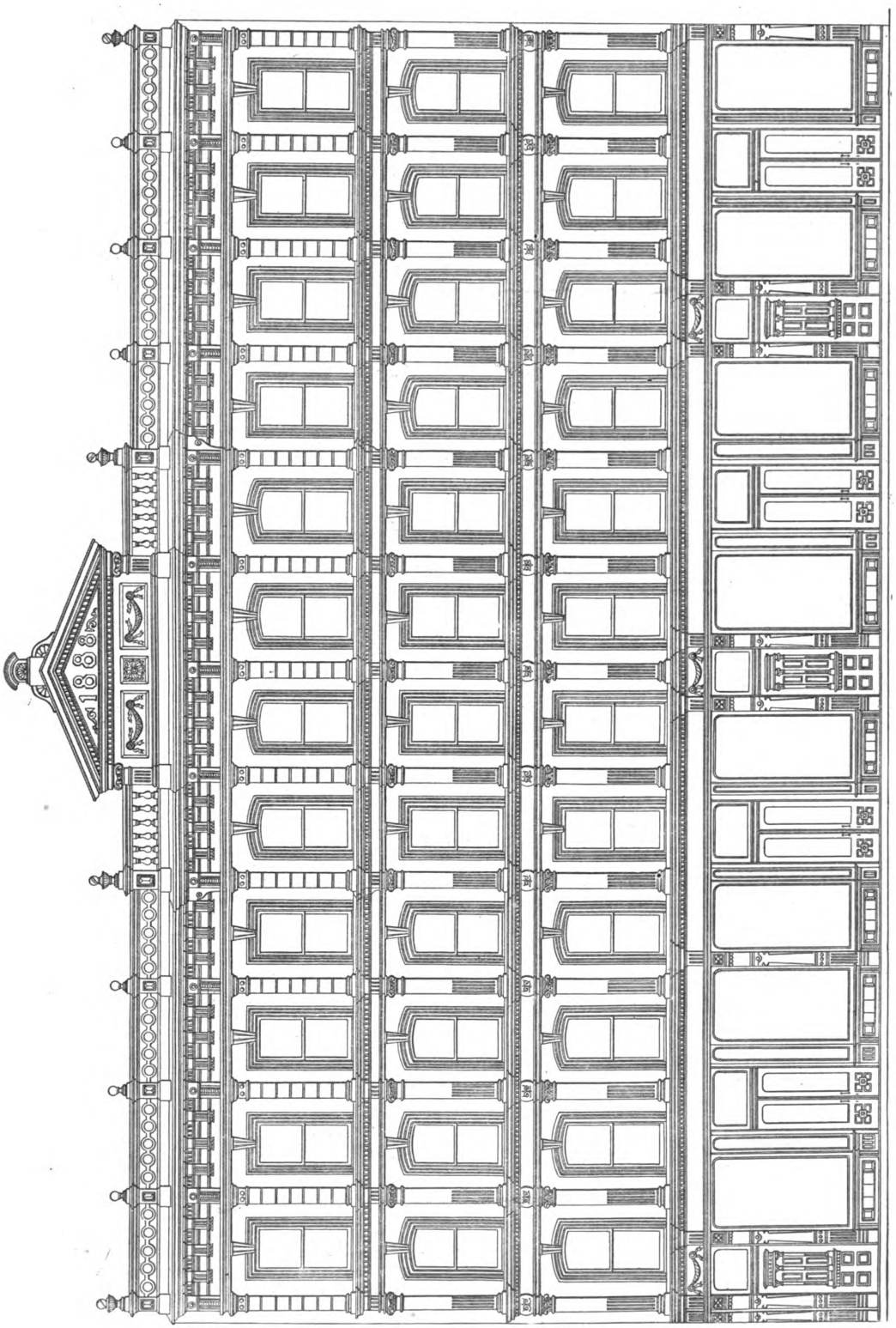


DETAIL OF WINDOW SECTION.
Scale, 1 1-2 Inches to the Foot.



SECTION THROUGH WINDOW-FRAME. Scale, 1 1-2 Inches to the Foot.

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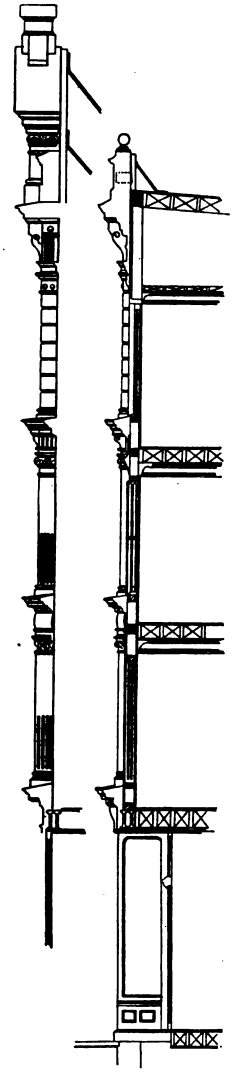
ELEVATION OF BUILDING IN JERSEY CITY, N. J.—ENTIRE FRONT OF GALVANIZED IRON. Scale, 1-10 Inch to the Foot. (For Details see Opposite Page.)

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among us; across these are laid flat rails of the same, and the spaces between these are bridged over by thin bricks 13½ inches long, with their ends resting on the rails. Another layer of bricks is then laid with lime and generally on this a layer of flat tiles. The doors and windows have no boxes, but simply frames, which are set up when the walls are going up and built in. There is no lathing or wainscot or skirting of the bottom of the walls. A house thus built cannot be burned.

Galvanized-Iron Fronts.

A very interesting example of the application of galvanized iron to the fronts of buildings is found in a structure recently



Galvanized-Iron Fronts.—Fig. 1.—Sectional Views of Building Covered with Galvanized Iron.—Scale, 1-10 Inch to the Foot. (For Elevation see Plate IV.)

erected on Bergen avenue, near Montgomery avenue, Jersey City, N. J. This building, which is four stories in hight, has its entire front covered with galvanized iron, the work being executed by Messrs. Jacob Ringle & Son, of the city named. In the execution of this work one of the principal objects aimed at was to make the front as free and independent as possible from any connection with the brick-work, and with the exception of such flanges as were necessary to stiffen the return columns at each end of the building none were built into the wall. In the illustrations which we present herewith we show front and sectional views of the structure referred to, as well as some of the details of con-

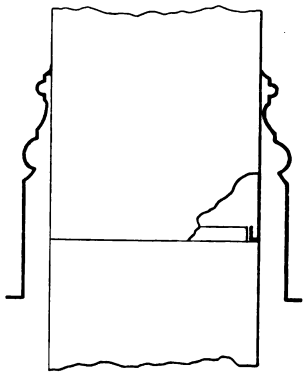


Fig. 2.—Base of Pilaster.—Scale of Details, 1 Inch to the Foot.

struction. A front elvevation of the building showing the attractive features after the work was completed is presented in Plate IV, while Fig. 1 shows sectional views of the front. The work was put together at the shop in sections of such size as to be convenient for handling, the various parts of each section being well soldered and riveted before taken to the building. The seams made at the building were for the most part of the lock type, as shown in the illustrations. In the execution of this work the lintel or stone-

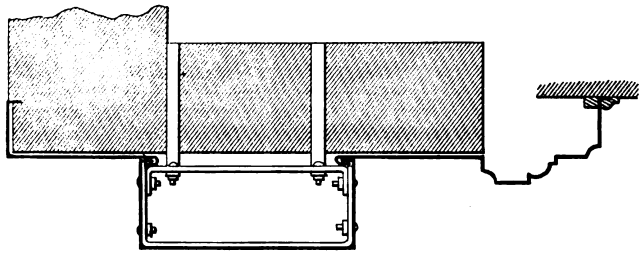


Fig. 3.—Horizontal Section Through Pilaster, Showing Position of Anchors.

cornice was first set in place and well anchored and bolted to iron beams or girders over the first story. With the exception of the roof-boards over each story cornice

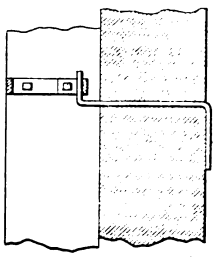


Fig. 4.—View of Anchor.

there was no wood-work employed on the entire front. The roof-boards rest on iron braces and were bolted to them. The next step after covering the cornice with galvanized iron was to lay off the distance for the centers of all the columns and set them in place. These columns were made in sections, each section being one story in hight and constructed as shown in Fig. 2 of the illustrations. From an inspection of the cut it will be noticed that an edge is turned in on the back to receive the side flanges of the window-frame. The columns were temporarily secured to the floor-joists in each story and provided with braces at four points—one at each end of the section and the other two spaced off

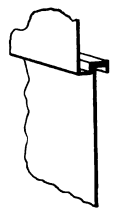


Fig. 5.—Showing Method of Making Cross Joints.

at equal distances between. Each of these braces was provided with two anchors, as shown in Fig. 3 of the cuts. These anchors were of sufficient length to go through the wall and turn down on the inside, all of which is clearly indicated in Fig. 4. After the columns were set and secured to the floor-joists the window-frames were put in place from the back and locked on to the side of the columns. The window-frames were constructed in one piece, the size of opening between columns, and in hight extended up under the cornice above, the flange at the top being turned back. The cornices above the windows in each story were made exactly the length of the space between columns, with a head in each end extending the entire hight of the cornice. On the back of these heads a flange was turned out to lock on to the back of the column in the same manner as employed in connection with the window-frames below. The bottom of the cornice extended down over the window-frame, as indicated in Fig. 5 of the illustrations. The cornices of the different stories returning around the columns of the front were built on to the columns in the shop. As each story of the building was completed the back was filled in with brick, as indicated in Fig. 3. In the construction of this work the columns were made of No. 20 iron, the window-frames of No. 22 iron and the cornices of No. 24 iron.

THE LOCAL PRESS in reporting the Pittsburgh Exhibition give quite an account of the exhibits of Reinecke & Co., who show the Gurney hot-water heaters among other goods. At their exhibit they are distributing a valuable little treatise on the subject of "How to Heat Our Homes," in which the merit of the hot-water system is dwelt upon.

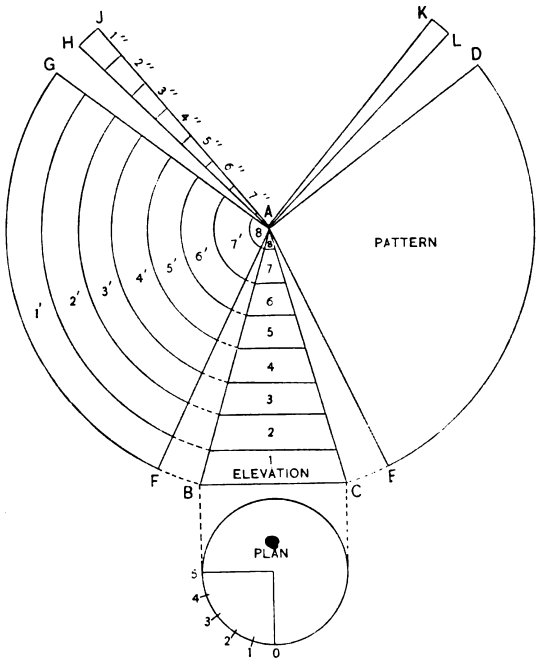
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CORRESPONDENCE.

Covering for Conical Roof.

From R. L. Y., *Clarksville, Tenn.*—I should like to have published in *Carpentry and Building* a method for obtaining the patterns for a flat-seam roof to be circular in shape, 10 feet in diameter at the base and 16 feet high, to be in the form of a cone.

Answer.—The patterns that our correspondent wishes are for the envelope of a right cone, as shown in Fig. 1. In order



Covering Conical Roof.—Fig. 1.—Pattern for Roof Covering.

to describe the necessary patterns for the covering of a conical roof the size of the material should be taken into consideration, as, for example, if the covering is to be of 14 x 20 or 20 x 28 tin. In the illustration let A B C represent the elevation of the cone, below which is drawn the plan. The pattern for the envelope is by setting the compasses to the slant hight of the cone, as A C, and striking the arc E D, upon which space or measure the circum-

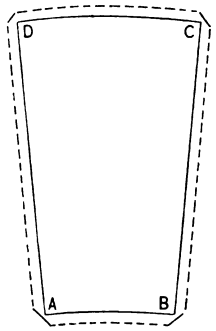


Fig. 2.—Enlarged View of Pattern for One of the Sections.

ference of the plan, and draw the lines E A and D A as shown. Then E D A is the pattern or covering for the cone A C B. if it is desired to put on the covering in strips reaching from the base to the top, then the whole or part of plan can be spaced off into divisions of proper size, representing the size of material with which the roof is to be covered. In the illustration one-fourth of the plan is divided into five parts; then five strips like A L K, locks being added, would cover the roof from 0 to 5 in plan, or 20 strips in all.

The cone can be divided into a number of sections, in the present ins'ance eight, and each section considered as the frustum of a right cone. Proceeding as directed above, A F G would be the pattern for the entire cone and 1′ for the frustum 1, 2′ for 2, &c. If the patterns were got in the shape indicated by 1′ to 8′, it would e necessary to allow for seams or laps between 1′ and 2′, 2′ and 3′, &c., and at the edges F A and A G. If it is desired to put on the covering in sheets, as is done in ordinary flat-seam roofing, and have the sheets of each section narrow toward the apex of the cone, then A H J would represent the several patterns, 1″, 2″, 3″, &c., representing the net patterns, due allowance to be made for locks or seams. In Fig. 2 is shown the enlarged pattern for the section 3″, the solid lines A B C D representing the net pattern, the allowance for edges being indicated by the dotted lines.

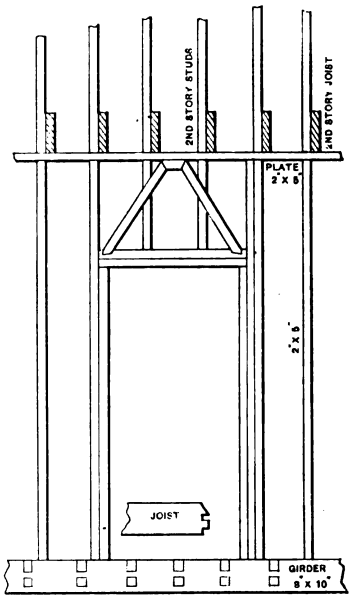
Soil for Earth-Closets.

From B. P., *Fort Yates, D. T.*—Will some one please inform me, through the valuable columns of *Carpentry and Building*, of the kind of soil or sand which is adapted for use in earth-closets and the manner of employing it? I am acquainted with the construction of the closet, but that is all I know concerning it.

Answer.—We would suggest to our correspondent that he make use of almost any kind of dry sifted dirt, or, if ashes are more convenient, these will be found to serve an admirable purpose. In using the closet it is usual to have a vessel filled with dry earth placed either beside the closet or in one end of it, as may be most convenient. The first step is to cover the bottom of the receptacle within the box with dry dirt to a depth of from 2 to 3 inches, and then after the closet has been used a small shovelful of earth is thrown in. In a case cited in Bayles' "House Drainage and Water Service" this plan was adopted with very good results, the statement being made that the closet was perfectly free from unpleasant odor, though in daily use by several persons. The only attention such a closet as that referred to requires is to empty the receptacle employed when it becomes filled.

Setting Inside Studding.

From A. W. H., *Westfield, Mass.*—Will you kindly give a reader of *Carpentry and Building* space for a criticism of "J. D.'s"



Setting Inside Studding.—Fig. 1.—Method of Setting Studding Suggested by A. W. H.

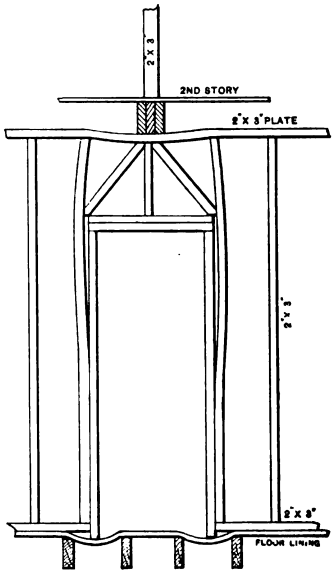


Fig. 2.—Appearance of J. D.'s Right Way After a Few Years.

"right" way of setting inside studding, which appeared in the October number? For fear some of the brotherhood will use

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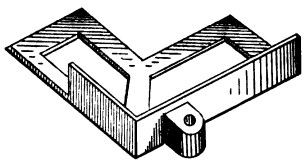
his plan without thinking what the effect will be, I send a drawing (Fig. 1) which cannot fail to interest and which I consider an improvement on his "right" way. Fig. 2 shows how J. D.'s right (?) way will appear after a few years. I would, however, like to hear from others on this subject.

Concrete Foundations for Brick Dwelling.

From M. & E., *Okaweville, Ill.*—Will some of the readers of *Carpentry and Building* kindly tell me what per cent. of concrete should be used to make a foundation and wall for a brick house, the same material to be used 3 feet above the ground? I would also be glad to learn the method of executing the work. The writer desires to build a two-story structure, and as no stones are to be had here I thought of making the foundation of concrete. I should also be glad to know the probable cost per cubic foot and how much one barrel of cement will make.

Shutter-Eyes.

From SHUTTER MAKER.—When a brick building is being put up and there is any probability that iron shutters will be required, it is a good plan to see to it that eyes or irons are placed in the wall for hanging the shutters on. This may appear as advice that is intended for the ears of those that own the building, but such is not entirely the case, for if the person who is interested in the manufacture of iron shutters can get the owner of a building to put in eyes for shutters the battle is about half won, for it is about as



Shutter-Eyes.—Fig. 1.—Cast-Iron Shutter-Eye.

easy to get an order for shutters when the eyes are in the wall and the shutters are not absolutely necessary as when the opposite is the case. Cast-iron eyes are sometimes used for placing in the wall to hang iron shutters and doors on. They are made as shown in Fig. 1, so as to represent a brick when set in the wall, a frame of iron extending back to the face, giving greater security to the eye when set in the brick wall. The eye to receive the pin in shutter-hinge is cast on the



Fig. 2.—Hinge with Pin.

face of the hollow brick as shown. These eyes must be made in pairs or sets, so as to be right for each side of the opening. The engraving shows an eye for the right-hand side of an opening. When it is not convenient to procure cast eyes they can be made from bar-iron that will answer the purpose very well. Some make the irons for holding the shutters in the wall with a pin, as shown in Fig. 2. This form is very inconvenient to secure in the wall without the iron is twisted so as to lay flat in the wall, which brings the pin too far from the wall without the brick is cut for the twist. The most convenient form of shutter-eye that can be made from bar-iron is shown in Fig. 3. They can be made from 1½ x ¼ inch iron when to be used for doors or windows of ordinary size. Sometimes old wagon-tire can be used for the purpose, which reduces the expense. These eyes are made

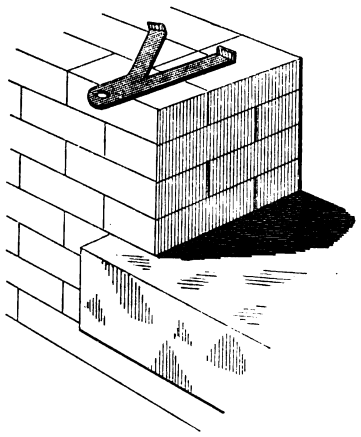


Fig. 3.—Shutter-Eye Made from Bar-Iron.

by splitting the iron for about two-thirds of its length, which should be about 2 inches, bending out one of the parts and bending up the ends so as to hold on the second brick as shown. A ⅛-inch hole is to be punched in the outer end and the corners rounded off. These eyes are also to be made in pairs, or rights and lefts, but this can be done by turning up the ends from opposite sides.

Friendly Criticism.

From ALTA, *San Francisco, Cal.*—I notice in recent issues of *Carpentry and Building* which have come to hand that the wood butchers are beginning to jump on each other like a parcel of ordinary doctors and lawyers. One old chip from Suckerdom piles his whole kit on a poor unfortunate from Kansas (see page 77 of the April number). After reading that article I felt it to be my Christian duty to step on the editor for allowing a whole page of valuable space to be wasted in telling us that "very few bay-windows are octagon." Probably the majority of carpenters outside of the Sucker State are aware of that fact, and yet most of the bay-windows, excepting those having square angles, have octagon angles, and that is the point in which the carpenter is most interested Brick is made to that angle, and from more frequent use it is easier for the carpenter to work to it The center or front being the larger the mullioned window does not necessarily alter the angles. Another suggestion, Mr. Editor, which I would like to make is this: A man writing or speaking to the public should know what he is writing or talking about. In the May number, on page 101, several correspondents try to tell how to cut jack-rafters. They are all of the "good-enough" class, but 'way off when accuracy is considered. Were the jack-rafters 6 inches thick instead of 2 inches the error would be more readily apparent. In previous issues of *Carpentry and Building* I have seen a diagram giving the genuine article, the cuts of which are warranted to fit "like de paper on de wall." While I am in a reckless mood I would like to tramp on those stair-men and make them explain more clearly the whys and wherefores of their diagrams. I shall never forget what a puzzle I found Ridley's hieroglyphics on stair-building.

Octagonal-Roof Framing.

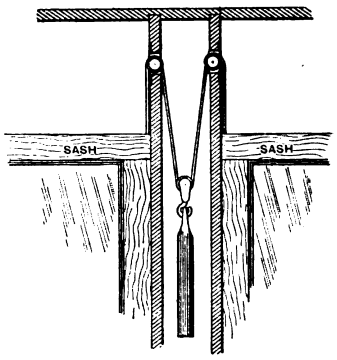
From T. D. G., *Council Bluffs, Iowa.*—I notice in recent issues of *Carpentry and Building* quite a lively discussion of the rafter-framing problem, more particularly of the O. G. style. I will not attempt to criticise the methods already shown in the May and June numbers of the paper, but generally I find the easiest way of framing such roofs is to lay off the miters for jacks on the bottom of the rafter. The latter is generally straight and the same pitch as the common rafter. Furthermore, I prefer to plant the crooked parts of the rafter on a straight piece either 2 x 4 or such other size as may be required.

Rake Molding Intersecting a Level Molding.

From J. S. B., *Philadelphia, Pa.*—In reply to "J. N. B., Jr.," of Burlington, Pa., whose inquiry appeared in the November number of *Carpentry and Building*, I would say that it is impossible to miter and member a rake and level molding of the same size.

Hanging Sash in Mullion Window-Frames.

From D. W. D., *Franklinville, N. Y.*—I inclose herewith a sketch showing an easy method of hanging sash to prevent the necessity of wide mullion window-frames. By referring to the sketch it will be seen that I run a cord through the frames and attach to each sash. Upon the cord in the box I place a small pulley, to which I at-



Method of Hanging Sash in Mullion Window-Frames Suggested by D. W. D.

tach the window-weight. I send this sketch for the benefit of "W. L. K.," of Mount Carmel, Ill. I cannot say who is the inventor of this arrangement, but it has been in use for some time and I consider it of interest to readers of *Carpentry and Building.*

Methods of Hand-Railing.

From J. H. MONCKTON, *Brooklyn, N. Y.*—In the February, 1889, number of *Carpentry and Building* N. B. Garvock, of Ottawa, offers some suggestions indicating an intelligent interest in the practical treatment of hand-railing. The writer expresses himself as dissatisfied with the use of tangents for hand-railing purposes and raises the question of improvement. He says: 1. "We think an improvement can be made in winders by working the easing in the wreath-piece connecting the straight rail, instead of the usual patch that makes the connection." In reply to this suggestion, I would say that the usual ramp can be dispensed with by drawing the connecting tangent in line with the

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pitch of the straight rail of the flight; but to do this the plan must be suitable—that is, it should have but one winder in the cylinder and be planned with a view to that result. But stairs are not always planned in the best way for comfort and ease of travel, but they are mostly assigned a corner or the least possible room that they can be crowded into; then the stair-builder is expected to make the best he can with the number of rises, tread, winders and size of cylinder as sketched and in the space allowed. As to the "patch," meaning the ramp, that may include, if considered important, any required length of straight rail, and therefore need be in no sense a "patch." Who would expect to find large and comfortable rooms in a house of 12 feet front? Just so with stairs. Limit them to 2 feet 6 inches in width with five winders crowded in and around a 5-inch cylinder at the starting and at the landing and one would not have a comfortable and easy way of travel from floor to floor. The wonder ought to be how over such crooked stairs as these the hand-railing, which is so admirable a guide and guard, is put up in such uniform hight and so perfect in strength, appearance and form. Without large cylinders, reasonably wide treads, with properly proportioned rises and ample room for a staircase it is absurd to expect easy traveling and artistic stairs or beautiful lines of wreathed hand-rails from the hands of any architect or stair-builder. We might as well think of demanding as delightful music from the limited capacity of a penny whistle as from an admirably-constructed, sweet-toned old violin.

The correspondent further writes: "We think the rail should follow the nosing line of equal winders, instead of the usual deviation which causes balusters to be of unequal length and the wavy falling line of rail so conspicuous in Monckton's new work." As it is well known that the steep pitch over winders brings the rail—if kept the same hight as over the regular flyers—nearer the nosings, it has been my practice, when possible without making the ramp curve too long, to raise the rail something higher over winders; but I have never had any one—superintendent or owner—object to or commend me for so doing. The fact is, it is a matter for experts to care for, and in extreme cases is of considerable importance. In planning stairs it is important that winder treads are made the same width on the established line of travel as the regular flyers; also, two diminished treads or winders are generally fixed in the straight part just before reaching cylinders to furnish the conditions for a ramp that will make a less steep pitch and more agreeable curve to the wreath. To do this uniformly and in general practice and at the same time be able to use balusters under all wreaths of the usual lengths under straight rails is impossible. But even if the winder treads are graded to suit the curve of ramp and the unfolded line of wreath—and they may be so graded if thought desirable—there would still occur different lengths of balusters, partly owing to the steep pitch of the wreathed rail—sometimes an angle of 60° or more, while the straight rail will be about 40°—and also to the fact that properly graded steps will be of different width, which makes it necessary to so place the balusters that their unequal distances may be least noticeable.

For the most commonly used winding stairs and some others it has generally been the practice of the trade in New York City and vicinity to leave out of an order to the turner of balusters all those required on winders with slight exceptions; then, after the rail is set up the lengths of balusters on winders under wreaths are taken and the order completed. This practice was very troublesome at times, as well as an expense; both of which I have overcome by the discovery and easy application of simple methods, as follows: 1. Unfolding in elevation from plan, the treads measured on the center line of the plan of rail. 2. By the introduction and use of level lines common to both plans, by means of which the exact hights to the center of wreath of any number of points taken on the center curve line of plan may be obtained and unfolded in position over the unfolded elevation (see February and December, 1888, numbers of *Carpentry and Building*), thus showing the exact position of the wreath in relation to the elevation and enabling the stair-builder to get at once from his drawings lengths of all balusters wherever placed on the winding steps. The fact that this unfolded center line of wreath is curved—or, as Mr. Garvock puts it, "the wavy falling line of rail"—arises from the same geometrical law made use of by metal-workers in unfolding the miter line of a stove-pipe elbow, which line is the intersection of the circular surface of a pipe with the cutting-plane of its miter. Surely no metal-worker ever found fault with this curved or "wavy" line. Nor do I think Mr. Garvock would, or could, after giving the subject more careful study.

The writer asks: "Does the tangent system of hand-railing present the art in its highest form, or can any improvement be suggested in the art?" Let us look into this question. By tangents to eccentric or elliptic curves, or to very small circles, or those of the largest radius, and of any desirable portions for wreath-pieces, we are enabled to make use of such inclinations or pitches—changing pitches is necessary at each pair of tangents—as required in any case, either for elegance of appearance within certain limits or as imperatively demanded by the nature of the plan. Then, again, the place of tangents being always in the center and parallel to the planes or faces of plank, and the tangents of adjoining pieces also lying always in the same plane, permits all joints of wreath-pieces through the thickness of the stuff to be made with great facility at right angles to face of plank; also the joints of all face-molds—controlling the direction of joints across the width of rail—are conveniently directed by and made at right angles to tangents.

The above enumeration of the uses and advantages of tangents for purposes of hand-railing it would seem ought to cover every practical use and requirement needed. Mr. Peter Nicholson in 1813, and in 1826 his son, Michael Angelo, of London, England, showed how to draw face-molds and shape wreaths without the use of tangents, but falling molds were required in the formation of wreaths and to find hights and joints; also wreath-pieces had to be sawed out plumb through the stuff and long plumb-joints made and used in connection with one falling mold to make butt joints, which took twice the time and material, with no compensating advantages whatever over the method by tangents now in use. I can hardly persuade myself that any intelligent mechanic thoroughly acquainted with the theory and practice of the control of wreathed hand-rail by tangents could go back to Mr. Nicholson's best methods. I have been acquainted with the application of tangents to the purposes of hand-railing for 47 years and have made practical use of it for every variety of staircase and hand rail and know of no failure by their use "to produce a line of rail suitable to any reasonable conditions that can be laid down."

Marks on Slide-Rule.

From F. S. R., *Mount Dora, Fla.*—In answer to "C. E. W.," who recently inquired about the E M marks on a slide-rule, I desire to say a few words. The line M is divided into 34 parts and each of these subdivided into four equal parts. The line E is divided into 24 parts, each of which is subdivided into four equal parts. The line M is used for measuring from the middle line to obtain the points for framing an octagon on any square. For example, we have a 12-inch square on which to make an octagon. We find the middle of one side, which is 6 inches from the edge. Apply the rule, putting the end on the middle line and measuring back to 12 on the M line, giving the point which is to form one corner of the octagon. Repeat the operation on all four sides and the eight points to form an octagon will be obtained.

The line E is used for the same purpose—that is, for finding the points in a square to form an octagon. The measurements are made from the edge of the square instead of from the middle line—that is, we find that 12 on the E line stands exactly on a line with 3½ inches. Three and one-half inches, therefore, from the edge is the point which forms an octagon. Repeat the operation and we have the correct points for an octagon in a 12-inch square.

Hodgson gives the following rule for finding an octagon on the slide: Set 5 on B to 12 on A and opposite to the length of the side of any square on A is the length of a side of the octagon on B. For example:

A	10	12	15	18 square inches.	(Side of the square.)
B	4⅛ full	5	6¼	7⅛ square inches.	(Side of the octagon.)

I find the slide-rule very useful for laying out all kinds of work and calculations. The subject is of interest to the trade at large, and I should be glad to hear from others on the different uses of the rule.

Note.—From the above it is quite evident that our correspondent has devoted more or less time to the study of some of the works treating of the slide-rule and its uses, especially the one prepared by F. T. Hodgson. After a careful perusal of what our correspondent has to say about the M E marks, we are of the opinion that he has so thoroughly mastered what he has read upon the point under discussion as to be able to repeat it *verbatim*.

Formula for Finding Dimensions of Beams to Sustain Given Weights.

From A. H., *Kansas City, Mo.*—Will some reader of your valuable paper give me a simple arithmetrical formula to find the required dimensions of a beam to bear a given weight and *vice versâ*? I have algebraical formulas, but they are too complicated to be able to work.

Answer.—Most of the formulas given in text-books and works of reference on the strength of materials are involved in form and difficult of application. The obstacles in the way of giving this apparently simple question a simple answer arise from the fact that the application of a formula implies the possession of judgment and experience upon the part of the person who makes the application. Most of the formulas given for determining the strength of a beam stop at the point where

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the breaking-load comes in. What most of us wish to know in such a formula is: What is the safe load for a beam of a given span and dimensions? and this really involves a matter of judgment, this depending in turn upon the ratio of the working-load to the breaking-load. After this important feature is decided upon, there arises the question of the relative stiffness of the beam under consideration. This in turn depends upon the amount of deflection which shall be permitted in the beam. There is no natural relation between these conditions; certain assumptions must be made, and the solution arrived at is true only for those conditions.

Whether the beam under consideration will be dominated by its load under such conditions is a matter requiring a knowledge of precedents rather than the familiarity with formulas.

The formulas presented apply only to beams of rectangular section and refer chiefly to timber sections, as special shapes in iron and steel demand special treatment and are not of as universal application. For our own use we prefer Formula 3 to any with which we are acquainted, as it is, 1, of such general application, and, 2, because of its special fitness in enabling one to choose such a permissible deflection as will best fulfill the conditions imposed by the working-load.

If we wish a formula which shall determine simply the load that will produce rupture of the given beam we have—1. Center-breaking load $= \frac{bd^2c}{s}$. To find any dimension, assume all dimensions and conditions but one, and solve the equation with respect to the dimension or condition desired. b = breadth in inches; d = depth of beam in inches; s = span in feet and c = a constant or breaking load for a beam 1 inch square and 1 foot span (including one-half the weight of the beam itself).

While one-third of the result obtained by this formula would ordinarily give the safe load sustained by the given beam, it would not answer to determine the size of a beam that was to support a plastered partition or a ceiling, because it is necessary to consider the deflection limit. In the best work a beam should not deflect more than $\frac{1}{360}$ inch per foot of clear span. First determine the greatest deflection by this allowance that the beam may have, then one of the best and simplest formulas in use is—2. Greatest center load within this deflection limit $= \frac{B \times D^3}{S^2 \times C}$, in which B = breadth of beam in inches, D = depth in inches, S = span in feet and C = a constant or co-efficient for deflections of $\frac{1}{360}$ inch per foot of span of horizontal rectangular beams supported at both ends and loaded at the center.

If the distributed load is wanted multiply the result obtained for the greatest center load within the elastic limits by 1.6.

3. Safe center load in pounds within elastic limits =

$$\frac{4 \times \text{co-ef. elasticity} \times B \times D^3 \times \text{def.}}{\text{Cube of clear span in inches.}}$$

All dimensions in this last formula are in inches.

In Formula 1 the constants for a safe center load are as follows:

Ash—American White	216	Oak—white	200
Ash—swamp	133	" red or black	216
" black	200	" live	200
Beech	283	Pine—White	150
Birch—black	183	" American yellow	166
" yellow	283	Pine—pitch	183
Cedar—white	83	" Georgia	283
Chestnut	150	Poplar	183
Elm—white	216	Spruce	150
Hemlock	166	" black	183
Hickory	266	Sycamore	166
Locust	233	Tamarack	133
Larch	133	Walnut	283
Maple—black	250	Whitewood	183
" soft	250	Willow	116

We think the value assigned for walnut is rather high; 200 would be safer, because of its tendency to split in dry places. The value assigned for spruce is rather lower than the average. For good clear-grained spruce, such as can be obtained in the New York market, 175 would be a fairer amount.

For Formula 2. Table of constants for deflection $\frac{1}{360}$ inch per foot of span are:

Hickory	0.0064	White or common yellow pine	0.0128
White oak	0.0092	Spruce, good hemlock	0.0128
Poplar	0.0230	Red and black oak	0.0128
Teak	0.0080	Average wr'ght iron	0.00066
Horse-chestnut	0.0170		
Cast-iron	0.0011		
Steel	0.00044		
Best Southern pitch pine	0.0108		
White ash	0.0108		

For Formula 3. The co-efficient of elasticity corresponds to the modulus of elasticity and may be obtained for the material under consideration from any book of reference on the subject.

To show the discrepancies existing among our authorities on this matter, I have compiled a table of the safe distributed loads for a white pine beam 19 feet clear span, 2 inches in breadth, 12 in depth, deflection $\frac{1}{360}$ inch per foot of span deflection = 0.475 inches.

Table of Comparisons of Safe Load Distributed on a White Pine Beam.

	Pounds.		Pounds.
Trautwine	1197	J. C. Bland	*2026
Hatfield	1110	F. A. Leers	*1780
Kidder	1503	Trenton Iron Company	*2104
Cousins	1256	Vosges	*1814
Berg	912		
Carnegie Iron Works	*2020		

*Amount of deflection not stated.

Vosges' formula is breaking weight minus ten times the span in feet divided by three times the span, the quotient to be multiplied by the breadth and square of the depth, both in inches. For breaking-load use three times the constants given for Formula 1.

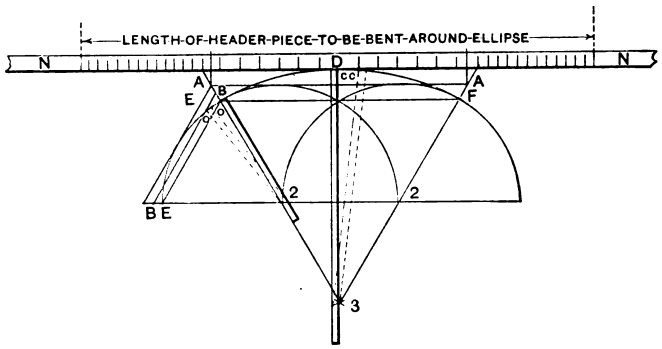
4. Vosges' formula for safe load in elastic limits $= \frac{(B.\ W. - 10s)\ bd^2}{3s}$

Laying Tin on Roofs.

From JOURNEYMAN READER.—In reply to "B. A. L." about laying tin with flat locks the reverse way, would say that I have done it that way, beginning at the top and finishing at the gutter, and am satisfied that it is the best method for a pitched roof, as it will solder so much easier. Every ounce of solder can be made to go under the locks and not run away from the seam, as is apt to be the case when the seam is laid the common way. It is difficult to soak the solder under the seam on a pitched roof as commonly laid, whereas the chances of making the seam tight by soldering if laid the reverse way is very much in its favor. I would like to hear from the knowing ones who have watched the results of tin-roofing for years.

Saw-Kerfs for Bending an Elliptical-Head Jamb.

From E. H. G., *Sierra Madre, Cal.*—In reply to "J. C. Y.," who inquired in a recent number of *Carpentry and Building* how to form the kerfs for bending an elliptical head, permit me to offer the following method, which I have employed on numerous occasions with very satisfactory results. I think the diagram I inclose will convey the idea, as our friend says that he understands the kerfing part of it. Referring to the sketch, C C and O O are the distance for the kerfs, 2 2 and 3 are the length of the points E F, while B B* is



Elliptical Heads.—Diagram Accompanying Letter from E. H. G.

the length of the points E E, making the whole head-piece in one. In case it is necessary to joint do so at the point D. Leave the ends about 8 inches longer than is necessary, as shown by N in the sketch, The object of this is to reduce the liability to breakage.

Iron Houses.

Some interesting facts in regard to a new method of building iron houses adopted by the Belgian establishment Forges d'Aiseau for trade in Africa, South America and the Dutch Indies are given by the Paris *L'Industrie Moderne.* The method hitherto followed in building such iron houses has been to adhere in the main to the designs of similar wooden structures, substituting for the wooden frame one of iron and for the board walls corrugated sheet-iron. The new method practiced at Charleroi is designed to imitate building with blocks of stone, using a sort of sheet-iron box. These boxes consist of two stamped sheets with the edges turned up, held together by short iron cross-pieces having a length corresponding to the desired thickness of wall. The two iron sheets, it will be understood, thus represent two sides of a box, the remaining sides being open, except for the cross-pieces. In building up a wall the various layers of these boxes are tied together horizontally by strips of sheet-iron and vertically by small T-irons, the turned-up edges of the two sheets which form each box affording means of securing the fastenings. No special foundation is necessary, a double frame of U-iron simply laid down on the leveled ground serving this purpose. The doors and floors are made of wood, though even here a metal construction could be adopted. As a protection against rusting all the iron-work is galvanized. The form of construction is obviously intended specially for small houses without unnecessary elaboration, but is said to have been satisfactorily applied to more pretentious structures, such as railway stations, hospital wards and churches.

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Building Operations in Other Countries.

One of the members of the American Workingmen's Expedition which visited Europe during the past summer under the auspices of Scripps' League was Mr. William Delaney, a practical brick-layer and mason. This gentlemen was a close observer of the methods employed in the building trades in the various countries visited, and since the return of the expedition has contributed to the Philadelphia *Press* a very interesting article covering some of the more important features of this particular branch of industry. He writes as follows:

In England the business of building is much different from that in the United States. The contract is usually let by the architect to one firm of builders, who are responsible for the full completion of the building. The builder employs a competent foreman for each department of the work. The men devote their whole attention to the supervision of their particular part of the work to be done, the employer or architect exercising a general supervision over the whole. While this may have the effect of attaining more satisfactory results in the matter of having every detail of construction and finish attended to by one head and in consequence worked up to the letter of the contract, yet such a system would hardly find a firm foot-hold with us, as every individual American mechanic has an ambition to become at some time a boss in his particular line. Therefore he begins by taking subcontracts, a dealing which is not very well known in Europe. This European system is really good for the journeyman mechanic, so far as it goes, as he is more constantly employed, and in fact loses very little time, which, of course, to him represents money. In the case of the sub-contracting the journeyman is often idle because the sub-contractor has for the time being run out of work. It often happens in Europe that both skilled and unskilled labor in the building line work for years without losing time, except that caused by bad weather, and in these cases a mason may be employed laying mosaic work and all kinds of inside work, which is done after the building is covered in.

Bricks in Europe differ very much from those of the United States. In England the bricks are usually 9½ inches long, 3½ thick and 4⅛ wide. These sizes vary some in different localities. There is a very hard brick called a "blue brick," 9½ inches long, 3 thick and 4½ wide. It is mostly used in the arches of railroads, a kind of work that requires a brick nearly as hard as limestone. Most of the brick are rough in appearance. They cost from $20 to $50 a thousand, according to quality. Some glazed brick of good quality bring even a higher price. The French brick is about the same in size as the English, averaging about eight courses to 24 inches. The Holland brick is much smoother and of a more uniform color than any other I saw in Europe. It measures 2 inches thick, 4½ inches wide and 9 inches long, and has a good dark red color. The number of brick supposed to be laid in England by each man varies, as with us, with the class of the work. On rough work 1000 per day is a good average, the work being rather slowly done, but in a very solid and straight manner. In France, Germany, Belgium and Holland the average is much less. On all fine work, such as fronts and enameled work, pains are taken to keep the bond plumb and straight. In the case of outside work, such as front and rear walls, they are always laid in Flemish bond, although in some parts of England and the Continent of Europe I saw heavy buildings laid every second course a header, a style called English bond. I saw also some walls where every course was laid in headers. A brick or stone mason in Europe is expected to do all kinds of work pertaining to his trade, such as setting stone steps and stairs and sometimes laying encaustic and mosaic tiling.

Outside work is usually put up rough in England and afterward tuck-pointed, except in large buildings, where the joints are struck. The dwelling-houses are not, as a rule, as handsome or convenient as those of the States, but the work both inside and out is always well put up. There is much more work for brick-layers in most of the buildings than in the United States. In England there is a great deal of arching, nearly all large buildings being groin-arched. The heavy, substantial character of the work requires much more time. The buildings, therefore, are often two or three years in course of construction and give more constant employment. Segment arches over window openings are seldom seen. They are nearly always arched with straight or camber arches, sometimes called "Jack arches." I have found mortar in old buildings as hard as rock, although the buildings were several centuries old. I picked up some scraps of mortar at Fountains Abbey, in Derbyshire, a ruin seven centuries old, and found it to be as hard as the stone. This style of building, though old, is still copied in modern buildings. The beauty of the workmanship and the elegance of detail are often carried out almost exactly. I have noticed that in all those historical buildings of England and the Continent each piece of stone is of a convenient size to handle by hand. All through England the class of brick and stone work is much the same. There is much more of both used in building than with us, and for that reason the men make more time in the year. But as the wages are low compared with the cost of living they have no real advantage from the steadier time.

In Paris I think the highest perfection of the building trade is attained. The city as a building center is the queen city of the world. Everything is artistic, from the beginning of the building to the last stroke of the painter's brush. Every artisan and mechanic in Paris is an artist. He takes an artist's pride in his work. He has every opportunity to develop his taste for the beautiful in art, for on every side he turns he sees everything done with a view to being artistic and beautiful. For the Frenchman's benefit and education the State maintains museums, art galleries and gardens which are free to all comers, and the Parisian workman avails himself of these opportunities. As a consequence he becomes the better mechanic, or I might use the word artist, as every mechanic in Paris works with an eye to what would be beautiful and artistic in his industry. The public buildings of Paris, both ancient and modern, are beautiful in every detail of exterior and interior finish. The workman is not in a hurry to get the work off his hands. He tries to make his work look good and he generally succeeds. The leading trade in the building business of Paris is that of stone-cutter and carver. Almost all outside work is stone, beautifully carved in almost every place where a piece of ornamental work can be put. The public buildings sometimes take years to complete, as everything inside and outside is made with the intention of being ornamental. Next to the stone-cutter in importance is the Parisian plasterer. There is an immense lot of ornamental plastering done, both in private and in public buildings. I was among some of the Parisian masons and worked with them a short time. Their methods of work and tools are much different from ours, and to an American mechanic look crude. For instance, their trowel is similar to an American mortar hoe. Although not so wide, the tang of the trowel is almost exactly the same as the hoe. The trowels of Germany, Holland and Belgium are much the same and are very awkward to handle. The brick-hod is a flat board with a piece cut out for a man to pass his neck through. While it rests on his shoulders the bricks are placed on each end of the board. The mortar-hod is an oblong trough about 2 feet long, made to rest on the shoulder, with two handles from one end to steady it while being carried on either shoulder.

Not alone in public buildings, but in private houses is the skill of the French artisan displayed, even in the minutest detail of exterior and interior finish and decoration. There is a great deal of stone, both rough and cut, used in French buildings. At Paris there is one of the largest pieces of brick-work that I ever saw. It consists of a reservoir for supplying a portion of the city with water. It covers a space of 40,000 yards and is a two-story basin, the first story the same size as the second, and containing 2500 columns of brick, each 21 inches square and about 8 feet high. The whole is arched over with groin arches in brick, and again there is the same number of columns, about the same hight, and again arched over in a similar manner for the second floor. Each floor carries about 4 feet of water, and the whole is covered over with glass. A man goes over both lakes twice each day, in a boat constructed for the purpose, to see that all is secure. The brick-layers in England do not seem to be well organized. They have a union in almost every large city, but all brick-layers are not members. Some men object to organization because there is a system prevailing which allows a man to go from town to town at the expense of the union, and this opportunity is sometimes abused. Others claim they can do as well outside of a union, but the general result is that they are not quite so independent in manner and appearance as the American workman of the same class. I saw no trace of organization anywhere else in Europe, except Paris, where there is a labor bureau where all labor organizations meet. This bureau is established by the Municipal Council of Paris. The hours of labor in England are mostly ten per day, with a half-holiday on Saturday, making an average of about 54 hours per week. The English mechanic goes to work at 6 in the morning and takes a half-hour for breakfast at about 9. In France the hours of labor are 11 and 12 a day, and half a day on Saturday, but they do not work as steady during the day as the English. In Germany, Belgium and Holland the hours of labor are even longer. Sometimes, in Holland, the men work until dark in the summer, but they work very slowly and accomplish little in the day.

In England men are paid by the hour and receive from 15 cents in some parts to 16 cents in London. In Paris the wages are about the same as in London. In Germany the wages average $1 per day in United States money. In Holland the rate is a trifle less. The wages of stone-cutters are about the same as those of brick-layers in most parts of Europe. The terms of apprenticeship is usually about four years in Europe, but this is a question into which I had little chance to enter. In no part of Europe do the men live as well as the American mechanic, nor are they housed and clothed as well. They seldom save any money. They usually dress as a class; that is to say, they can be readily recognized as belonging to certain trades by the manner of their dress. Especially is this so in the building trades. In Paris it is easy to tell the building mechanic, as he wears a long white blouse something like a night-shirt. In Germany they are not as neat in personal appearance and workmanship as the Parisian workmen, nor do they

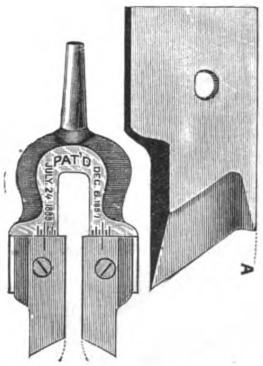
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by any means come up to the American workmen. The English building mechanics do not lose much time during the building season, and indeed very little in the winters, as the winters are usually mild, and when the season is cold there is often inside work for them to do. The European masons do not as a general rule have as comfortable homes as the American mechanic of the same grade. Themselves and their children are not as bright looking as the same class in America, nor are their houses furnished as cheerfully. On the whole, there is really nothing in the building business in Europe that can come up to the American methods, except it may be the solidity of construction and the pains that are taken to carry out the idea of the architect, even in the smallest detail.

NOVELTIES.

Improvement in Tenoning-Bits.

Mr. Lewis F. Parks, of No. 272 Colerain avenue, Cincinnati, Ohio, has recently perfected an attachment designed for use in connection with his foot-power mortising-machine for tenoning. A very good idea of the general construction of



Novelties.—Fig. 1.—Improved Form of Tenoning-Bit.

the device may be gathered from an inspection of Fig. 1 of the accompanying illustrations. One of the features to which the manufacturer calls special attention is the cutting edge of the bits, which, it will be noticed from an inspection of the cut, extends around the inside corners represented by A. This construction, it is claimed, causes the sides of the tenons to be shaved perfectly smooth. The device is carefully constructed and designed to prove a valuable adjunct to mortising machinery.

Improved Duplex Plumb and Level.

The Stanley Rule and Level Company, of New Britain, Conn., are offering the trade what they are pleased to call Stanley's Improved Plumb and Level, a general view of which is shown in Fig. 2 of the cuts. From an inspection of the engraving it will be observed that in addition to the ordinary form of leveling-glass set in the top surface of the stock there is a plumb set in the side at one end and a level set in the side at the opposite end. These glasses are protected by brass disks, which may be easily removed for the purpose of adjusting the glasses in case adjustment is ever necessary. The glasses are inserted with the least possible removal of wood from the stock, and are so arranged that they may be used from either side. The construction of this level is such that it may be advantageously employed in a variety of positions where it would not be possible to use one as ordinarily arranged.

Brook's Outside Window-Fasteners.

Figs. 3 and 4 of the accompanying cuts represent a line of outside window-fasteners which is manufactured by Eastern Mfg. Co., Boston, Mass., for whom Bigelow & Dowse, 229 Franklin street, Boston, are sole agents. Fig. 3 represents these fasteners separately, showing also the socket or bushing with which they engage. Fig. 4 shows a portion of the outside casing and of the outside sash and the manner in which the fasteners are applied. In using these fasteners the sash are fitted to the frames so that they will go in easily when the bushings by means of a $\frac{3}{8}$-inch bit are inserted in the casings, the hole being bored 7-16 inch from the outside edge, and the lip of the bushing turned outward and set in even with the surface. The sash is placed firmly against the casing and the fasteners attached by means of screws exactly opposite the center of the bushing. The fastenings are attached with a back against the casing, handle up, as seen in Fig. 4, and when the handle is turned down the eccentric of the fastener engages with the bushing, thus making a secure fastening. It is also pointed out that with this fastening, if the sash is made in two or more sections hinged together at the line of division, a part of the sash may be swung outward for ventilation. It is also explained that the sash can be raised from the ground to any desired hight by dropping a line from the window to which it is to be attached and passing it around one of the fasteners on either side of the sash to which they are attached and lowered in like manner. The fastener, by setting the bushing in the edge of the sash and securing the fastener to the casing, is referred to as well adapted for use in mills and shops where the sash is fastened to the inside instead of the outside casing, and by this means the whole sash may be secured in much less time than is required by the old method. The point is especially emphasized that windows with these attachments affixed are put on from the inside instead of the outside of the building by putting the window out over the top sash, thus obviating the use of steps or ladders in putting on or removing them.

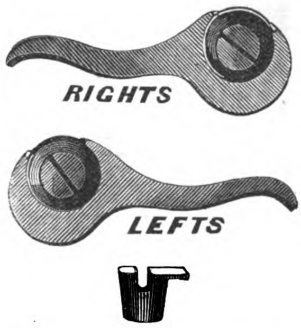


Fig. 3.—Brook's Outside Window-Fastener.

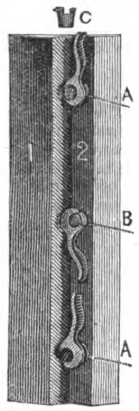


Fig. 4.—Fasteners Applied to Window.

Sash-Cord Fasteners.

Fig. 5 of the accompanying cuts represents a new style of sash-cord fastener which is put on the market by Edwin W. Abbe, New Britain, Conn. This fastener is stamped out of sheet-steel in the form shown in one of the cuts, and after the cord has been placed between the tongue and the body of the fastener the tongue is hammered down in such a position as to hold the sash-cord securely. It is pointed out that this construction requires no tying of knots, while at the same time the cord can be fastened more quickly and better, with economy also of cord. As it is made of steel it is practically indestructible and there is sufficient spring in it to hold it in place in the sash, so that it is not liable to work out and scratch the casing. These fasten

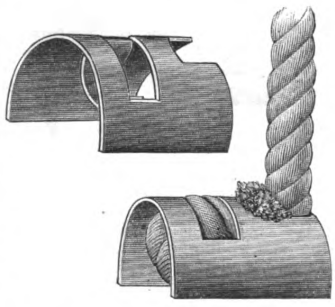


Fig. 5.—New Sash-Cord Fastener.

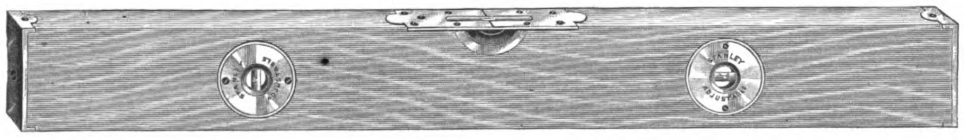


Fig. 2.—Stanley's Improved Duplex Plumb and Level.

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ers can also be used for attaching the weight to the cord, as they can easily be hammered together so as to make a secure and compact fastening. The price of this fastener is referred to as no greater than that of the former cast fasteners. It can be used with small braided cord or with chain, but is designed more particularly for cotton or soft-laid cord.

Railway Cut-Off Saw.

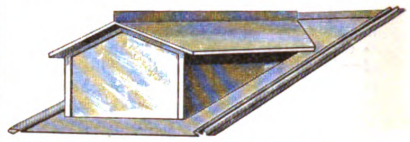
In Fig. 6 of the illustrations we show a general view of a railway cut-off saw with power-feed which is being introduced to the trade by the Bentel & Margedant Company, of Hamilton, Ohio. The frame of this machine, as may be inferred from an inspection of the cut, is very strong and heavy, is well braced and supports a strong double table while carrying the counter-shaft at the rear. The housing and sliding plates are arranged with a special view to accurate and powerful sawing. An adjustable gib on the side provides for the readjustment of the housing to keep it true in case there should be any wear on the mandrel or slides. The mandrel is made of the best quality of steel, is 1½ inches in diameter and is furnished with the necessary collars. The manufacturers direct attention to the fact that the feed is very powerful and that the operating mechanismconsists of a few parts which are not liable to wear. A cone pulley is provided for the feed-belt for the purpose of changing speed, but aside from this it is stated the operator may regulate the speed of the feed while the saw is cutting or returning. The saw is so arranged that it may be started on its course from any point by changing the position of the returning-pin, to which point, wherever established, the saw returns. It is also stated that it may be arrested at any point in its backward and forward movements, and the speed of travel increased or diminished at will while the saw is cutting. All these movements are under full control of the operator. Another feature to which the manufacturers direct attention is the novel arrangement of the driving-belt, the tension of which is retained in all positions of the saw except when at rest, when the tension is relieved. The weight of the machine is said to be 1250 pounds.

Stanley's Improved Level-Sights.

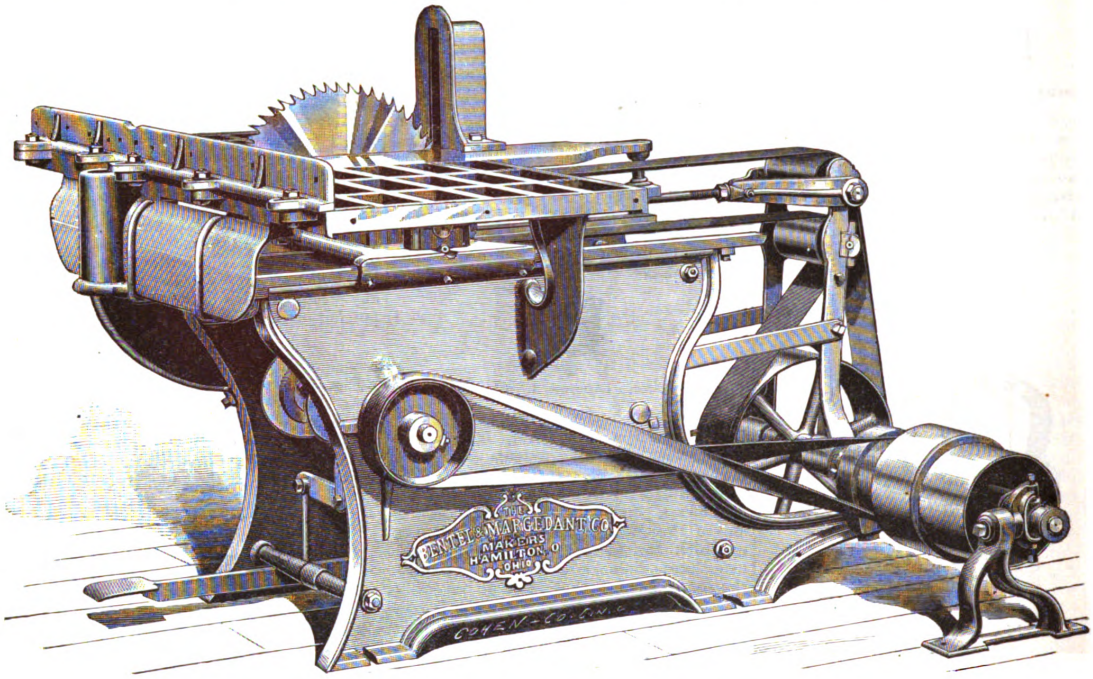
In the accompanying illustrations are presented views of Stanley's Improved Level-Sights, which are being introduced to the trade by the Stanley Rule and Level Company, of New Britain, Conn. Every carpenter and builder frequently finds it desirable to ascertain the exact level of different points which may be more or less remote from each other, and a convenient means of accomplishing this cannot fail to be fully appreciated. To meet this want the company referred to have brought out the level-sights which are shown in Fig. 7. These sights are so made that they may be easily and quickly attached to an ordinary level or straight-edge, and when thus employed the makers claim that an accurate leveling instrument is obtained. In Fig. 8 of the illustrations is shown the application of these sights to an ordinary level. When not in use they are readily detached and packed away in a small space for future use.

Improved Sky-Light and Ventilator.

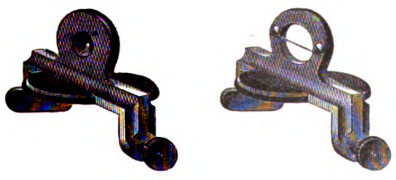
The National Sheet Metal Roofing Company, of 510 East Twentieth street, New York City, have recently brought out an improved sky-light and ventilator which they are pleased to call the Attic. The frame of the sky-light is attached to a sheet or plate of 20 x 28 inch tin, the lateral edges of which are corrugated when it is designed to use the device in connection with a slate or wood shingle roof. When employed with the company's metallic shingles the lateral edges of the plate carrying the sky-light frame are provided on both sides with a side lock, which prevents leakage and avoids the necessity of soldering. The front of the sky-light, as may be seen from an inspection of Fig. 9 of the cuts, is provided with a plate of double strength 9 x 12 glass, the edges of which are held in a light tin frame. It is retained in place by a brass catch on the inside directly under the crown of the frame. When it is to be



Improved Sky-Light and Ventilator.—Fig. 9. Showing Sky-Light Attached to Plate of Tin.



Novelties.—Fig. 6.—Railway Cut Off Saw, Made by Bentel & Margedant Company.



Stanley's Improved Level-Sights.—Fig. 7.—The Sights Detached.

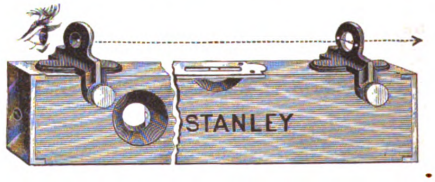
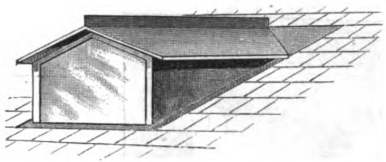


Fig. 8.—Showing Application of Sights to Ordinary Level.

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used as a ventilator the glass is drawn down on the inside to a position corresponding to the slant of the roof, acting as an apron to shed the water which otherwise might enter during a storm. In using the device it is only necessary to cut a hole 12 x 16 inches through the roof boards and set the Attic in place, as shown in Fig. 10 of the cuts. The arrangement is compact, easy of application and economical in use.



Novelties.—Improved Sky-Light and Ventilator.—Fig. 10.—Appearance When Set in a Roof.

The Variety Hand Elevator.

The hand elevator represented in Fig. 11 is manufactured by the Variety Machine Company, Warsaw, N. Y. It is designed to carry freight or passengers weighing up to 1000 pounds. Special attention is directed by the manufacturers to the clutch, which embodies a neat mechanical device, and by its use the elevator is held at any point without the use of a brake. This elevator may be operated by any one, the car stopping when hand-rope is released, whether going up or down, with or without load. The shafts run, it is stated, in steel roller-bearings, thus reducing friction to a minimum. The machinery is compact and is fastened together substantially in an iron frame. The elevator is furnished complete, with hard-wood guides, hand-ropes, sheave and counter-weights, &c., and the manufacturers claim that it can be set up by any mechanic, or they will bid on putting it in. The car is made any size up to 5 feet square. A safety attachment is put in when desired at small additional expense. The low price of this elevator and its easy operation are points made in regard to it.

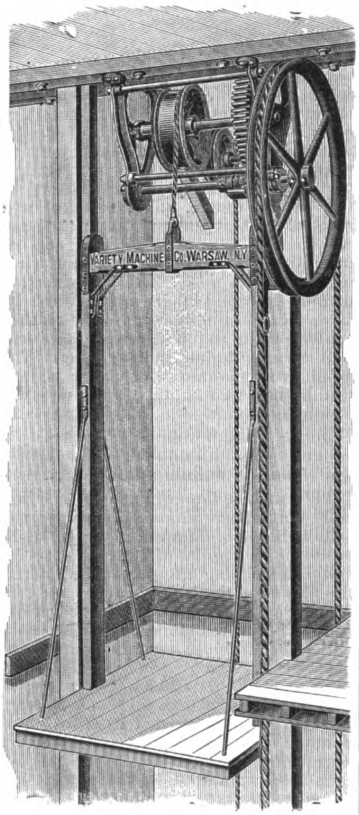


Fig. 11.—The Variety Hand Elevator.

The Monitor Steam Heater.

We present in Fig. 12 of the illustrations a sectional view of the Monitor steam heater, manufactured by Steel, Van Rossum & Co., 1631 North Fifth street, Philadelphia, Pa. The cut shows the position of the water spaces and coal magazine, the arrows indicating the direction of the flames and hot gases which travel up the large flues and down the small ones, this action, it is said, making the tubes self-cleaning. The magazine, which is of cast-iron, is surrounded by water and therefore will not burn out. The Monitor is constructed in two sections, and thus can be readily handled and conveniently taken in at a cellar door or down cellar stairs. The base and draft-box doors, grate, cast-iron casings, smoke-elbow, check-draft and all the castings are carefully fitted before leaving the works, so that they may be readily assembled. The jacket is made of extra heavy boiler iron thoroughly fitted and finished, and in it are arranged six clean-out doors sufficiently large to admit a brush and through which the interior construction of the boiler can be seen. The top and bottom sections are connected by means of three round sockets and tubes, and are fastened together by three short bolts on the outside. The only thing necessary in fitting the sections together is to place pieces of packing in the sockets and then tighten the bolts, when the entire work of setting the Monitor is complete, the operation occupying less than an hour. These boilers are made in six sizes. The diameters of the grate are from 15 to 30 inches; hight 51 to 68 inches, with 35 to 145 square feet of fire surface and adapted to supply from 175 to 950 square feet of radiating surface. The same concern also make the Columbia hot-water boiler, which is somewhat of the same pattern.

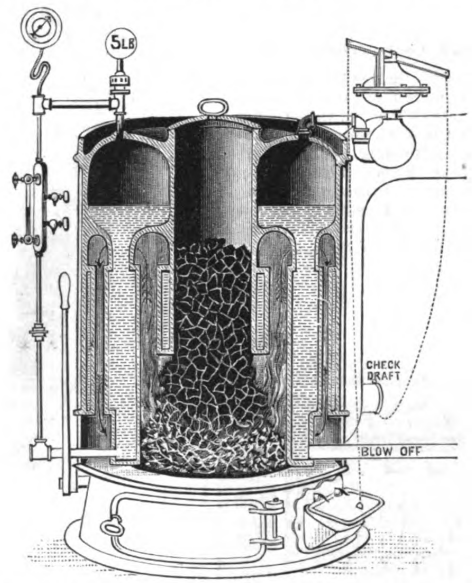


Fig. 12.—Sectional View of Monitor Steam Heater, Built by Steel, Van Rossum & Co.

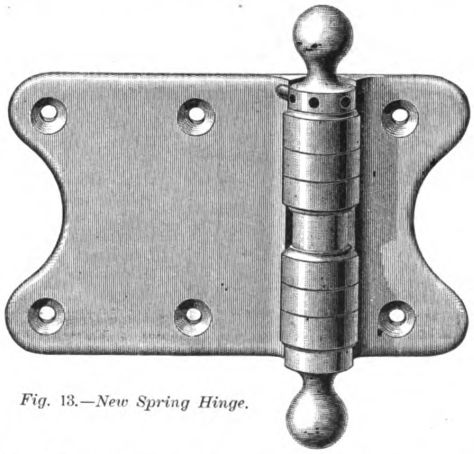


Fig. 13.—New Spring Hinge.

New Spring Hinge.

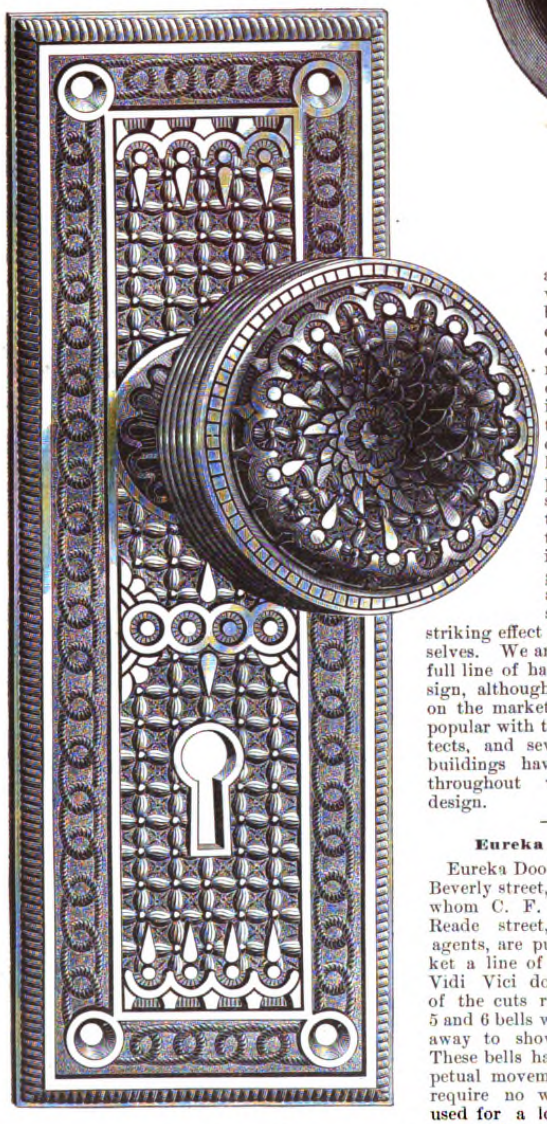
The illustration (Fig. 13) represents a new pattern of the well-known line of Gem spring hinges, manufactured by the Van Wagoner & Williams Company, 82 Beekman street, New York. It is, as shown in the cut, a single-acting surface hinge. These hinges are especially de-

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signed to screw on marble for water-closet doors of hotels and office and public buildings, but are referred to as also adapted for other screen-doors. They can be made to throw a door open instead of closing it, if desired, and can be furnished with both flanges like either shown in the illustration when so desired. They are 3½ inches and furnished in real bronze or polished brass.

Elaine Design Lock Trimmings.

In connection with the marked tendency toward the production of artistic hardware we illustrate in Fig. 14 the Elaine design, which has been patented by Reading Hardware Co., Reading, Pa., and 81 Reade street, New York. This design, which will be recognized from the cut as exceptionally neat and artistic, is applied by them to a line of locks, knobs and other related hardware, as shown in their catalogue devoted exclusively to these goods. This design is furnished in different styles of finish, among which the Hecla bronze, chocolate bronze, which has a chocolate-colored background, in gold bronze which has a bright colored background, which has a steel-gray background, is referred to as by far the handsomest and most striking. It is also furnished in and in royal bronze, which has a black background. The catalogue of the company which represents this line of goods is deserving the attention of the trade from the completeness of the line and the elegant printing, which shows the goods off to excellent advantage, although the illustrations are given without color and fail to represent the beauty and striking effect of the goods themselves. We are advised that the full line of hardware of this design, although only recently put on the market, has proved very popular with the trade and architects, and several large public buildings have been furnished throughout with the Elaine design.



Novelties.—Fig. 14.—Reading Hardware Company's Elaine Design.

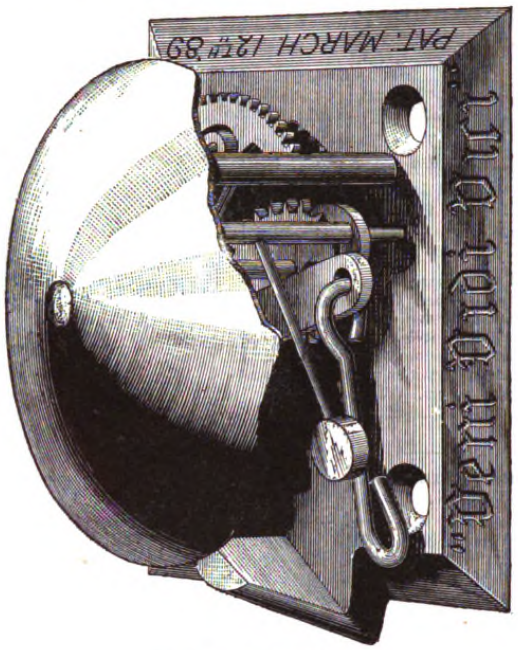


Fig. 15.—Eureka Door-Bells.

Eureka Door-Bells.

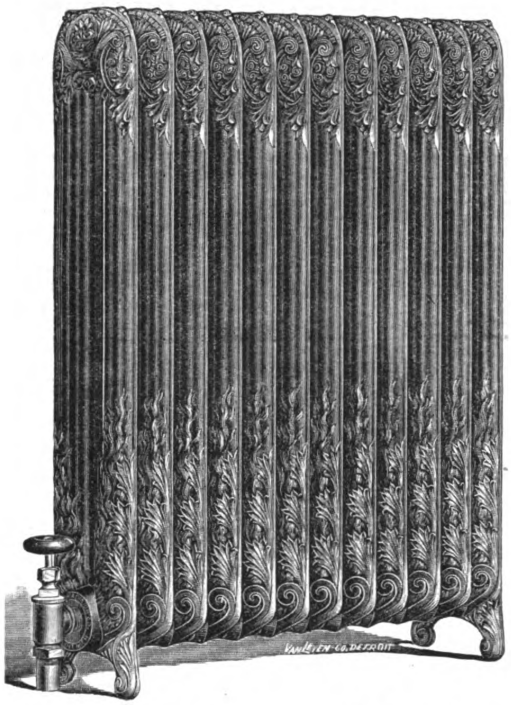
Eureka Door Bell Company, 86 Beverly street, Boston, Mass., for whom C. F. Guyon & Co., 99 Reade street, New York, are agents, are putting on the market a line of Eureka and Veni Vidi Vici door-bells. Fig. 15 of the cuts represents their No. 5 and 6 bells with the bell broken away to show the mechanism. These bells have positive or perpetual movements, so that they require no winding. They are used for a long range and are worked by a pull. No. 5 has a japanned base and brass bell and No. 6 a nickel base and bell. The Eureka is simple in its general features and can be used with either lever or pull, on or over a door. These bells with positive or perpetual movement are made in sizes ranging from 3½ to 10 inch, the 10-inch bell being used for fire-alarm in hotels or on fire apparatus of any kind, cable or motor cars and school-houses. The 6-inch bell is used for elevators, mines, toboggans, &c. The point is emphasized by the manufacturers that these bells give the same result as electric bells without the use of a battery; that they are durable and satisfactory in use, being simple, solid, practical and made of the best material and in the most workmanlike manner; that they cost no more than any first-class bell, and when once placed in a position are no further care or expense and are not affected by heat, cold, dust or moisture, and that they can be put in any position or place and will work with any pull or lever. The point is emphasized that old trimmings can be used without extra expense or defacing doors or house. The company also make bells with a negative movement.

Detroit Fluted Radiators.

An attractive form of radiator for steam and hot water manufactured by the Detroit Radiator Company, Detroit, Mich. is shown in Fig. 16 of the cuts. To increase the heating efficiency of the radiator the interior of the loop is cored out to correspond with the flutings of the outside surface. The radiators are put together with standard 2-inch wrought-iron nipples, having full 2-inch openings. The hot-water radiators have in addition to the 2-inch opening at bottom a 1¼-inch opening at the top, unobstructed by bolts. The radiators are carefully tested with steam after being put together, besides having each loop submitted to 120 pounds hydraulic test before assembling. The tongue-and-groove joint at the top of the radiator is made secure by a special composition gasket, which, it is said, becomes very hard and tough by the action of the heat. The rod binding the radiator together passes below and not through the opening for circulation, for which feature special merits are claimed. The radiators for steam or hot water may be taken apart for repairs with no other tool than a monkey-wrench. The plain fluted radiator is a very simple and attractive form of construction, while the decorated

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radiator, as the engraving shows, is a handsome piece of casting. The latter is suited to further decoration with bronzing of different shades of color to adapt it to the style of the room's furniture. These radiators are made with from 2 to 32 loops having a length of from 4⅝ to 74 inches. The radiators are made in the following hights: 35, 38, 31, 25 and 20 inches, each individual loop containing the following number of square feet of heating-surface: 5¼, 4⅛, 3½, 2¾ and 2¼.



Novelties.—Fig. 16.—Detroit Ornamental Fluted Radiator.

Electrical Notes.

About 300,000 telephones are now in use in this country alone. The telephone and the type-writer are modern business conveniences which have sprung into use almost simultaneously, and it would be difficult to say which could be spared most easily. The field of application for the telephone, however, is constantly growing wider, and every day witnesses greater dependence upon it in the conduct of business operations. More than 170,000 miles of telephone wire are estimated to be in operation in this country at present. Long-distance telephoning is rapidly coming into play and is proving very acceptable to a large class of business men. Thus far the longest distance reported over which conversation by telephone is daily made is between Portland, Maine, and Buffalo, N. Y., which are about 750 miles apart. It is expected that New York City and Chicago will shortly be connected for this purpose.

The telephone instead of supplanting the telegraph is merely supplementing it. Both these means of annihilating space have their special fitness in business communications, and interfere as little with each other as do the elevated and surface roads of New York City. Business for each grows with the improved facilities afforded. Over 1,000,000 miles of telegraph wire are now in operation in the United States—enough to encircle the globe 40 times. Between the leading cities of the country the telegraph service has attained vast proportions, and though the quadruplex system of telegraphy enables four messages to be transmitted over one wire at a time, the number of wires in use is constantly being increased to keep pace with the growth of the business. The most widely separated points between which it is possible to send a telegram are British Columbia and New Zealand via America and Europe.

About 400 miles of electric railway are now in operation in this country and many more miles are under construction. The systems which have thus far been reduced to practice are more suited to cities of 20,000 to 50,000 inhabitants than to very large centers of population, but they are making their way into some of the leading cities of the country and will in time develop methods of electrical conveyance and application which will overcome present objections to their use. The fastest record time made by an electric railway is about 20 miles an hour on a street-car system.

The application of electricity as a means of transmitting power in factories is rapidly on the increase. A firm of ready-made clothiers, of Leeds, England, are building a factory in which about 800 sewing-machines will be employed, as well as the necessary number of cutting-machines to keep these going. All these will be operated by electric motors, it having been found on calculating the relative cost that it will be more economical to fit up the building in this way than to furnish it with shafting and all the necessary adjuncts.

Electric lighting has been a wonderful stimulant to business of many kinds since it was first reduced from a phenomenon of the laboratory to an adjunct of every-day life. Not only have engine-building and other essential industries been greatly stimulated, but an incalculable benefit has been derived from the rapid spread of electric lighting by the greater mechanical precision called for in the manufacture of the necessary apparatus. A higher order of skill and, of course, an increased modicum of intelligence have been required from mechanics employed in this direction. The average engines built in the United States to-day are better by far than they would have been with all our progressive ideas and inventive genius if electric lighting had not played such an important part with us in the last decade.

The magnitude of the electrical industry is shown by the estimate made, presumably by persons well informed on the subject, that some 250,000 persons are now engaged in business in this country depending solely on electricity.

Encaustic Flooring Tiles.

The history of the uses of encaustic flooring tiles is most interesting to those who are disposed to follow it. An English writer referring to this subject says :

Ornamented tiles were formerly much used for paving the floors of sacred edifices, and their use was so generally confined to buildings of a devotional character that whenever they are found in the remains of castellated or domestic mansions there is good reason for supposing that a religious fabric had at some time existed on the spot, either a private chapel or other holy edifice. The earliest known specimens appear to be of the latter part of the twelfth or the beginning of the thirteenth centuries, and on them the foliage has the characteristic trefoil of the period. Of this age, one of the most interesting examples was recently discovered at Woodferry, Oxfordshire, some of the tiles exhibiting the badges of Richard, King of the Romans, to whom the manor belonged. In the two following centuries the decorations were of a much more varied and elaborate character. The foliage was more elegantly and gracefully thrown and exhibited great natural freedom. In the sixteenth century encaustic tiles appear to have been but occasionally used ; but Flanders tiles of this period are sometimes met with—they are of foreign manufacture and have their patterns depicted in superficial colors. The devices impressed upon paving tiles consist for the most part of foliage, variously thrown ; heraldic bearings, crosses, sacred symbols, geometrical figures, mounted knights, and grotesque figures of hideous forms, comparable only to fiends and demons. In many cases a single tile contains a complete pattern within itself, but sets of 4, 9, 16 and other numbers with a continuous pattern extending over the whole surface are not uncommon.

Armorial bearings, badges and cognizances are perhaps the most useful and valuable decorations to the archæologist which tile-paving presents. Heraldic remains are at all times valuable, and whether they are found depicted in all their gorgeous blazoning on the stained glass of the windows or on the monumental effigies of the great departed, or whether sculptured on the bosses, the brackets or font, or impressed in the tiles of the pavement, they should be most carefully noted down and zealously preserved, as a single blazon or the badge of an illustrious house will frequently lead to the most successful research into the history and foundation of the building upon whose site it has been discovered. The arms upon pavement tiles frequently exhibit the bearings of the lords of the manor and chase, as well as those of the monarch, and of founders and benefactors to the church, and their aid is therefore peculiarly valuable in tracing the descent of property. At Malvern the arms of the successive lords of the chase and manor, viz., Clare and De Spencer, Earls of Gloucester, Newburgh and Beauchamp, Earls of Warwick and the royal arms (the lordship having by marriage reverted to the crown) are represented. At Neath are the arms of Clare, De Spencer, Turberville, Montacute, Gran-

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avilla and other patrons and benefactors of the abbey, as well as the royal shield. At Haccombe, Devon, among other bearings are those of the founder, Haccombe.

TRADE NOTES.

WE HAVE RECEIVED from the Philadelphia office of Merchant & Co. a very handsome set of phototypes of the great Forth Bridge, which is rapidly nearing completion. One view shows the bridge in perspective, the photograph having been taken before the spans were united. The second view is a perspective of the north tower. The massiveness of the structure, as far as its hight is concerned, is shown in a side view of one of the towers and its foundation, with some of the highest structures in the world in the background. Only three structures overtop the bridge—the Great Pyramid, Cologne Cathedral and Old St. Paul's, of London. In a side elevation of the whole bridge the principal dimensions are given. A view is also given of the well-known illustration—having a "Jap" sitting on the connecting span—showing the principal of the cantilever. Merchant & Co. were led to prepare these pictures by the great interest manifested in the phototypes of the Eiffel Tower presented by them.

THE CORDESMAN MACHINE COMPANY, Cincinnati, Ohio, are presenting their friends and customers with a very useful article for office use, consisting of a pencil-eraser. It has printed on its four sides the business card of the firm. The piece of rubber measures 2¼ inches long by ⅝ x ⅝ and is made of best quality gum.

WE HAVE RECEIVED from Harry Brothers, Dallas, Texas, a circular descriptive of B. W. Harry's metallic shingles, manufactured under patents recently granted. The circular dwells particularly upon the important feature of strength of construction. For the side lock there is a standing groove or double-seamed joint which the manufacturers say avoids the very common source of trouble in a great many tin shingles—namely, grooves or gutters that are relied upon to carry off the water, but often become filled with accumulated dust and dirt in such a manner as to cause the concealed gutter to overflow into the building. They also direct attention to the cross lock which is employed, and point out that they have the only shingle with a cross lock and lap combined.

THE CINCINNATI CORRUGATING COMPANY, of Piqua, Ohio, have recently issued an interesting catalogue of their specialties. It is a neat work of 40 pages of letterpress, carefully printed in two colors and bound in colored paper covers of typographical design. It is profusely illustrated with engravings showing numerous styles of corrugated work, and indicates in a very clear manner what this company are able to accomplish in the direction referred to The frontispiece of the pamphlet consists of a bird's-eye view of the company's corrugating-works and rolling-mills at Piqua. In their announcement to the trade they review the causes which led them to remove their plant from Cincinnati to Piqua and enumerate some of the facilities which they at present enjoy.

THE VENETIAN BLIND COMPANY, of Burlington, Vt., have recently issued a very interesting pamphlet of nearly 60 pages of letterpress devoted to Hill's Patent Inside Sliding Blinds and Screens and to the company's improved Venetian blinds. The work is profusely illustrated with engravings showing the practical application of the goods of the company and the method of arranging the window-frames to accommodate different varieties of blinds. Nearly half of the work is devoted to testimonials, references and engravings from photographs showing some of the buildings fitted with the company's blinds.

J. E. BOLLES & Co., of Detroit, have recently furnished the *Pioneer-Press* offices, St. Paul, Minn., with wrought-iron railing for their new 12-story building recently dedicated. The railing is finished by the Bower-Barff process and is of very attractive design. The company report a good business and plenty of orders in all departments. Among their recent shipments was a handsome piece of stair-work, designed by Archimedes Russell, architect, for the John P. Hire flats, Syracuse, N. Y.

THE GLEN COVE MACHINE COMPANY, Limited, Brooklyn, are offering the trade a variety of improved planing-mill machinery, reference to which will be found in their advertisement this month.

IN THEIR ADVERTISEMENT this month Charles A. Strelinger & Co., of Detroit, Mich., present some interesting remarks relative to the stock of tools and supplies which they are prepared to furnish to the trade. They have issued a very interesting catalogue containing 200 pages and 700 illustrations, and announce that they will furnish a copy of this work to any one desiring it on receipt of 8 cents in postage-stamps.

THE LUDLOW-SAYLOR WIRE COMPANY, St. Louis, Mo., call attention elsewhere in this issue to the line of wire, brass and wrought-iron goods which they are prepared to furnish. They turn out bank and office railings in great variety and of attractive design, as well as iron and wire fencing, coal and ore screens, wire cloth, barbed fencing wire, &c.

ELSEWHERE IN THIS ISSUE Owen B. Maginnis, 545 West 125th street, New York, calls attention to the fact that he is prepared to write articles descriptive of inventions or of tools in their practical application to work.

THE FULTON IRON AND ENGINE WORKS, Detroit, Mich., solicit applications for their catalogue of Sure-Grip Steel Tackle-Blocks, which they have ready for the trade. They call attention to the economy of this device and its adaptability for builders', machinists' and contractors' use.

"THOUGHT AND THRIFT" is the title of a book which is being published by Mr. Joshua Hill, 25 West Sixth street, Cincinnati, Ohio. Brief reference to the contents and scope of the work will be found in his advertisement this month.

JUDSON & GORDON, of No. 10 East Fourteenth street, New York, call attention to the fact that they are in a position to furnish reproductions of a very fine series of carved-wood panels at prices within the reach of all. The views are each 4 x 6 inches in size and are *fac-similes* of some of the work executed by the late Henry R. Richardson while in charge of the Capitol at Albany, N. Y. The most notable feature of the interior finish of the Court of Appeals is the judge's bench, 40 feet long. The front and ends are composed of 20 oak panels, no two being alike, covered with rich and delicate carving worked out with very artistic effect.

CORDESMAN, MEYER & Co., of Cincinnati, Ohio, have issued a large-size poster showing a variety of wood-working machinery manufactured by them. The line includes shapers, planers, scroll-saws, band-saws, frames, arbors, shafting, &c. A foot-note requests applications for circulars and price-lists.

MURPHY & Co., of Newark, Boston, Cleveland, St. Louis and Chicago, present in their advertisement this month some remarks on the subject of varnish which will prove interesting reading. They contrast good and poor work and call attention to some of the points it is well to observe in the use of varnish.

WE HAVE RECEIVED from the Pope Mfg. Company, Boston, Mass., a copy of the Columbia Bicycle Calendar and Stand for 1890, which is a very attractive novelty for the new year. It is in the form of a pad of 366 leaves, a good portion of each of which is left blank for memoranda. The portable stand which holds the pad contains pen-rack and pencil-holder and is made of solid wood, brass mounted. Each slip or leaf bears a quotation relative to cycling or type-writing, and notwithstanding the fact that this is the fifth year in which the calendar has been brought out in the present general form, the quotations are new and fresh.

C. B. JAMES, 98 Lake street, Chicago, dealer in cutlery and tools exclusively, has just issued his catalogue No. 1 for 1890. This catalogue is quite a handsome publication, comprising some 80 pages of price-lists, illustrations and descriptions. It is devoted mainly to fine tools for accurate measurement, embracing a great variety of instruments of precision, from draftsmen's sets to yard-sticks. A few pages are devoted to chisels and gouges. We have alluded to this publication as a catalogue, which it is worthy of being called, but Mr. James simply styles it a series of advance sheets, to be followed soon by another series, which will embrace an illustrated price-list of tools intended for metal-workers.

THE CORDESMAN MACHINE COMPANY, of Cincinnati, Ohio, report a very good demand for their improved wood-working machinery, and in order to keep pace with the requirements of their customers have been forced to add new tools to their plant. The machines of this company are being used by some of the largest manufacturers of furniture, carriages, chairs, wagons and the like, and all speak in high terms of the satisfaction which they give.

THOMAS, ROBERTS, STEVENSON COMPANY, Philadelphia, Pa., direct the attention of builders to their line of Active Fortune ranges, some of the merits of which are set forth in their advertisement presented elsewhere in this issue. They lay particular stress upon the fact that this range is made with either right or left oven, low closet and cast base. The circulating-boiler is placed in a horizontal position somewhat above the top surface of the stove at a sufficient distance to be out of the way of cooking utensils. The claim is made that builders are using these ranges very extensively in their operations, as they help to sell houses.

THE STANLEY RULE AND LEVEL COMPANY, New Britain, Conn., elsewhere in this issue set forth the merits of their beading, rabbet, slitting and matching plane, in which they have recently made several important improvements. They also direct attention to an interesting assortment of carpenters' tools and present illustrations of several specialties which they are offering the trade.

NEW PUBLICATIONS.

EXAMPLES OF AMERICAN DOMESTIC ARCHITECTURE. By J. C. Stevens and A. W. Cobb. Forty pages of letterpress and 60 full-page plates. Board covers. Published by William T. Comstock. Price $10.

This work represents an effort on the part of the authors to meet what appears to them to be a well-defined need of reform in the prevailing style of American architecture. In handling the subject they have not confined the discussion to one particular branch of the art, but have touched upon different points bearing upon the general question. The discussion, which is carried through several chapters, is accompanied by illustrations showing work actually executed in different sections. In the opening chapter the need of reform in American architecture is discussed in a very comprehensive manner, the question being considered under two heads. Under the first arguments are presented to show the tendency to magnificence in American architecture and its influence on domestic life, while under the second head is set forth the apparent duty of architects in the premises. The second chapter deals with desirable and undesirable styles of architecture, and includes five plates showing examples of good work by American and British architects. Chapter III is largely devoted to designs by the authors of this work, many of which are accompanied by descriptive text. Of the large number of designs contained in the 60 plates presented, the majority have been prepared especially for the purpose, while many represent work actually executed. The volume is handsomely printed in clear type on good paper and is substantially bound in board covers. To the careful student of American architecture this work is likely to prove of great interest and value.

The Casting of Plate-Glass.

The casting-tables, the most important pieces of apparatus in a plate-glass works, are 19 feet long, 14 feet wide and 7 inches thick. Each is provided with an iron roller 30 inches in diameter and 15 feet long. Strips of iron on each side of the table afford a bearing for the rollers and determine the thickness of the plate of glass to be cast. The rough plate is commonly ¼ inch in thickness; after polishing it is reduced to $\frac{3}{16}$ or $\frac{1}{8}$. The casting-tables are mounted on wheels, and run on a rack that reaches every furnace and annealing-oven in the building. The table having been wheeled as near as possible to the melting-furnace, the pot of molten glass is lifted by means of a crane and its contents quickly poured on the table. The heavy iron roller is then passed from end to end, spreading the glass into a layer of uniform thickness. The whole operation of casting, says the *British Mercantile Gazette*, scarcely occupies more time than it takes to describe it. Each movement is made with almost nervous rapidity. Few industries offer such fine scenic display as the pouring of molten glass. One feels like crying "Encore!" it is so very brilliant. In contact with the cold metal of the table the glass cools rapidly. As soon as possible the door of the annealing-oven is opened and the plate of glass introduced. The floor of the oven is on the same level as the casting-table, so that the transfer can be conveniently and quickly made. When, after several days, the glass is taken out of the oven, its surface is found to be decidedly rough and uneven. A small quantity is used in this condition for sky-lights and other purposes where strength is required without transparency. It is known in the market as rough plate. The greater part, however, is ground, smoothed and polished before it leaves the establishment.

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CARPENTRY AND BUILDING.

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A MONTHLY JOURNAL FOR THE BUILDING TRADES.

DAVID WILLIAMS, - - PUBLISHER AND PROPRIETOR.
A. O. KITTREDGE, - - - - EDITOR.
JOHN S. KING, - - - - BUSINESS MANAGER.

66 & 68 DUANE STREET, NEW YORK.

FEBRUARY, 1890.

The National Builders.

As we go to press the fourth annual convention of the National Association of Builders is about to be held in St. Paul, Minn. Delegates to the convention are present from the principal cities of the East and West, and their numerical strength is such as to warrant a successful meeting. According to the programme mapped out for this convention important questions are to be discussed and much good to the building trades should result. The first day of the convention will be devoted to routine business, while the sessions of the second day will be occupied with the discussion of important questions, the first of which is "Shall the National Association recommend the adoption of the Eight Hour day in the building trades; and if so, when and under what conditions?" Just at the present time this question is occupying the attention of the trade in all sections of the country, and the discussion of it by the National Association is likely to go far toward a proper understanding of the merits of the movement. Another question which will come up for discussion is "The Lien Laws—Shall the National Association recommend that they be abolished?" Another topic which will occupy the attention of the members on the second day is "Sub-Contracting—Shall the National Association recommend that it be encouraged?" A portion of the morning session of the third day is reserved for a continuation of the Eight Hour discussion if necessary. If not other topics will be presented. During this session the question of "Manual Training—Shall the National Association recommend its introduction in the public schools?" will be taken up and considered. The closing session will be occupied with the consideration of reports of a number of committees, the election of officers, unfinished and new business. It will be seen from this that the topics to be considered are all of vital importance to the building trades just at the present time, and the results of the deliberations of those in attendance upon the fourth annual convention of the National Association of Builders will be watched with deep interest.

The Brooklyn Institute.

According to previous announcement, something like 40 New York and Brooklyn architects recently met in the Brooklyn Institute for the purpose of forming what is to be known as the Department of Architecture of the Brooklyn Institute. We understand that the institute offers the privileges of its building free of charge, and in return asks that the organization shall be broad enough to include not only professionals, but amateurs and all who are interested in the study of architecture. The object of the new organization is said to be the promotion of architecture by lectures and instruction and by the formation of an architectural museum and library. The professional members will constitute an advisory board, who will practically control the organization. At the meeting referred to Prof. Franklin D. Hooper, general curator of the Brooklyn Institute, explained the relations which that body would hold toward the department of Architecture. The meeting was full of interest, and the progress of the movement is likely to be watched by all interested in the subject of architecture in this and other cities.

Massachusetts Institute of Technology.

The annual report of President Walker of the Massachusetts Institute of Technology, contains a great deal of useful and interesting information relative to the work which is being done at that institution. At present there are in the Institute 909 students, which is an increase of 82 over last year. These are divided by courses as follows: Graduate students for advanced degree, 3; regular students, fourth year, 110; third year, 130; second year, 148; first year, 261; special students, 257. Of the whole number of students attending the Institute, 72 per cent. are regular. The statistics of residence show that 35 States of the Union, with the District of Columbia, as well as Canada, Ireland, Scotland, Peru, Brazil, Gautemala, Turkey, the West Indies, Hawaiian Islands, Bulgaria, Japan, Panama and France, are represented in the list of students. Of the 909 students attending the Institute 533 are from the State of Massachusetts; 114 from other New England States; 262 from outside of New England, of whom 17 are from foreign countries. There are also 33 women in the Institute. Of the specials, 9 are of the chemical and physical course; 9 study biology and allied subjects; 4 mathematics and 1 architecture. The division of the second year students into courses is, civil, 29; mechanical, 29; mining, 9; architectural, 16; chemical, 5; electrical, 43; biological, 4; physics, 1; general, 5; chemical engineering, 3, and sanitary engineering, 6. The number of instructors of all grades, exclusive of those persons announced as lecturers for the year only, but including the instructors at the shops, is 92 as compared with 79 the year previous.

Brick Makers' Convention.

The fourth annual convention of the National Brick Manufacturers' Association of the United States, recently held in Philadelphia, was among the most successful meetings in the history of the organization. Nearly 500 delegates were in attendance, representing every section of the country from Maine to California. The annual report of the secretary showed a membership of 256, while the treasurer's report indicated a substantial balance on hand. A number of interesting papers were read, among them being one on "The Theory and Practice of Brick Making," by J. W. Crary, of Bluff Springs, Fla., which brought out a lively discussion by the delegates from that section of the country. The method of making bricks set forth in the paper was different from that employed in the East, and referred to the different names applied to bricks in Philadelphia as compared with those manufactured in the West. The paper also urged the adoption of a brick of a certain size, to be known as the "standard size." After the matter had been pretty generally discussed a committee of five was appointed to give it further consideration, the committee consisting of representatives from Cincinnati, Chicago, Toledo and Buffalo. Among the features of the convention were an address on "Brick Making in New England," an essay on "Ornamental and Molded Bricks" and some remarks by John Cubbins, of Memphis, entitled "A Common-Sense Talk on Brick and Brick Making." The subject for discussion was "Re-pressing Brick," and was opened by J. H. Boggs, of Bridgeport, Ohio. The officers elected were Thomas B. McAvoy, of Philadelphia, president; R. B. Morrison, of Rome, Ga., M. E. Hunter, of Lincoln, Neb., and George M. Fiske, of Boston, Mass., vice-presidents; C. P. Merwin, of Berlin, Conn., recording secretary; T. A. Randall, of Indianapolis, Ind., corresponding secretary, and W. A Alsip, of Chicago, treasurer.

Manual Training Schools.

It would appear from what has recently transpired that an industrial economist has been found who does not approve of manual training schools, at least in some instances. The gentleman is Mr. J. R. Abarbanel, who recently lectured before the Manhattan Single Tax Club of New York, taking for his theme "Manual Training and its Relation to the Single Tax." In the course of his remarks the speaker said: "Trade schools were almost unknown among us until a few years ago, but have so multiplied and expanded that they have come to be regarded as one of the necessary departments of our system of public education. I have no fault to find with those who are simply seeking the advancement of the young to promote their future welfare by making them skilled and competent workmen, but when we discover that the effect of these institutions is adverse and hostile to the interests of labor organizations, I am inclined to question whether they are of as much public utility as is claimed for them. In several of these institutions where trades are taught the goods manufactured are turned into the market at prices which defy competition. The Protectory in this city offers its shoes to the stores at 20 and 50 cents a pair less than they could be made for elsewhere. A reformatory in Brooklyn sends solicitors into every printing and publishing establishment in the

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city, offering to set type and print sheets at one-half the price fixed by the labor organizations. Of course the help that these institutions receive from charitable sources enables them to do this work at prices that would be ruinous to the ordinary manufacturer, and it becomes a serious matter for consideration whether the injury thus inflicted on the working people at large is over-balanced by the good resulting from these institutions. The system of teaching trades is good and beneficial in itself, but when the trade schools are used for flooding the market with cheap, underpaid laborers, they fail to promote the purposes for which they were intended, and are sure to be discountenanced and discouraged by the public." It should be noted that this so called economist fails to distinguish between schools in which the sons of honest mechanics are taught the elements of trades and the reform schools in which criminals are obliged to work for their own and their country's good.

Building in New York.

The records of the Building Department of the city of New York show that a vast amount of building has been in progress in the metropolis during the past year. For the 12 months ending November 30, 1889, the number of permits granted was 5,084 as compared with 4,226 for the corresponding period of the previous year. The estimated value of the buildings for which permits were granted during the past year was $26,579,405 as against a valuation of $22,377,825 for the year 1888. For the 12 months ending November 30, 1889, permits were issued for the construction of 443 buildings, described as tenement houses, containing accommodations for 3014 families, at a cost of $2,226,709; 309 for stores and flats intended to accommodate 1611 families, at a cost of construction of $2,986,380, and 710 for flats to be erected to furnish homes for 3265 families, at a cost of $5,569,654. The buildings strictly designated as dwelling houses were divided into two classes: the first containing more than one family, all of which cost less than $10,000 to construct, while the remaining dwellings were for one family each—1228 of them estimated to cost $5000 or less, and 401 to cost more than $5000 and less than $10,000 each. The remaining 115 dwellings were estimated to cost more than $10,000, and each to be occupied by one family. In his annual message Mayor Grant says, that "it is almost incredible that the growth of the city can warrant such an enormous amount of construction. Upon the basis of the census of 1880, these 13,049 families would consist of 64,201 souls. Whether the increase of the city keeps pace with this new construction or not it is reasonable to conclude that Brooklyn's annual addition to its population is larger than that of any other city in the Union excepting, possibly, New York."

THE PLATES.

We devote our plate pages this month to illustrations of examples of the five orders of architecture, concerning which we have frequently received inquiries from our readers. The descriptive text to accompany the engravings will be found on page 40.

Fire-Proof Construction.

In a recent issue of the *American Architect and Building News* there appeared an article descriptive of a fire in Berlin which destroyed a so-called fire-proof structure built wholly of iron and brick. The subject treated is one of such unquestioned interest to readers of *Carpentry and Building* that we present the article referred to herewith:

It is a satisfaction to find that the Americans are certainly giving lessons to the rest of the world in matters of construction, if not of art. Perhaps the art will come later. Not long ago a great fire took place in Berlin, totally destroying a structure composed wholly of brick and iron, and built with the solidity characteristic of German work. The building was a storage warehouse for the great Berlin Express Company, and was about 100 feet wide, and 150 feet long, 6 stories high, with a small courtyard in the center. A heavy brick wall divided it through the middle, and the floors were all made with brick arches turned between iron beams, which rested on the walls, and on ranges of iron girders, supported by cast-iron columns. The doors in the partition-wall were all of plate-iron. We have learned by experience the vulnerable points of such a structure, but to the Germans, unaccustomed to destructive fires, it must have seemed as fire-proof as it would have to us 30 years ago. Five months after the building was substantially completed one or two temporary openings were made in the third floor for the purpose of finishing some part of the work, and while these were still open an accident occurred, by which fire was set to some goods stored in the third story. The flaming brands immediately fell through the holes in the floor, setting fire to the goods in the next story below, which were mostly cotton and woolen materials, and although the fire-engines arrived five minutes after the fire started they were too late to be of any service. Five minutes seems a short time for a fire starting in a little bundle of dry goods to accomplish the destruction of a huge building, in the construction of which there was not a trace of inflammable material, but no sooner had the nearest bales become kindled than the iron beams over them, quickly heated by the flames, expanded, violently wrenching the girders, and in many cases breaking off the capitals of the columns. In this effort the beams themselves were bent and twisted, letting the brick floor arches fall; and so quickly did this effect occur that many of the floor arches had fallen out before the engines arrived, five minutes from the setting of the fire.

The collapse of the arches not only opened a passage upward for the flames, but piled broken cases, torn cloth and other combustibles in the best condition for speedy kindling upon the blazing goods beneath, and the west half of the structure, in which the fire first caught, was soon a mass of flames. The eastern half was cut off by means of the iron doors, all of which had been duly closed, but these soon became red-hot from the action of the fire behind them, and in that way set fire to goods lying against them, and they also soon warped enough to let the flames through and hasten the effect, so that in one hour from the first alarm little remained of the western half of the building but the tottering outside walls, a large portion of which had already fallen, while the three upper stories of the eastern half, notwithstanding the brick partition wall and the iron doors, were totally destroyed, and the lower stories nearly ruined by the fall of the upper floor arches. On examining the place after the fire, it was found that out of 100 columns which originally held the floors 38 had been thrown completely out of their places, while 34 more, although they remained standing, were so broken or bent as to be useless, the only ones still fit for serving being those in the lower stories of the eastern half of the building. The girders were formed of iron beams 18 inches deep, and these were in some places twisted like corkscrews by the strain which they had undergone. An expert commission was immediately appointed to study into the causes of the fire, and made a report expressing the opinion that no building could henceforth be considered fire-proof unless the flanges of iron beams and all portions of iron columns were "covered by some non-conducting material," as "is now commonly done in such structures in the great cities of the United States of America."

Towers and Spires.

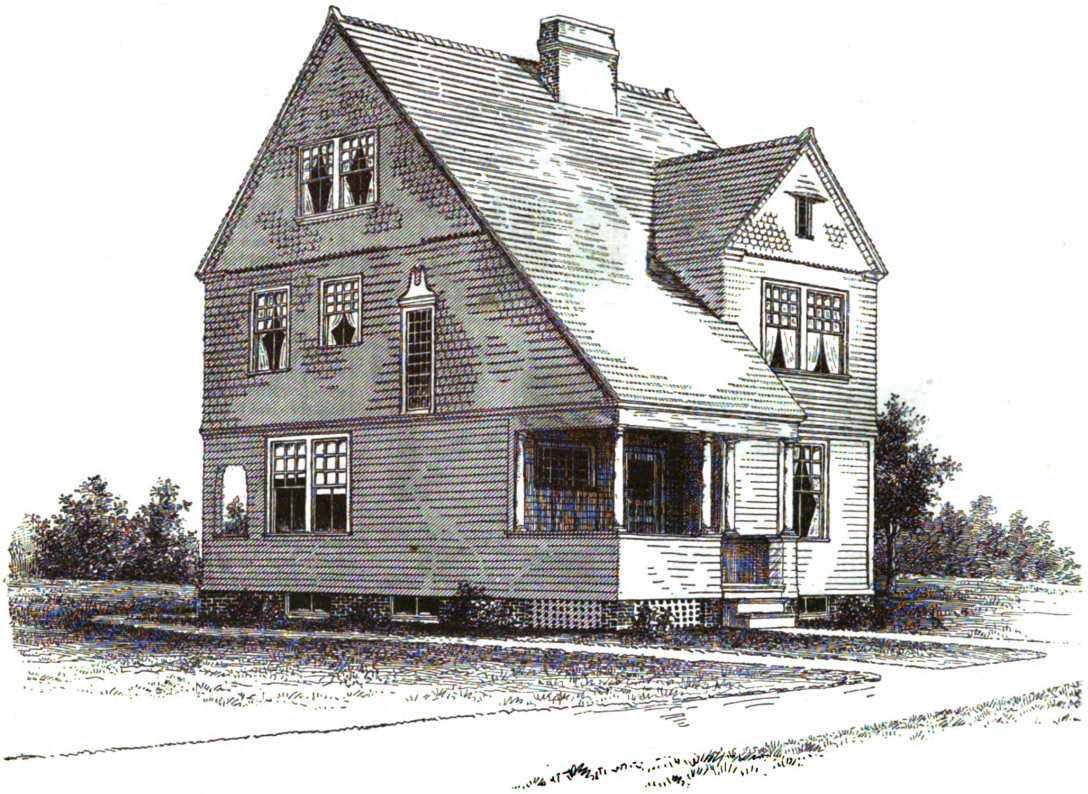
Old St. Paul's spire of wood and lead was 529 feet high; St. Stephen's, Vienna, 465; Strasburg, 456; Salisbury, 387; Norwich, 317, and Chichester, 290. The singularly beautiful spire of Louth, in Lincolnshire, was begun in 1502 and finished in ten years by John Cole, architect, at the expense of £305 .7/5; it is 134 feet high, exclusive of the tower—total, 282. Grantham, 144. The central spire of Lichfield is 258 feet high, and those of the façade, 185 each; St. Michael's, Coventry, 300, which was built in imitation, and very probably by the same architect. The last-mentioned are all of stone. The spire of St. Andrew's, Worcester, which is extremely elegant, was built in the eighteenth century by Nath. Wilkinson, an uneducated mason. The hight from the parapet of the tower is 155 feet 6 inches, the thickness of the walls of the spire is 20 inches, and under the capital and weathercock only 6¾ inches. From a survey of Salisbury Cathedral it appears that the spire did not form a part of the original plan, but was added many years after its completion. The spire of Chichester Cathedral resembles it very nearly on a smaller scale, and was traditionally the work of the same architect.

Of the 22 cathedrals in England, Salisbury, Chichester, Lichfield and Norwich have most beautiful central spires; those of Oxford and Rochester are not worth noticing. The spire of old St. Paul's was finished 1221; Sarum, 1256; Chichester, 1270; Norwich, 1278; Lichfield, 1370; St. Michael's, Coventry, 1395. Magdalen Tower is 122 feet high, diameter 26; the cathedral at Gloucester, 224; Lincoln, 288; Canterbury, 235; Ely, 270; York, 234; Durham, 210; Worcester, 196; Wrexham, 132; Doncaster, 152; Derby, 174. Towers of Beverley, 198 each—the prototypes of those of Westminster; St. Stephen's Church, Bristol, 124; Taunton, Somersetshire, 153; all of which were built between 1400 and 1520. Towers of this age in Gloucestershire and the West of England are very frequent and beautiful. The tower built by Giotto in 1334 at Florence is 264 feet high, with a diameter of 46 feet. The Falling Tower, at Pisa, is 188 feet high. The tower at Boston, in Lincolnshire, is finished by an octangular louver, having in the whole an elevation of 282 feet. It was built the year 1309, probably by the Flemings established there, and is said to resemble that of the great church at Antwerp. At Bruges I remarked a similar tower attached to the town house, and another at Brussels. The central tower of the abbey of St. Oüen, at Rouen, which is octangular and of the same date, is 240 feet high. The lantern tower at Ely is 170 feet high. Another at Peterborough is 136 feet from the floor.

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Design for a Suburban Residence.

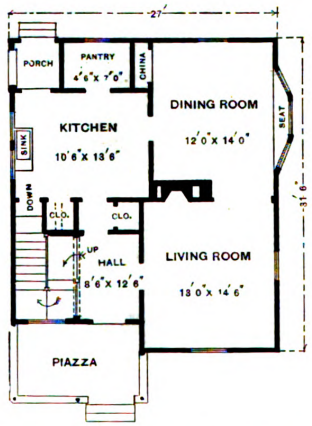
On this and the following pages we present the perspective view, floor plans, elevations and details of a moderate-priced house designed by E. I. Thomas, of Boston, Mass. The object of the author has been to make a pleasant yet convenient plan with an attractive exterior. Upon the first floor are three rooms with a commodious hall, which might in case of necessity be employed as a reception room. The living room has an open fireplace, which can be used for ventilating purposes when not containing a fire. The dining-room has a bay window provided with seat, which may be used if desired for flower pots. The kitchen is conveniently located to the hall, yet cut off from it by two doors. Opening from the kitchen is a pantry 4½ x 7 feet, and a closet which will be found useful. The door between the kitchen and dining-room is arranged to swing both ways and remain closed. The opening between the dining and living rooms is closed by *portières*, though folding doors may be used if preferred. Upon the second floor are three chambers and an ample bath-room. Throughout the house abundant closet room is provided, a feature which cannot fail to be appreciated. The chimney is so placed that every room in the house, with one exception can be heated from it. From the author's specification we learn that the sills are 5 x 8 inches, the floor joists 2 x 8 inches, the studding 2 x 4 inches, the plates 2 x 4 inches doubled, the corner posts 4 x 6 inches, and the rafters 2 x 6 inches. The roof is to be covered with shingles laid 5½ inches to the weather, while those upon the walls and gables are laid 6 inches to the weather. The floors of the kitchen and pantry are of birch laid in 4-inch widths; in all other rooms spruce or cheap pine is used. The mantel of cherry is provided with plain glass mirror. The fireplace has a brick facing and tile hearth.



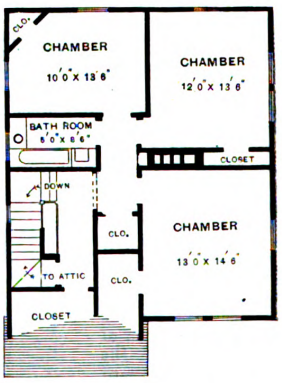
Design for a Suburban Residence, by E. I. Thomas, Boston, Mass.—Perspective View.

Early Use of Window-Glass.

Glass was first applied to the windows of domestic buildings in the thirteenth century, says an English exchange—at least, no trace of the use of it for any other than ecclesiastical structures has yet been discovered of an earlier date. Still it must not be supposed that glazed windows were to be found in every house; they were a luxury barely known to royalty and the wealthiest persons, and even in palaces windows of glass and wood were intermixed, the latter being distinguished by the various names of fenestrals, lattices, window-shutters or literally "window-doors" and "wooden-windows." The presumed reason of this fact is, strange as the assertion may appear, that no kind of glass was manufactured in this country until a comparatively late period, and the fragility of the material prevented any very regular or extensive importation of it from the Continent in the early time of British commerce. The perfection to which the Romans brought the art of glass-making is well known, but it was long uncertain whether they used glazed windows. The discovery of portions of glass so applied at Herculaneum and at Pompeii has satisfactorily proved that they did. Glass-making was one among the many arts which survived the



First Floor Plan.—Scale, 1-16 Inch to the Foot.

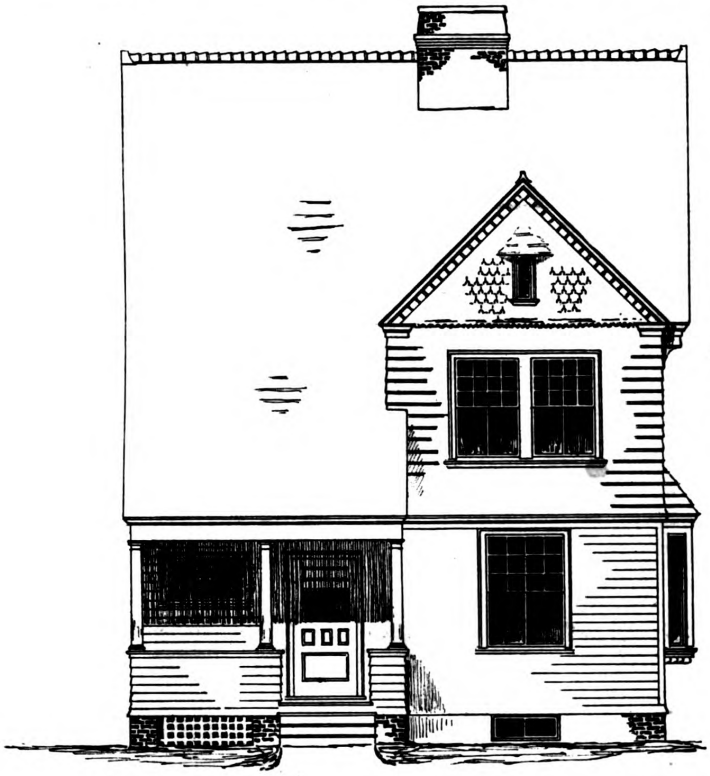


Second Floor Plan.—Scale, 1-16 Inch to the Foot.

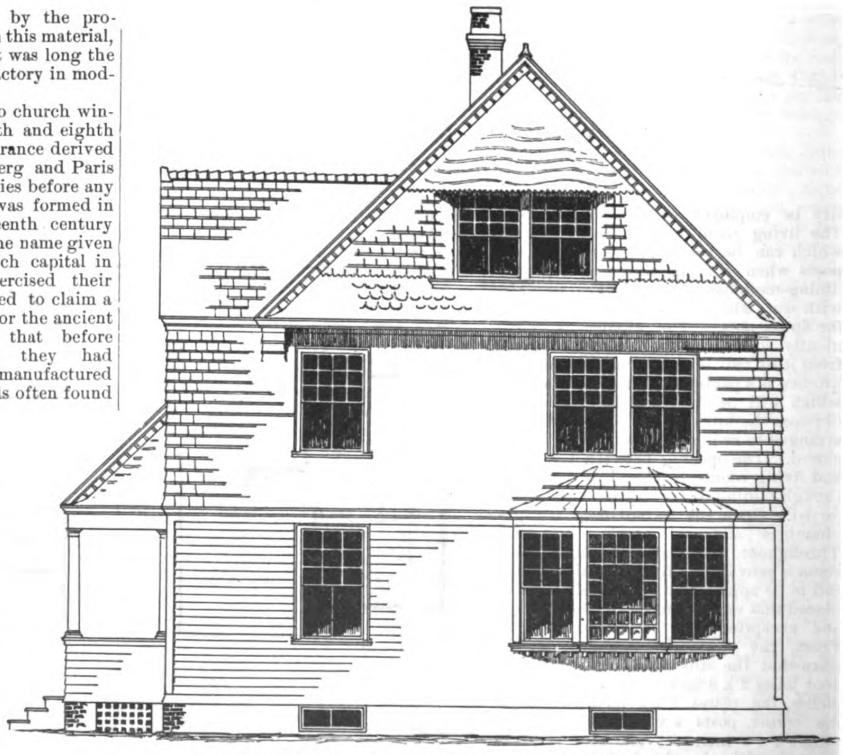
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destruction of the empire and were exercised in Italy in the earliest mediæval times. The island of Murano, near Venice, still distinguished by the production of elaborate works in this material, is the most ancient seat, as it was long the greatest, of the glass manufactory in modern Europe.

We find glazing applied to church windows in Italy in the seventh and eighth centuries. Germany and France derived the art from Italy; Nuremberg and Paris had glass-houses some centuries before any establishment of the kind was formed in England; and in the fourteenth century the Rue de la Verrerie was the name given to that quarter of the French capital in which the glass-makers exercised their craft. It has been attempted to claim a knowledge of glassmaking for the ancient Britons; and it is said that before the landing of Cæsar they had works in which they manufactured those peculiar enameled beads often found in tumuli, but which are now believed, with good reason, to be of foreign origin, and to have been brought to this island by foreign traders, for the same commercial object that we, at the present time, ship like wares to the West Coast of Africa. This assumption, for it is nothing more, in favor of the civilization of the Britons is fully as absurd as that theory which attributes to them a national coinage ascending to an antiquity of many centuries before the Roman invasion. But, supposing that the Britons really did make their own glass beads and every kind of glass, it is, nevertheless, quite certain, on the testimony of Bede, that glass was not made in England in the seventh century; therefore the art was soon lost, if it had ever been previously known. The plain truth, however, is that there is not a particle of evidence to prove that any description of glass was manufactured in this country before the fifteenth century. Proof to the contrary may yet be discovered; but until it shall appear that is the earliest period to which the introduction of this fabric can be assigned, and it was not produced in any considerable quantity until the middle of the following century.



Design for a Suburban Residence.—Front Elevation.—Scale, ⅛ Inch to the Foot.



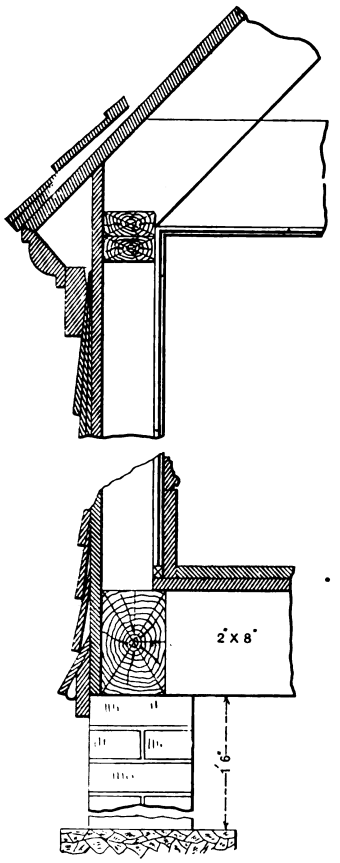
Side (Right) Elevation.—Scale, ⅛ Inch to the Foot.

Iron in the Construction of Buildings.

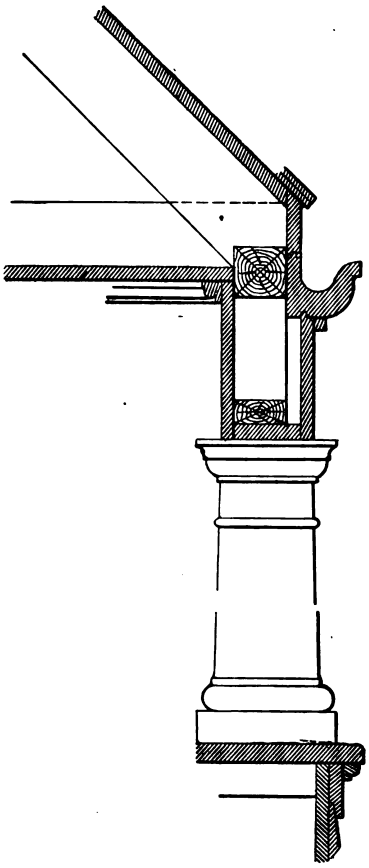
Without question, says a Western exchange, the timber trade is beginning to seriously feel the loss of demand resulting from the use of iron in the construction of buildings. By this it is not meant to imply that there is less demand for timber and joists than there was before iron came so extensively into use, but that heavy dealers in such stuff are failing to realize such increase of demand for wood interiors as they had counted on as the result of the rapid growth of the larger cities. They still have left as a resource the growing demand for the lighter and shorter timbers and joists, such as enter into the construction of smaller business and residence houses in the outlying districts of the larger cities, and in all interior places. But in the immense warehouses and office buildings that are being so numerously erected in the great cities iron and steel are being mostly used as supports for floors and interior work. The growth of the demand for structural iron has been rapid within the past three years, and lumber dealers are beginning to comment on it as if it was a serious matter. It changes the nature of the requirement for timber and joists, there now being proportionately less long and heavy stuff called for than formerly, such demand as there is being cut into by the increasing use of yellow pine for certain classes of heavy freight warehouses and large manufacturing structures. The present flourishing condition of the iron trade and the ore market, in a season when there is certainly

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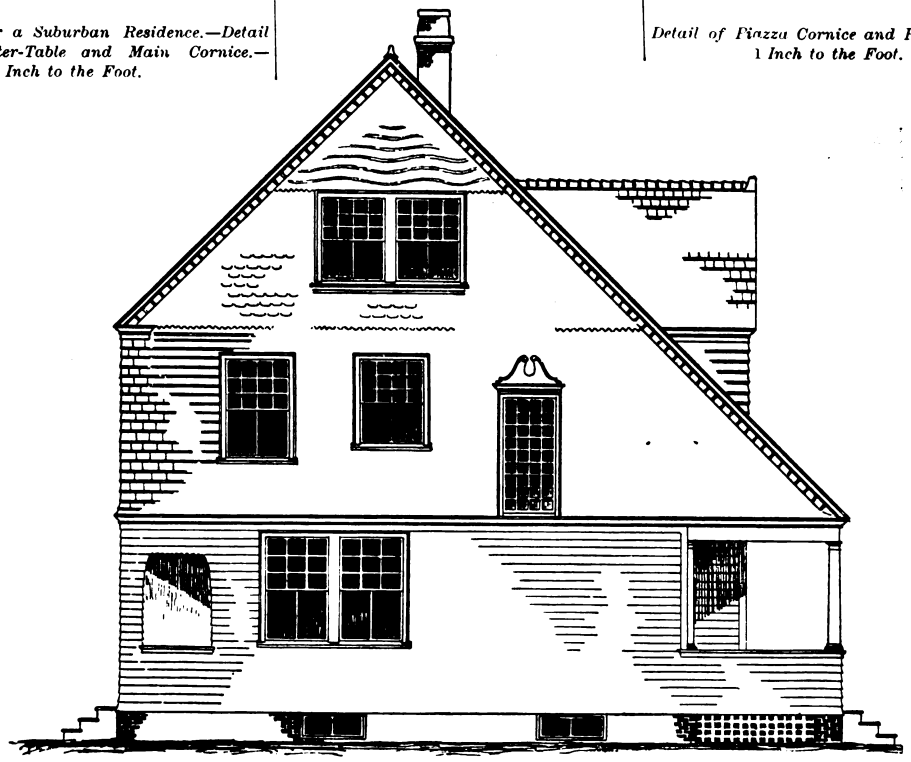
no remarkable extent of railroad construction going forward, is attributed to the demand for structural iron. If the requirement has so remarkably increased within the recent past that it can absorb the greatly enhanced output of mines and mills, supplemented as it has been by the late development of mineral wealth in the South and in the newer Lake Superior districts, what may we expect for the coming decade? The use of structural iron has but just acquired full headway. We may safely predict that in the near future not only will the larger, costlier structures require iron, but it will be employed in the medium class of business houses as well. The tendency of recent architecture is to strength, solidity of appearance and ability to resist decay and destruction by fire. Investors are building more for the future than they did in the past. As wealth increases and interest on money diminishes in rate per cent., the tendency is to permanently invest in enduring structures that will continue as a means of preserving capital and securing income for generations to come. This leads men to seek an enduring building material, and iron answers the purpose. For this reason we may expect to see the demand for structural iron increase and that for wood correspondingly decrease. But this observation, in its reference to wood, applies only to timber and joists in the cities. In country towns wood will be used as long as the supply shall last and all finishing will continue to be done in wood. So there will be a demand for the product of the mines and the forests, but iron will work a change in that for the coarser product of the saw mills by cutting off a measure of the requirement for timber and joists of the heavier class.



Design for a Suburban Residence.—Detail of Water-Table and Main Cornice.—Scale, 1 Inch to the Foot.



Detail of Piazza Cornice and Rail.—Scale, 1 Inch to the Foot.



Design for Suburban Residence.—Side (Left) Elevation.—Scale, ⅛ Inch to the Foot.

ACCORDING TO STATISTICS which have lately been compiled, the number of churches in the city of New York is rapidly on the increase. It is said that within the last two years plans for 50 new church edifices have been prepared. Of the new edifices erected or begun since the 1st of January, 1888, 12 are Roman Catholic, 8 Protestant Episcopal, 8 Presbyterian, 3 Methodist, 3 Baptist, 1 Unitarian, 1 Lutheran, 1 Congregational and 2 Jewish, besides several of a miscellaneous character. As a rule the Protestant Epis-

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copal are the most costly, while the Roman Catholic rank next in order. A prominent feature in the new buildings is the tendency to swing from the Gothic into the Romanesque and Renaissance schools of architecture.

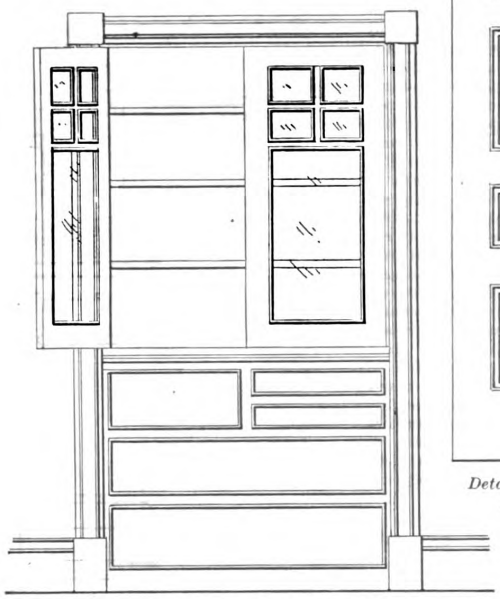
Iron Houses.

We do something occasionally in this country in the way of iron buildings, but seldom, if ever, have we gone to the extreme of producing newspaper comment like our English cousins. The following extracts from a recent issue of the London *Standard* will be found interesting, although the particulars in which many of our readers are specially concerned are studiously omitted:

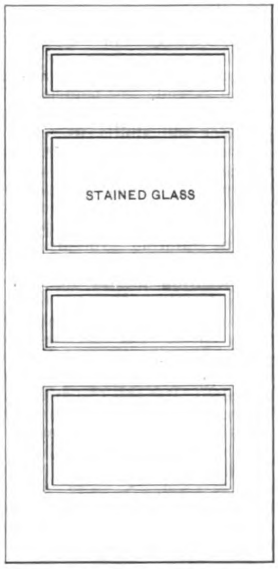
Mr. Gladstone, we are informed, is having an iron library erected at Hawarden. It is to contain 16,000 volumes. He takes the liveliest interest in the building and watches every detail of the erection. The house contains five rooms, the largest one measuring 41 x 21 feet. Cases are being made to hold 20 tons of books. Mr. Gladstone intends the library for quiet study, and therefore proposes to admit only a few persons at a time. These houses are put together like a child's puzzle and can be taken apart, compactly packed and removed elsewhere. A large number of iron villas have been sent from the works at Albertgate to the Riviera and there erected upon plots of land purchased or rented for a term of years. When the lease expires the houses can be packed up and removed. There is beginning to be a demand for iron bungalows as marine residences in England. The rapidity with which they can be built and their small cost, as compared with the ordinary dwelling of brick and stone, are recommendations which tell in their favor.

The possibility of having a house built in a month to the buyer's own plan and ready for occupation as soon as finished seems almost incredible. The pretty Welcome Club at the Italian and American exhibitions was made of iron, and its cost—£300—will give some idea of the comparative prices of brick and iron. It was covered with trellis-work, which imparted a picturesque and rural aspect to the outside. In its uncovered state the corrugated iron cannot be said to be ornamental, but the trellis-work embellishes it at a small cost. It is suggested by the manufacturers that thatching the roofs with heather would add to the pictorial effect and also give additional protection to the roof. Heather from Bournemouth thus applied would last for 15 years or more. The thatching would aid in keeping the house cool in summer and warm in winter, though this double *desideratum* has already been secured by the air-spaces between the outer iron walls and the inner ones of felt and pine wood.

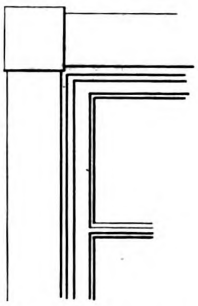
It is now feasible to add an additional room to the ordinary brick dwelling-house where such accommodation is needed. Being removable, it is the property of the tenant, so that the objection felt by most people against building for the ultimate benefit of one's landlord does not hold good in such a case. Stabling and coach-houses can in the same way be temporarily erected. As a play-room or school-room for children, a detatched iron building communicating with the house by a covered way would frequently prove a boom to the brain-working father of the family, and



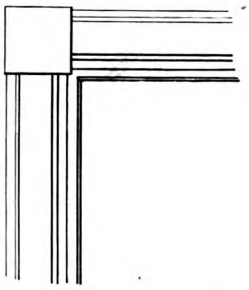
Design for a Suburban Residence.—Elevation of China Closet.—Scale, ½ Inch to the Foot.



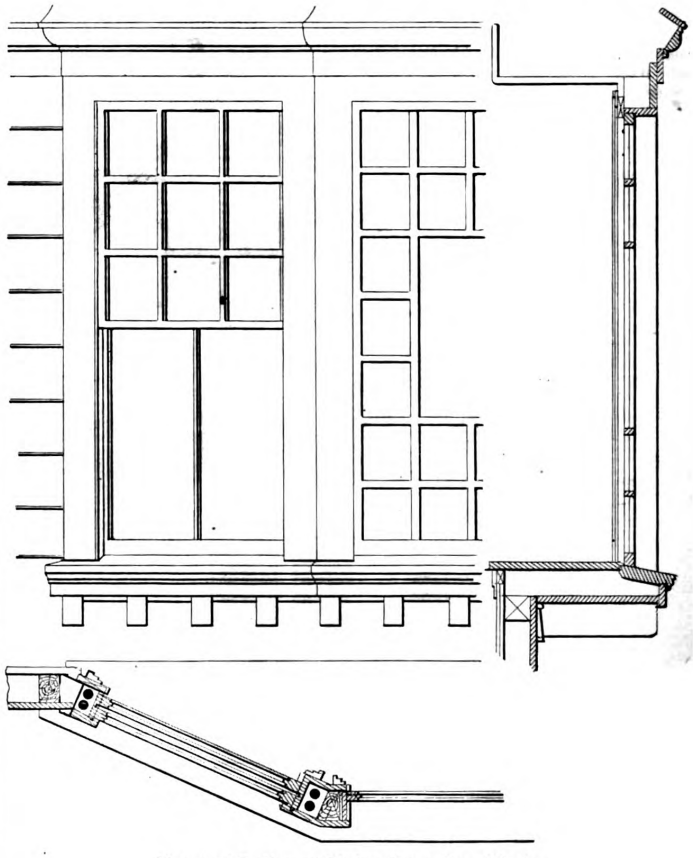
Detail of Front Door.—Scale, ½ Inch to the Foot.



Window Finish.—Scale, 1 Inch to the Foot.



Detail of Door Finish.—Scale, 1 Inch to the Foot.



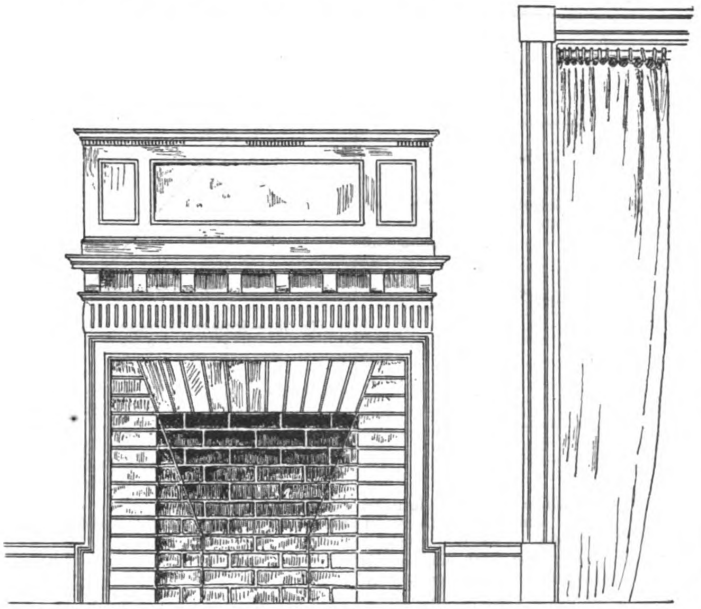
Plan and Section of Dining-Room Bay Window.

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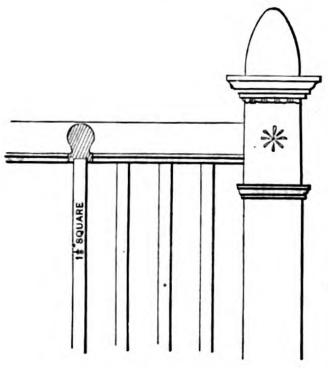
in time of illness it would be possible by this means to isolate a patient completely from the other members of the family.

There is no damp to be apprehended in an iron house. A useful present to a village would be an iron play-room, which could be built in a week. A building costing £200 can be erected in a fortnight. The price of a room measuring 20 x 13 feet would be about £50. The cost of removal is from £5 upward. With this novel architecture it would be possible to reside in one's own house at a different sea-side resort in England every year by having an iron house removed in this way. The brick-work chimney is preferred to any other by the builders of iron houses, no mode of heating being so wholesome as the open grate, with direct ventilation. There are other methods of warming rooms, and some of them are sufficiently satisfactory when the ventilation has been properly secured. The drainage can be worked on the usual plan, if this be preferred to the simpler mode recommended by the originator of the iron houses.

Mr. Gladstone has addressed the following communication to the Hawarden parish magazine: "Observing that statements, either erroneous or premature, with reference to the small structure of corrugated iron which I am now erecting near the church have found their way into some of the public journals, I address to you these few lines with the view of obviating any misapprehension among my fellow-parishioners and friends. The building is simply a depository for books, with the additions necessary for due care-taking, and will be in no wise suited for the purpose of a reading-room. My design is not limited to this narrow scope, and it will not be of a merely personal character; but I require more time and leisure for reflection before deciding what shape it shall ultimately assume, and no description of the plan which has been given has had any authority from me. I trust, however, that it will not be without utility to the parish, though possibly not to the parish only."



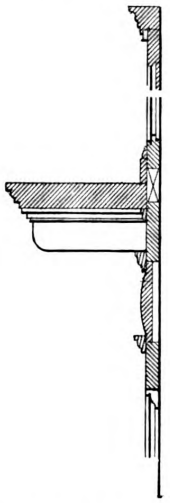
Design for a Suburban Residence.—Elevation of Mantel.—Scale, ½ Inch to the Foot.



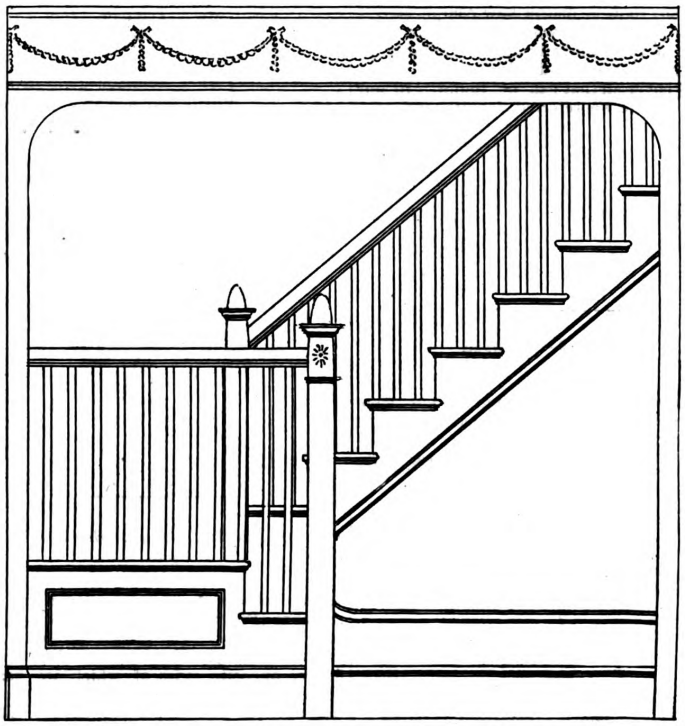
Detail of Stairs.—Scale, 1 Inch to the Foot.

Life of Corrugated-Iron Roofs.

At a recent meeting of the Connecticut Association of Engineers, a paper by Mr. C. M. Jarvis was presented on "Iron Roofs." In the discussion which followed Mr. Field was asked the question: "What is the ordinary life of corrugated iron?" He replied: "The life of a corrugated-iron roof depends on what gauge of iron you use or whether you use it galvanized. You can put it on to last 100 years, but ordinarily it will not. Iron near the sea-shore will go faster than inland. There are instances where that iron has lasted 20 to 25 years; other times it has gone in five or six. There is no repair except to put a new sheet on. You can take off any one sheet and renew it. We have had roofs on our place 17 years, and they do not leak very badly now. We keep them painted. A good many places where they have lost corrugated-iron roofs they have not painted them. We use metallic paint. Those that last the longest



Vertical Cross-Section of Mantel.—Scale, 1½ Inches to the Foot.



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

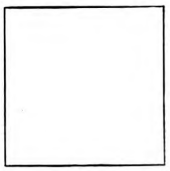
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are galvanized iron. Many people put on 26 iron, which is not much better than paper. If they will put on 18 or 20 galvanized they will have a roof to last, practically, forever. They put on 26 frequently. There are three or four gauges—standard, Birmingham and others—and you must be posted on what gauge you are buying, for 26 in one might be 28 in another man's. You gauge it by the weight per foot."

Measurement of Roofs.

BY TRIANGLE.

If a person were to look over a number of plans of buildings it might appear that there were roofs of an endless variety of shapes, and that one would require an ex-



Measurement of Roofs.—Fig. 7.—Square.

tensive knowledge of arithmetic and geometry in order to estimate correctly the various surfaces, in fact a greater knowledge than most mechanics possess. That such is not the case, we hope to show in this and following articles. By analyz-

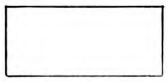


Fig. 8.—Equiangular Parallelogram, called Rectangle or Oblong.

ing any roof, no matter how complicated it may appear as a whole, it will be seen that a comparatively limited number of figures are used, and a few general terms will cover all that can be found. In our first article we referred incidentally to a

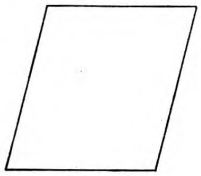


Fig. 9.—Rhombus.

number of shapes occurring in roofs, some of which require special calculation in order to determine their area. In Fig. 3 was shown a roof that would appear quite



Fig. 10.—Rhomboid.

complicated and difficult to estimate to one not accustomed to the general principles underlying the calculation of the area of triangles, but after being analyzed it becomes quite simple.

It might be well to remark that almost every geometrical figure that can be drawn

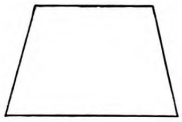


Fig. 11.—Trapezoid.

has a name, but it is not necessary to know the name of a figure in order to be enabled to calculate its area. Among the

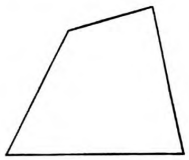


Fig. 12.—Trapezium.

forms of roofs commonly found might be mentioned square and various forms of rectangles; triangles of various shapes also are frequently met with, and quadrangles, both regular and irregular, are occasionally found. For the benefit of those who are not acquainted with the

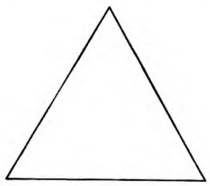


Fig. 13.—Equilateral Triangle.—Has Three Equal Sides.

names of the more common geometrical figures and for convenience in describing them, the names of a number will be given. It might seem unnecessary to define a square (Fig. 7), which is a figure that has all its sides equal and all its angles right angles. In Fig. 8 is shown a rectangle, an oblong figure which has all its angles right angles but has not all of its sides equal. While a rectangle has

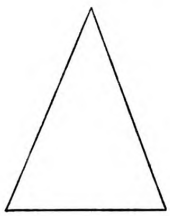


Fig. 14.—Isosceles Triangle.—Has Two Sides Equal.

square corners it is not a square. A rhombus (Fig. 9) has all of its sides equal, but its angles are not right angles. A rhomboid (Fig. 10) is a quadrilateral figure, opposite sides of which are parallel. A trapezoid is a quadrilateral, having only two sides parallel, as Fig. 11, All other four-sided figures, as Fig. 12, are called trapeziums. The different forms of triangles and their names are shown in Figs. 13, 14, 15, 16, 17, 18 and 19. In Fig. 20 is shown a triangle, the several parts being named, as are the parts of a right-angled triangle in Fig. 21. It will be noticed that many of the figures are nearly alike so far as methods of calculation are concerned, as the square and oblong and rhombus and rhomboid.

In the previous article it was shown that the area of a triangle was obtained by

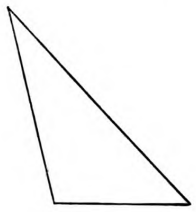


Fig. 15.—Scalene Triangle.—Has Three Unequal Sides.

multiplying the base by the altitude and taking one-half of the sum. So it will be seen of the number of figures shown in this article it is a comparatively easy matter to determine their areas, and after the figures are analyzed two or three general rules will cover the whole. The reader will observe it is a simple matter to esti-

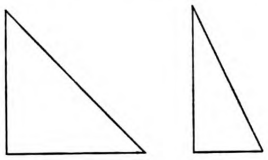


Fig. 16.—Right-Angled Triangles.—Have Right Angles.

mate the area of any roof, no matter how complicated it may appear, it being only necessary to take each figure or shape separately and determine its area, which is an easy thing to do even with figures



Fig. 17.—Right-Angled Triangle.—Has a Right Angle.

having more than four sides, as will be explained in a future article. In estimating the area of triangles the mistake should not be made of taking the side for the altitude. In the right-angled triangle (Fig. 21) the altitude and side A B are the same, but in Fig. 20 it would not be right to multiply the base A C by the side B C. The base A C is to be multiplied by the altitude D B.

Our readers are undoubtedly aware that architects' drawings are very generally made to a scale of $\frac{1}{8}$ or $\frac{1}{4}$ inch to the foot

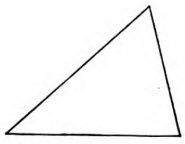


Fig. 18.—Acute-Angled Triangle.—Has Three Acute Angles.

and that scales of different designs for measuring drawings can be procured from dealers in mathematical instruments and are generally kept by the hardware trade. Most of the pocket-rules have various

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scales marked on them and are sometimes very convenient to use for making scale drawings when a regular scale is not at

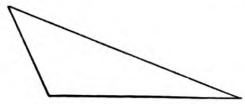


Fig. 19.—Obtuse-Angled Triangle.—Has an Obtuse Angle.

hand. As a general thing it is a good plan for one to accustom himself to the use of the common pocket-rule, as it is more apt to be at hand when wanted,

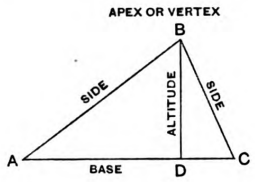


Fig. 20.—Names of Parts of a Triangle.

while special scales are rather inconvenient to carry about and might be lacking when most wanted. If the drawings to be measured are to a scale of $\frac{1}{4}$ inch to the

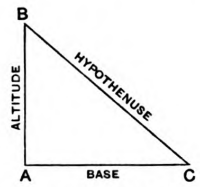


Fig. 21.—Names of Parts of a Right-Angled Triangle.

foot, every inch will represent 4 feet, every $\frac{1}{8}$ inch 6 inches and every $\frac{1}{16}$ inch 3 inches. If the drawing is made to a scale of $\frac{1}{8}$ inch to the foot, each $\frac{1}{16}$ would represent 6 inches, $\frac{1}{32}$ 3 inches, &c. With a

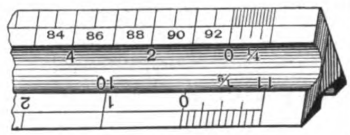


Fig. 22.—Triangular Box-Wood Scale.

little practice it is almost as easy to measure drawings with a rule as by means of a scale. If desired, a convenient scale can be made from a strip of drawing-paper or

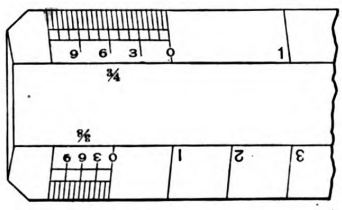


Fig. 23.—Flat Box-Wood Scale.

card-board, the necessary divisions being marked on the edge and numbered as desired. Of the special scales made for measuring drawings two illustrations are given. In Fig. 22 the triangular scale is shown. As the scales commence from each end and are on each edge, 12 different scales are shown. The spaces representing feet are numbered, while an extra space is ruled to represent inches. By laying a scale of this kind upon a drawing it is easy to make the necessary measurement. In Fig. 23 is shown another form; its use is similar to the triangular, but its shape is such that it cannot have as great a variety of scale.

Perfection Direct-Indirect Radiator

The Michigan Radiator and Iron Mfg. Company, Detroit, Mich., are offering the trade a modified form of their Perfection radiator, the peculiar features of which are illustrated in the accompanying engravings. According to the new style the bottoms of the loops are so incased as to form a box, into which the air can be conducted from the outside of the house and the room heated by the direct-indirect method. Fig. 1 shows a side view of this radiator, and an end view is illustrated in Fig. 2. As will be noticed by the engravings, each section or loop of the radiator is cast with its part of base and flue, and when the sections are put together these flanges form a diamond-shaped flue of an area of 6 square inches. The advantage claimed for this method of construction is that it compels the fresh air admitted through the base of the radiator to come in contact with the loop through its entire length, and consequently the air is brought into the room at an exceedingly high temperature. The base is provided with a damper-door, as shown in Fig. 2, at either end, for the purpose of admitting air from the room and also for cleaning under the radiator. Ordinarily the air is taken from without and enters the middle of the base, but by shutting this off and opening the damper-door just mentioned the air can be drawn from the room and the radiator is then of the ordinary direct type.

The same manufacturers are also offering to the trade a radiator adapted to stand under stair-ways, or wherever it is desirable

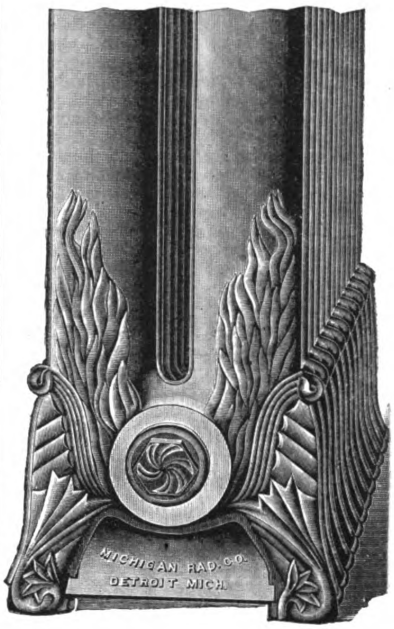
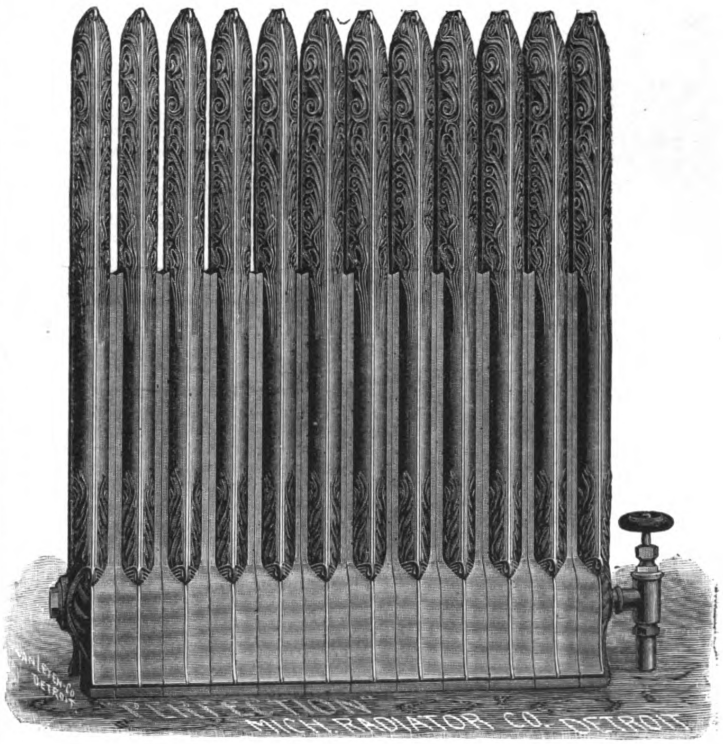


Fig. 2.—End View of Radiator, Showing Damper-Door.

to have a radiator with inclined top. This stair-way radiator is made by joining together perfection loops of different hights,



Perfection Direct-Indirect Radiator.—Fig. 1.—Side View of Radiator.

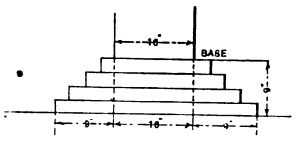
and by properly proportioning the number of loops of different hights the pitch of the radiator can be made anything desired.

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Rules for Brick Walls.

The following rules for the thickness of brick walls are taken from the Canadian *Architect and Builder*, and are according to the Metropolitan Building act passed in London in 1885, and in which subsequent building acts have made no changes.

The projection of the footing at the bottom of every wall on each side shall be at least equal to one-half the thickness of the wall at its base. The diminution of the footings shall be in regular offsets, and the hight from the bottom of the footing to the base of the wall shall be at least equal to one-half the thickness of the wall at its base, the base of the wall being the first course above the footings. For example see Fig. 1.



Rules for Brick Walls.—Fig. 1.—Diagram Showing Projection of Footings.

Here the wall at its base is 1 foot 6 inches thick, therefore the projection on each side must be at least 9 inches, and the hight from the bottom to top of the footings must always be 9 inches, not less.

Bricks are here supposed to be not less than 8½ inches long, or more than 9½ inches long.

EXTRA HIGHT OF A STORY.

If any story exceeds in hight the thickness prescribed in the tables below for that

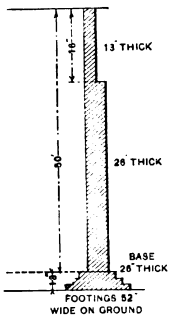


Fig. 2.—Section of Wall 50 Feet High.

story multiplied by 16, the walls of that story must be increased in thickness one-sixteenth part the hight of the story.

Example—

Hight of story, say 17 ft. 4 in.
Thickness of wall described, 13 in.

Now, as 17 feet 4 inches is 16 times the thickness of the wall, the wall is to be thickened by one-sixteenth the whole hight, or 13 inches, making 26 inches the correct thickness.

But this extra thickness may be confined to piers distributed properly, the total widths of the piers being equal to one-quarter the whole length of the wall.

Example—

Extra thickness is 13 in.
Total length of wall, say 30 ft.
¼ length of wall is 7 ft. 6 in.

The width of the piers must together equal 7 feet 6 inches.

You have therefore a wall 17 feet 4 inches high, 30 feet long, 13 inches thick, with four piers that are each 1 foot 10½ inches wide on face.

I.	II.	III.	IV.
Hight up to 100 ft.	Length up to 45 ft. 1st story 21½ in. thick 2d story 21½ in. thick 3d story 17½ in. thick 4th story 17½ in. thick 5th story 17½ in. thick Remainder 13 in. thick	Length up to 80 ft. 1st story 26 in. thick 2d story 26 in. thick 3d story 21½ in. thick 4th story 21½ in. thick 5th story 17½ in. thick 6th story 17½ in. thick Remainder 13 in. thick	Length unlimited. 1st story 30 in. thick 2d story 26 in. thick 3d story 26 in. thick 4th story 21½ in. thick 5th story 21½ in. thick 6th story 17½ in. thick 7th story 17½ in. thick Remainder 13 in. thick
Hight up to 90 ft.	Length up to 45 ft. 1st story 21½ in. thick 2d story 21½ in. thick 3d story 17½ in. thick 4th story 17½ in. thick Remainder 13 in. thick	Length up to 70 ft. 1st story 26 in. thick 2d story 21½ in. thick 3d story 21½ in. thick 4th story 17½ in. thick 5th story 17½ in. thick Remainder 13 in. thick	Length unlimited. 1st story 30 in. thick 2d story 26 in. thick 3d story 26 in. thick 4th story 21½ in. thick 5th story 17½ in. thick 6th story 17½ in. thick Remainder 13 in. thick
Hight up to 80 ft.	Length up to 40 ft. 1st story 21½ in. thick 2d story 17½ in. thick 3d story 17½ in. thick Remainder 13 in. thick	Length up to 60 ft. 1st story 21½ in. thick 2d story 21½ in. thick 3d story 17½ in. thick 4th story 17½ in. thick Remainder 13 in. thick	Length unlimited. 1st story 26 in. thick 2d story 21½ in. thick 3d story 21½ in. thick 4th story 17½ in. thick 5th story 17½ in. thick Remainder 13 in. thick
Hight up to 70 ft.	Length up to 40 ft. 1st story 17½ in. thick 2d story 17½ in. thick Remainder 13 in. thick	Length up to 55 ft. 1st story 21½ in. thick 2d story 17½ in. thick 3d story 17½ in. thick Remainder 13 in. thick	Length unlimited. 1st story 26 in. thick 2d story 21½ in. thick 3d story 21½ in. thick 4th story 17½ in. thick Remainder 13 in. thick
Hight up to 60 ft.	Length up to 30 ft. 1st story 17½ in. thick Remainder 13 in. thick	Length up to 50 ft. 1st story 17½ in. thick 2d story 17½ in. thick Remainder 13 in. thick	Length unlimited. 1st story 21½ in. thick 2d story 17½ in. thick 3d story 17½ in. thick Remainder 13 in. thick
Hight up to 50 ft.	Length up to 30 ft. Wall below topmost story 13 in. thick T'pm't st'y 8½ in. thick Remainder 8½ in. thick	Length up to 45 ft. 1st story 17½ in. thick Rest of wall below topmost st'y 13 in. thick T'pm't st'y 8½ in. thick Remainder 8½ in. thick	Length unlimited. 1st story 21½ in. thick 2d story 17½ in. thick Remainder 13 in. thick
Hight up to 40 ft.	Length up to 35 ft. Wall below 2 topmost stories 13 in. thick 2 top. st'ys 8½ in. thick Remainder 8½ in. thick	Length unlimited. 1st story ..... 17½ in. thick Rest of wall below top story ..... 13 in. thick Topmost story ..... 8½ in. thick Remainder ..... 8½ in. thick	
Hight up to 30 ft.	Length up to 35 ft. Wall below 2 topmost stories 13 in. thick 2 top. st'ys 8½ in. thick Remainder 8½ in. thick	Length unlimited. Wall below top story ..... 13 in. thick Topmost story. ..... 8½ in. thick Remainder ..... 8½ in. thick	
Hight up to 25 ft.	Length up to 30 ft. From base to top of wall 8½ in. thick	Length unlimited. Wall below top story ..... 13 in. thick Topmost story ..... 8½ in. thick Remainder ..... 8½ in. thick	

Warehouses. Manufactories, Breweries, &c.

Hight up to 100 ft.	Length up to 55 ft. Base 26 in. thick.	Length up to 70 ft. Base 30 in. thick.	Length unlimited. Base 34 in. thick.
Hight up to 90 ft.	Length up to 60 ft. Base 26 in. thick.	Length up to 70 ft. Base 30 in. thick.	Length unlimited. Base 34 in. thick.
Hight up to 80 ft.	Length up to 45 ft. Base 21½ in. thick.	Length up to 60 ft. Base 26 in. thick.	Length unlimited. Base 30 in. thick.
Hight up to 70 ft.	Length up to 30 ft. Base 17½ in. thick.	Length up to 45 ft. Base 21½ in. thick.	Length unlimited. Base 26 in. thick.
Hight up to 60 ft.	Length up to 35 ft. Base 17½ in. thick.	Length up to 50 ft. Base 21½ in. thick.	Length unlimited. Base 26 in. thick.
Hight up to 50 ft.	Length up to 40 ft. Base 17½ in. thick.	Length up to 70 ft. Base 21½ in. thick.	Length unlimited. Base 26 in. thick.
Hight up to 40 ft.	Length up to 30 ft. Base 13 in. thick.	Length up to 60 ft. Base 17½ in. thick.	Length unlimited. Base 22½ in. thick.
Hight up to 30 ft.	Length up to 45 ft. Base 13 in. thick.	Length unlimited. Base 17½ in. thick.	
Hight up to 25 ft.	Length unlimited. Base 13 in. thick.		

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No story inclosed with walls less than 13 inches thick shall be more than 10 feet high.

DWELLING HOUSES.

The foregoing tables give the hights of the walls in the left-hand column, and the lengths in the corresponding horizontal columns. The lengths of the walls are supposed to be curtailed by return walls at either end, and the length of the wall is measured from center to center of the return walls.

The thickness of the top of walls of this class and for 16 feet below the top to be 13 inches, except when the wall is not more than 30 feet high, when it may be —— 8½ inches. Below this 16 feet point from the top, the walls to be built solid, of the thickness of the base.

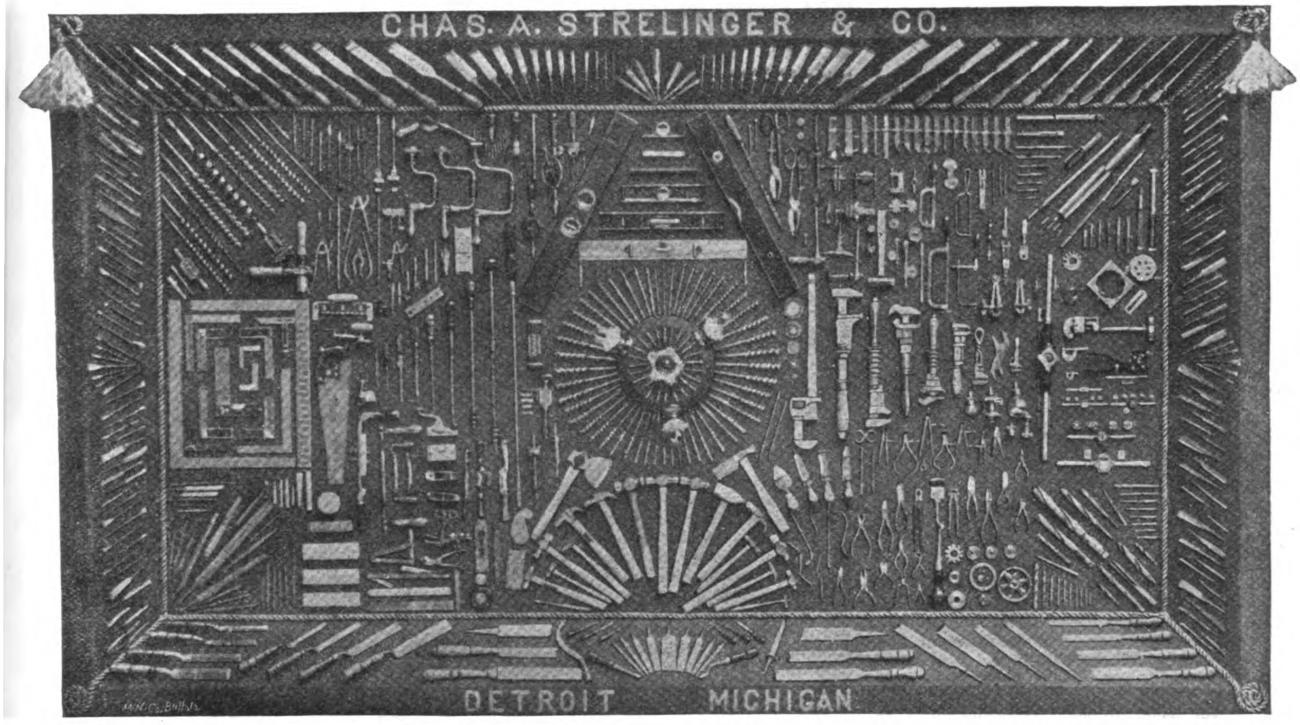
CROSSWALLS.

The thickness of a crosswall shall be two-thirds of the thickness described for the class of buildings to which it belongs, but never less than 8½ inches, and no wall subdividing any building shall be deemed to be a crosswall, unless it is carried up two-thirds the hight of the outside walls, and unless the openings and recesses in it do not exceed one-half the vertical surface of the wall in each story.

THE *Fair Haven Record* contains the following reference to the slate quarries of Vermont: "The first quarry ever opened in the Vermont slate region was that of Col. Alanson Allen, of Fair Haven, in 1839, at Scotch Hill. The first quarry at Poultney was that of D. & S. E. Hooker, opened in 1851. In 1843 Benjamin Williams opened the Jay Gould Quarry, at Middle Granville, and in 1872 a quarry was opened one mile east of Granville, by Merritt Bardwell and Evan Jones. Shortly afterward were opened the quarries now owned by Rising & Nelson, and at West Pawlet by Jake McFadden and Owens Evans."

Sample Board of Tools.

It is known in a general way that the number of hand tools at present at the disposal of the mechanic in the building trades constitutes an almost endless assortment, adapted for as many different purposes, but we question if many of our readers have a very clear idea of the distinct varieties of individual tools which are now upon the market. The list, if compiled, would be an interesting one, and would show in some measure at least the variety of tools which, while belonging to the same distinct class, differ in essential particulars For the purpose of conveying to our readers some idea of the assortment of individual tools within the reach of the intelligent carpenter and mechanic of the present day, and practically all of which are essential to the execution of their work in one branch or another, we present the accompanying illustration of a sample board of tools arranged by Messrs. Charles A. Strelinger & Co., of Detroit, Mich. This sample board was prepared especially for the International Exposition recently held in the city of Detroit, and in its make up something like 800 different tools were employed. The peculiar feature of this board is found in the fact that at least nine-tenths of the articles are what might be called special or novel tools. The size of the board is about 10 x 16 feet. The tools shown on this board include 112 varieties of Addis carving tools; 87 varieties of assorted chisels and gouges; 13 varieties of squares; 10 varieties of levels, 52 varieties of auger bits, 11 varieties of car bits, 30 of twist drills, 17 varieties of hammers, 9 varieties of wrenches; 25 varieties of files, 14 varieties of oil stones and 9 varieties of screw-drivers. In addition to these may be mentioned a large assortment of rules, spoke-shaves, draw-knives, scrapers, calipers, dividers, braces, plane-irons, pliers, small-gears and speed-indicators. A careful inspection of the engraving which we present will convey to the reader some idea of the work involved in arranging this board and of the multiplicity of devices with which the mechanic of the present day is provided.



Sample Board of Tools Prepared by Charles A. Strelinger & Co.

An Elevated Forest.

Among the natural curiosities of the country is one at Greensburg, Ind., consisting of an elevated forest on a small scale on one of the towers of the courthouse located in that place. From a local paper we learn that in the center of the business portion of Greensburg is a handsome park, which contains within its bounds a grassy lawn and a choice variety of shade trees. In 1854 a fine courthouse was built in this park. The architecture is of pleasing variety and the workmanship of the best quality. On either end of the building are two large towers, the one on the east standing 156 feet from the level of the ground to the fancy stone ornament at the top. In building the tower about 30 feet from the top an arch was made of brick, on which stone was laid about 2 feet in breadth and 3 or 4 feet in length. In 1868 a few leaves were seen protruding from between the stones on the tower, but they soon disappeared. Four years after leaves were again seen between stones on the tower and continued to thrive through the warm months. In about two years' time a well defined and proportioned tree spread its limbs and leaves from the great hight above. Greensburg became known all over the State as the "Lone Tree City," on account of this curiosity. But in time it will lose this name, as in 1876 more trees appeared, and six instead of one adorn the tower. The trees are of the silver poplar variety, and are from 3½ feet to 9 feet 4 inches high, the limbs measuring a little over 3 feet. They have a firm rooting and healthy appearance, and also cause the stones to spread about 1¼ inches apart, but just

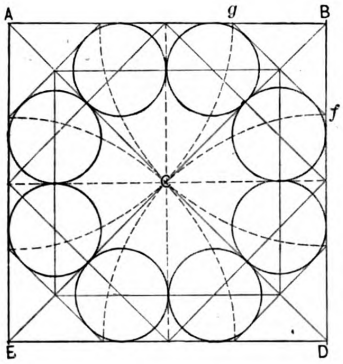
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above the crevices spread out and measure from 4½ to 7¾ inches in circumference. The trees can be plainly seen from the Union Depot and attract the attention of many travelers, and are regarded as the pride of Greensburg.

CORRESPONDENCE.

Geometrical Problem.

From D. F. H., *Milton, N. D.* — "W. E. R," Newark, N. J., asks how to strike eight circles in a square having 2-inch sides, each circle to be tangental to adjacent circles and adjacent sides of the square. After laying out the square construct

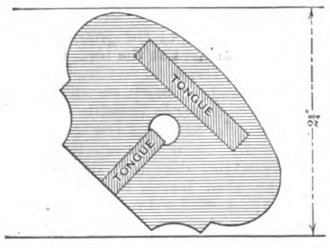


Sketch Submitted by D. F. H.

the octagon by taking E C as radius and striking arcs from the corners of square as shown by dotted lines. Connect these points as at *f g*, which gives outside tangents of all the circles. Where *f g* cuts C B gives center line of circles then by constructing an eight-pointed star it gives all center lines with center of circles located.

A Correction.

From J. H., *London, England.*—I notice that there is an error in my communication which was published in the August number of *Carpentry and Building* for 1889. On page 162 the text should read as follows: "Last year I produced a lot of wreaths on the tangent system, the size of the hand rail being 3¼ inches wide; the

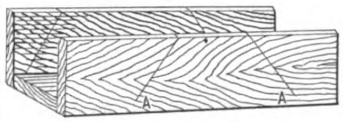


Sketch Submitted by J. H.

planks used being 2¾ inches thick." The section shown in the accompanying sketch will set the matter right and prove that the circumscribing circle is not a correct way of obtaining the exact thickness of wood required when working on the tangent system. The two bevels will give the exact thickness required when the center line of the hand-rail follows the center line of the plank.

Rake Molding Intersecting a Level Molding.

From O. A. H., *Chariton, Iowa.*—In reply to the inquiry of "J. M. B., Jr.," Burlington, Pa., which was published in the November issue, I would say, as the phrase goes, "I have my hands up," and don't think it can be done. The nearest to a solution of the problem that I have yet found is the following: Referring to the sketch, make the plumb cut down the side of the box, as shown by AA, which is obtained by taking the run of the rafters on the blade and the rise of the roof on the tongue and marking against the tongue of



Sketch Accompanying Letter from O. A. H.

the square. The cut across the box is obtained by taking the length of the rafter on the blade and seat of the rafter on the tongue and marking against the blade. The crown mold on the eaves is to be cut a square miter.

Laying Off an Octagon Bay-Window.

From W. S. W., *Washington, Iowa.*—As I am still a reader of your valuable paper I could not help noticing a communication from "L. W. T." in the April number, giving some "friendly" criticisms on an article from "W. S. W.," of Newton, Kan., which appeared in the August number of 1888. Now, I claim to be "W. S. W.," though not now living in Newton. In fact, when I had read his article part through I felt glad that I did not live there and almost wished I did not live anywhere, for I thought he was going to cut me all up. But I have survived the ordeal and now attempt to reply.

In the first place, I wish it understood that I am no architect or draftsman, as he seems to suppose—only a common carpenter of some 15 years' experience, but with my eyes always open to find out something new. The plan I sent was one I discovered several years ago, while playing one winter night with a pair of dividers and a straight-edge. I drew the octagon, drew lines from the corners to the center, and also chord-lines embracing three sides. Then I found that the extreme spaces on the chord-lines were the same length as the sides of the octagon, and that by placing the compass as I have already directed in my former article, and throwing up arches, they would intersect at the corners of the octagon. I then tried to find out the ratio of the mean space to the extreme, and found as near as measurements can determine that it was $\frac{5}{12}$; and if it is $\frac{5}{12}$ of one extreme it is $\frac{5}{29}$ of the whole line. That is my reason for using 29 parts.

But now let us see what our critic has done. He says he has reproduced my figures as nearly correct as he could make them. That is probably true. But if any of your readers will take the trouble to lay his copy on my Fig. 2 and prick it off with a pin he will see just how near correct he was able to make it. I would like to know by what stretch of imagination he calls his figure the same as mine.

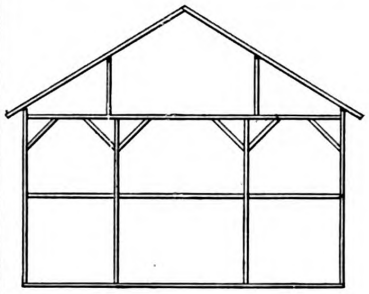
He says he passes my Fig. 1 as octagon, but says it may be an accident. Well, call it accident if you please, but remember that every time you bring about like conditions that same accident is going to happen, and also that he cannot change the position of that chord-line, for it is first laid down and the sides produced from it.

I did not have to wait until I read his article to learn that the pitch of the side of an octagon is at an angle of 45°. I have built a house with an octagon end within the last six months, and now have the contract for another of the same kind. To-day I made a pattern for the mason to set off his wall by and know that my rule will work out. I think the trouble with the old man is that he thinks he learned it all when he learned the trade, and is down on all new plans of doing work.

I fail to see in that little story of his that he did anything any carpenter could not have done. I did not fail to notice also what he says about working to plans furnished by others than himself. Now, my reply may be somewhat long, but as our critic occupied so much space when his criticism was all occasioned by his own mistake, it is but just that I should have room to reply. And now, if there are any readers of this journal who can prove this method to be either correct or not by a mathematical demonstration they are welcome to do so.

Remodeling a Barn.

From T. P. H., *Economy, Ind.*—I have derived a great deal of benefit from *Carpentry and Building*, and I desire to sub-



Remodeling a Barn.—Fig. 1.—Framing as it is at Present.

mit to the readers a question for their consideration. I have been called upon to remodel a barn. The owner wants the roof to be raised 4 feet and the driveway changed from a side to an end entrance. In order to raise the roof I propose to set

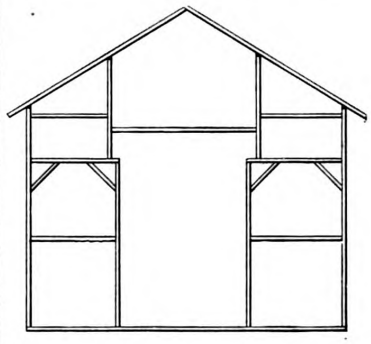


Fig. 2.—Proposed Framing.

posts 4 feet long on the old plates and put in longer purlin posts. Fig. 1 of the accompanying sketches shows the framing of the barn as it is at present. It will be seen from an inspection of the sketch that the main tie beam is too low for the driveway. What I wish to know is: Can I cut out the tie beam and put one in the purlin posts 2 or 3 feet above, as shown in Fig. 2 of the sketches, without danger of the barn spreading? Fig. 2 shows the framing of the barn as I propose to re-

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model it. There are five bents in the barn, and if I drive in from the end I will have to cut out all the ties.

Design for a Southern House.

From G. W. S., *Greenville, Miss.*—As I propose erecting a cottage costing from $3000 to $3500 the coming summer I desire all the information possible bearing upon the subject. I desire to build a one story, six or seven room house, though I would not object if it were one and a half stories. Will some of the readers of *Carpentry and Building* present a plan for a nice, convenient and stylish Southern house. I desire particular attention given to convenience of arrangement.

Note.—In previous issues of *Carpentry and Building* there have appeared several designs of Southern houses, but these were not of the character evidently desired by our correspondent. We think there are many practical builders in the section referred to who would be glad to present their ideas of what constitutes the ideal Southern house, and we should be pleased to hear from them.

Bevels of Jack Rafters.

From Jas. H. Monckton, *Brooklyn, N. Y.*—In the March number of *Carpentry and Building*, "J. D.," of Winchester, N. H., submits a plan of a tower roof asking how to get the "side bevels in the case of jack rafters" of the kind shown.

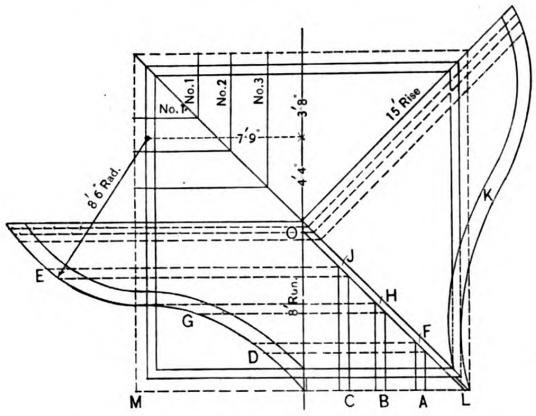


Diagram Accompanying Mr. Monckton's Letter.

The plan here given shows D G E as the rafter, and K the hip rafter, which I assume is correctly measured from the given rafter. The line L O is half the thickness of hip rafter set off parallel to its center. Place the jack rafters—drawing their lines of thickness as at A B C—in position as required; parallel to L M from F H and J draw the dotted lines as shown to D, G and E of the given rafter. The two lines marked on the pattern of the given rafter at D, G and E give the lengths and plumb lines on the sides of each jack rafter, and if the upper line at D, G or E be squared over the edge of the rafter and a line drawn across the thickness from the upper line on one side, to the lower line on the other side, it will give the bevel through the thickness to fit against the side of the hip rafter.

Arithmetic vs. Algebra.

From F. J. C., *Allentown, Pa.*—I am well pleased with *Carpentry and Building* thus far, but I would like it better if some of the friends would use a little more common sense. In the October number for 1889 "W. H. H.," of Northfield, Vt., complains about the algebra used in solving problems. Now, as algebra is absolutely necessary in some problems, I cannot see why he objects to it. I would like to have more of it, even if it does not interest him. Everything does not interest me, but it may interest somebody else, so I think others should be satisfied as well as myself. I know it is hard to please every one, and I do not see any way out of the difficulty but to let the editor do the best he can.

Hanging Sash in Mullion Window Frames.

From J. W. P., Jr., *Kokomo, Ind.*—In reply to "W. L. R.," whose inquiry appeared in the October (1889) issue of *Carpentry and Building*, I inclose a sketch of

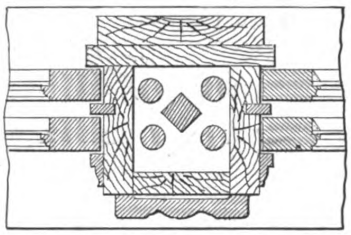


Diagram Showing Section Through Mullion of a Twin Window Submitted by J. W. P. Jr.

a mullion window frame arranged as we are using them in this city. From the sketch it will be seen that the frame is made of 2 x 4 inch studding, with outside casing 1½ inches; jambs, 1½ inches; sheathing, ⅞ inch, and inside finish ⅞ inch. The jambs being 1½ inches, gives an allowance of 3¾ inches for weights. A piece an inch square is placed between the four weights, as shown in the sketch, to prevent their coming in contact with each other.

School for Architectural Drawing.

From Cato, *New York.*—In answer to the inquiry of "E. S.," I would say that there is a very good class in architectural drawing at the Institute of Mechanics and Tradesmen, West Sixteenth street and Union square, New York City. The city evening high schools also have classes in drawing in charge of competent instructors.

Some Practical Questions.

From C. E. W., *Quincy, Mich.*—I would very much like an opinion on the following questions: 1. Will a chimney made of hard-burned drain tile, with 3 inches of concrete, made of portland cement around it, prove more satisfactory and durable than one made in the usual manner of bricks and lime mortar? 2. If the top of the chimney above the roof is made of cement, will it prove as durable as brick? 3. Will a cellar wall prove stronger and more durable if to the common lime mortar is added one-third of its bulk of portland cement? 4. Which is better for a girder or beam, a stick 6 x 8 inches or three pieces 2 x 10 stuff spiked together. The 2 x 10 stuff is to stand on edge when used?

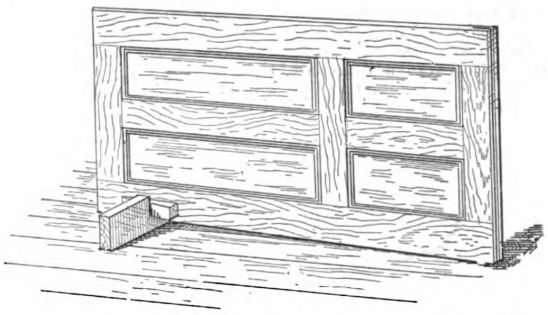
Making Blue Prints.

From R. M., *Grand Forks, N. D.*—I have a question that I would like answered through the columns of *Carpentry and Building*. It is this: How are blue prints made, or rather taken from the vellum drawings of architects? I desire an answer to this question in which the process is fully described.

Note.—The question propounded by our correspondent is an interesting one and we have no doubt that some of the practical architects among our readers will take pleasure in throwing light upon this subject for the benefit of the trade at large.

Convenient Door-Holder.

From J. L. H., *Grand Rapids, Mich.*—I inclose sketch of a door-holder which I use and which suits me better than any I have ever tried. It can be employed for any size door and for any width. The one described by "N. P. W." in the September number of *Carpentry and Building* allows the use of doors of but one width. In constructing my holder I take a piece 2 x 4 inches and from 20 to 24



Convenient Door Holder.—Fig. 1.—Method of Using the Holder.

inches long, I cut a notch 2 inches deep square across at one side and in a bevel on the other. From the sketches, Figs. 1 and 2, which I inclose the reader will be able to gather a very fair idea of the construction employed. Referring to Fig. 1 of

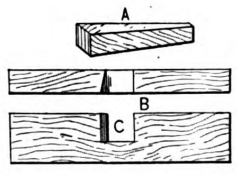


Fig. 2.—Showing the Different Parts of Which it is Composed.

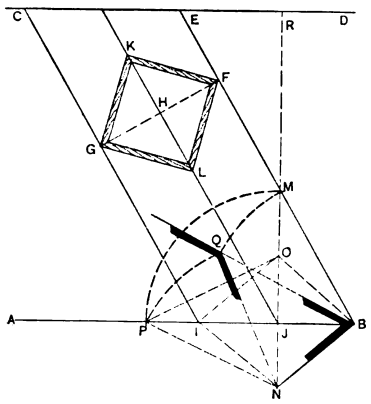
the cuts, A is a wedge, B the 2 x 4 piece and C the notch. To "N. P. W." I would say, "Do not hesitate to use it, for by so doing you will save many a mark on the door jamb." I think "M. F. B." did well in introducing his way, but now he will find something better for holding a door. We want to obtain all the informa-

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tion we can in regard to our trade, and I think that *Carpentry and Building* is doing an excellent work among the woodworkers.

Bevels for a Grain Spout.

From G. B. W., *Taunton, Mass.*—In the November (1888) issue of *Carpentry and Building* I noticed quite a number of diagrams showing the bevels for a grain spout extending diagonally from floor to ceiling in such a way that the grain will run in the corner. I see the correspondents



Bevels for a Grain Spout.—Fig. 1.—Method of Obtaining Bevel Suggested by G. B. W.

have different ways of getting the bevels, so I send my plan, which is unlike any of those published.

Referring to Fig. 1 of the sketches, let A B represent the first floor, C D the second floor and B E the slant of spout, which is 60°. Draw F G at right angles to B E and equal to the diagonal of the spout. Bisect G F in H; through G and H draw G I and H J. Make H K and H L equal

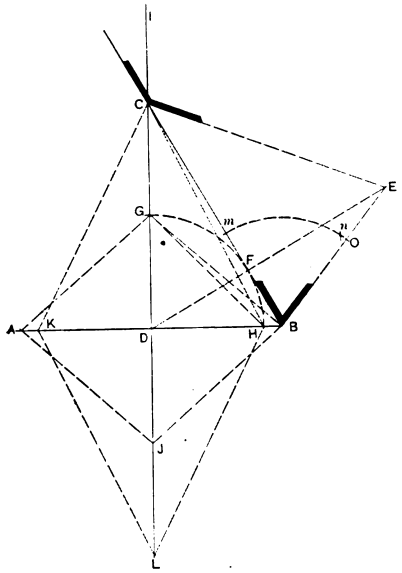


Fig. 2.—Another Method of Obtaining Bevel.

to H G and H F. Join G K F L, which forms a section through the spout. Through J draw N M, perpendicular, cutting the slant of spout B E at M. Make J O and J N equal to H K and H L. Join B N I O, which is a section of spout when fitted to the floor. To obtain the bevel required to cut the spout make J P equal to J M; join P N. From B and N as centers and with B M and N P as radii, describe arcs to meet at *a*. Join *a* and B. Then the required bevel is at B If the upper part of the spout is required to cut the vertical wall J R, then join *a* N. The bevel will be at *a* and the section through the vertical wall will be P O N. Now if

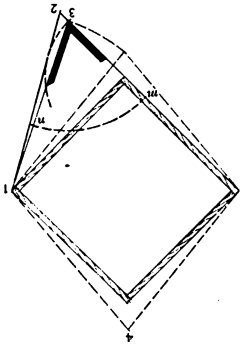


Fig. 3.—Diagram Showing Inaccuracy of Methods Suggested by J. P. and S. C.

the point *a* is raised up, revolving on N B to the hight of J M, the line *a* B and *a* N will be plumb over J B and J N. Therefore the bevels must be right.

Referring now to Fig 2. of the illustrations, let A B represent the floor line and B C, the slant of spout, which is 60°. Draw D I perpendicular, to A B, cutting the slant line at C. From D and at right angles to D C draw D E. From D as center and D F as radius, describe the arc G H. Join G H. Make F E equal to G H: join F B. The required bevel is at B. If the drawing is accurate B E will equal B J. The section at floor is A G B J. If the spout is to fit the vertical wall I L, join G E. The bevel will be at C and the vertical section will be K G H L.

I would also like to say a word in regard to some of the diagrams which have appeared in previous issues of *Carpentry and Building* relative to this problem. I will first consider the communication of

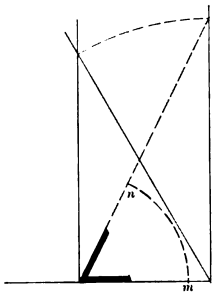
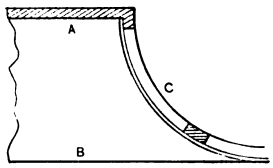


Fig. 4.—Another Diagram for Same Purpose.

A. C., Columbia, Ohio, which appeared in the November number of the paper for 1888. The diagram of this correspondent is correct if he will omit the words "If the work thus far is accurate all the angles in the figure A L K N will be right angles," which cannot be. If the lines are prolonged from D A and B A, the section at the floor is not a right angle, therefore A L K N will not all be right angles. I will next take the communication of W. F. Beaumont, Texas, which appeared in the same issue of the paper on page 236. I think he does not understand the question asked by I. H. D., of New Point, Ind., in the August number of *Carpentry and Building* for 1888, as his method is not correct. It only gives the bevel of the foot of a common rafter of that pitch. I refer next to the letters of J. P., Omaha, Neb., and S. C., Wichita, Kan., which appeared in the February number, page 36 for the current year. In my opinion the diagrams are not correct for the reason they will not give the right bevel except when the slant of the spout is 45°. The reason for this I will endeavor to show by means of the diagrams, which I will call Fig. 3 and Fig. 4. In this case the slant of the spout is drawn at 60°. Now take the measure of the bevels M N of Fig. 3 and Fig. 4 and transfer them to Fig. 2, M N, and the distance N O will show the error.

Base Board for Circular Bay.

From F. S. S., *Charleston, S. C.*—I have a problem which is of interest to a great many workmen in this vicinity that I desire to submit to the readers of *Car-*



Baseboard for Circular Bay.—Fig. 1.—Diagram of Piazza.

pentry and Building for solution. Referring to Fig. 1 of the sketch which I inclose, A B represents a piazza which is 10 feet wide. It slopes from the rear toward the front, the point at A being 4 inches higher than at B. The curve C is a quarter-circle bay window having a radius of 10 feet. Now, the object is to run a level base-board around the bottom of the bay

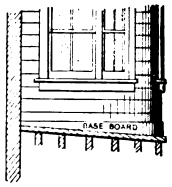


Fig. 2.—Baseboard in Position.

window (see Fig. 2), taking a straight board and laying it out before bending it to its place. I know by experience that this cannot be done by taking the length around the bay window, allowing 4 inches more at one end than at the other and drawing a straight line from the wide to the narrow end.

Plan for a Hand-Rail.

From S. J., *Dallas, Texas.*—Will some of the readers of *Carpentry and Building* give me a plan for a hand-rail? The rise is 7 inches, tread 10 inches and the diameter of the cylinder 12 inches. The stairs to be a straight flight.

Convenient Scaffold.

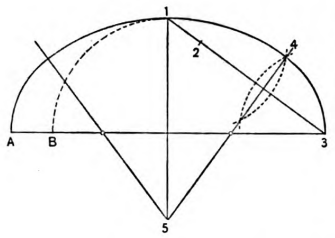
From W. L. R., *Mount Carmel, Ill.*—I would say to "O. B. M.," New York, that where wooden shingles are being put on he can make such a scaffold as he desires by nailing the butt end of a shingle to the underside of his foot-board—a 2 x 4 scantling—and the tip or thin end about 5 inches from the end to the last course of shingles above, so the first course will cover the nails. In removing the scaffold strike the scantling so as to draw the shingles off the hidden nails. The

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heads of the nails will remain slightly above the shingles, but they are covered and do no harm and may be driven nearly down by striking the shingle over them.

Saw-Kerfs for Bending an Elliptical Head-Jamb.

From J. B., *Omaha, Neb.*—I notice in the issue of *Carpentry and Building* for November, 1889, an article by "H. J. B." of Louisville, Ky., in which he gives a method for producing an elliptical curve for any dimensions. This method, according to my idea, is incorrect.



Sketch Submitted by J. B.

I do not, as a general thing, reply to questions except when the answers published by others can be improved upon. Then I have something to say. To draw the elliptical curve shown in the accompanying sketch make 1, 2 equal to A, B. Biseect 2, 3 and 4, 5 at right angles to each other. The dots are the centers.

From J. W., *Fall River, Mass.*—If "H. J. B. and S. A." had known that an ellipse is not formed by the attachment of two unequal segments they would have saved both time and trouble. An ellipse is a curve in which the sum of two straight lines drawn from any one of its points to two fixed is constantly equal to a given line. Referring to the accompanying sketch, let A B C represent half the ellipse soffit to be covered. The first thing is to find the number of cuts required. Make the circular segment E D equal in length to the half elliptic arch A C. To do this the square root of half the sum of squares of the transverse and conjugate diameters multiplied by 3.1416 equal the circumference of the ellipse. Omitting the last multiplier, we have the diameter of a circle, the circumference of which is equal to the whole ellipse. Make B D, which is A B produced, equal to half this diameter,

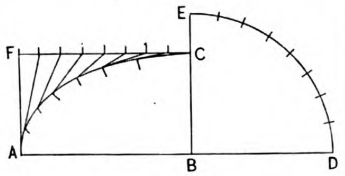
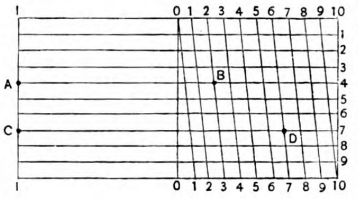


Diagram Sent by J. W.

produce B C and make B E equal B D. With B as a center and B D or B C as a radius, describe the arc D E, which would be equal in length to the elliptic arc A C and containing the same amount of curvature for the subtend equal angles. Find the number of saw cuts required to bend around the circular segment E D. The same number will lead around A C, but all will be at different distances apart. Through C draw C F parallel and equal to A B. Divide it into as many equal parts as will include the number of saw cuts required. From each of these marks on F C draw tangents to the elliptic arc and the touching points will be those where the board is to be kerfed.

Decimal Diagonal Scale.

From J. P. B., *Guysmills, Pa.*—I desire to learn through the columns of *Carpentry and Building* how to use the rule found on the tongue of the square. I think the



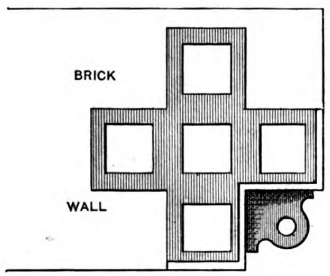
Decimal Diagonal Scale.

subject is one of interest to many of the readers of the paper, and I should be glad to see the matter discussed. I send inclosed a sketch of the rule to which I refer.

Answer.—The scale indicated by the sketch submitted by our correspondent is what is known as the Decimal Diagonal Scale, and is used for measuring fractions of an inch—in this particular instance tenths and hundreds. In the sketch presented we have a scale of 2 inches, one of which is divided into ten equal parts, represented by the figs. 1, 2, 3, &c. Diagonal lines are drawn from top to bottom, as represented in the sketch. The horizontal lines which divide the width of the scale into ten equal parts represent hundredths of an inch. If it is desired to take off, with the aid of the compasses, any fraction, as .24 of an inch for example, we first run down the diagonal line marked 2, until we reach the horizontal line 4, which is the point desired for one leg of the dividers. The other is placed on the vertical line, O, and the space between is .24 of an inch. If, for example, it is desired to lay off a distance 1.67 inches, place one leg of the dividers at the point C, and the other at the intersection of the diagonal line 6 and the horizontal line 7, which is at D. In the same manner any tenth or hundredth of an inch may be ascertained and transferred with the aid of the dividers. The scale is not always divided into tenths and hundredths, but may be divided into any fraction that may be most convenient for the purpose desired.

Shutter-Eyes.

From M. M. O'B., *New York City.*—I have read with considerable interest the article in the January number of *Carpentry and Building* by "Shutter Maker" and beg permission to present a few com-



Sketch Accompanying Letter from M. M. O'B.

ments thereon. In his article, Fig. 1 illustrates the best way for setting a cast "Shutter-eye," while at the same time it is the strongest. I have just employed the same plan for a warehouse with extraordinary width of openings, causing consequently extra weight and their efficiency and durability is beyond praise. The case is not exactly similar, as all the openings I refer to had a 4-inch reveal in brick jamb, as shown in the accompanying sketch. One ¼-inch iron was used for the base and ⅜-inch iron for the brick facings. I consider, from worthy opinions expressed to me upon inquiry and according to my own experience, Fig. 2 in the article referred to, impracticable since its very life of sustaining the required load is lost by bending or twisting the flat-iron so as to obtain a proper bearing and tie in the brick work. I would also urge a similar objection against "Shutter Maker's" Fig. 3, since there is insufficient thickness of metal to withhold the required weight for ordinary openings, if the metal be no thicker than the usual mortar joint. Should the metal be thicker than the ordinary joint it would make a very bulky and unworkmanlike job. "Shutter Maker" exhibits unbusinesslike qualities in his suggestions as to the manufacturer inducing an owner of a building to firstly "build in shutter-eyes" and when this point is gained compelling the owner subsequently, for the sake of argument, "architectural beauty," to then place "iron shutters" on the building, thereby gaining a "job" which he no doubt thinks an able stroke of shrewdness. Permit me, however, in connection with this to remark that as an architect, this is an erroneous impression, for I would refuse in my professional capacity to transact business with any such infringer on my client's exchecquer. Too little heed is given by manufacturers and contractors to the protection of other people's "ducats," for "opposition, the life of trade," has outbidden honesty.

Problem in Hip Roofs.

From B., *Denver, Col.*—In answer to "J. M.," of Germantown, Ohio, I send a rough sketch showing the way I would frame a roof for the house he refers to in the May number of *Carpentry and Building*. To get a square deck on the building there would necessarily be two pitches.

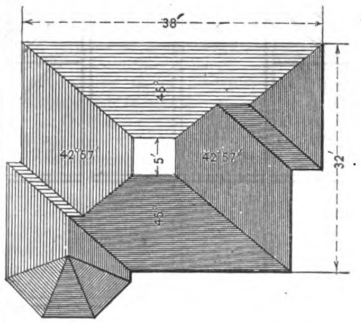


Diagram with Letter from B., of Denver, Col.

In the sketch the pitches are 45° and 42° 57 feet, with a deck 5 feet square. If the roof is framed with the same pitch on all sides the deck will be an oblong.

Plans for a City House.

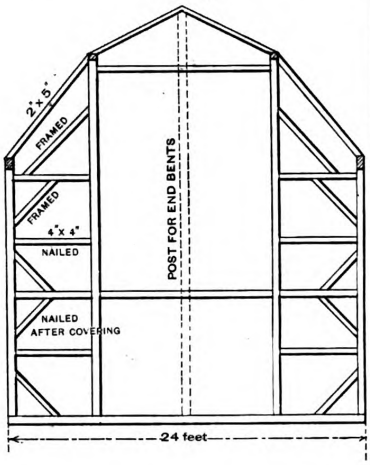
From J. T. M., *Newark, N. J.*—I have been a constant reader of *Carpentry and Building* since 1880. I have to-day received No. 131 from my newsdealer. I think every carpenter should take it, as I find it very instructive and interesting. I would suggest that there be published a few plans of houses costing about $2500,

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adapted for erection on city lots. I think these would interest a great many.

Questions in Framing.

From S. B. F., *Norwalk, Conn.*—I notice in the October number of *Carpentry and Building* an inquiry from "C. J. G.," Lebanon Springs, N. Y., for suggestions



Questions in Framing.—Fig. 1.—One Method of Framing a Barn, Suggested by S. B. F.

for the proper method of framing a barn. In reply to his inquiry I offer a few suggestions, which I trust may be of service to him. In Fig. 1 of the sketches which I inclose I show one method of framing a barn 24 x 36 feet. The sills are 6 x 8 inches; the posts and girts, 6 x 6 inches; the main plate, 6 x 8 inches; nailing beams, 4 x 4 inches; braces, 3 x 4 inches, framed and pinned, and the trusses, 8 x 8

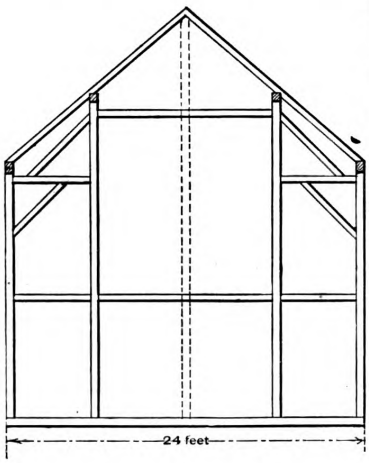


Fig. 2.—Alternate Construction of Same Barn.

inches. All the joists are flush. The tenons are 2 inches, with two pins in each. From an inspection of the sketch it will be seen that the post for end bents is shown by the dotted lines. The object of this post is to keep the frame from spreading when the barn is filled with hay. The floor line of the barn is represented by the horizontal timber. In Fig. 2 of the sketches is shown an alternate construction of the same barn. Fig. 3 shows my method of framing a barn 40 x 60 feet. In this case the sills are 8 x 8 inches; the trimmers, 8 x 10 inches; the main plates, 8 x 8 inches; the 17-foot posts, 8 x 8 inches; all other posts, 6 x 6 inches, and girts, 6 x 6 inches. The dotted lines in the sketch show the manner in which I would frame the barn if it was arranged so as to drive in on the floor from the bank to the end of the barn. I think the sketches inclosed will sufficiently explain my meaning to make further remarks unnecessary.

Replying to that part of his question in which he asks about the better way of

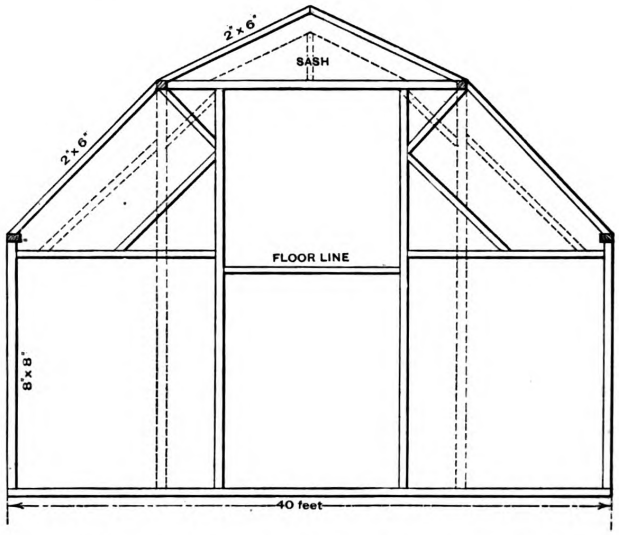
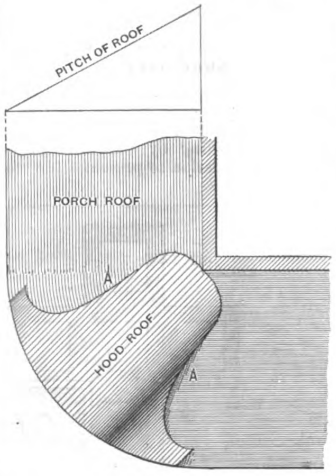


Fig. 3.—Method of Framing a Barn 40 x 60 Feet, as Suggested by S. B. F.

putting in braces, I would say that braces properly framed in will last as long as the barn itself and hold together every time. A brace that is nailed in shrinks as well as the timber to which it is nailed, and then all that holds the brace in place are the nails. In nailing a brace in place one is likely to crowd off the joists and push out the timber, which is just the reverse of framed braces.

Hood Intersecting a Conical Roof.

From J. S. B., *Philadelphia, Pa.*—I recently had a piece of work to execute



Hood Intersecting a Conical Roof.—Fig. 1.—Plan View.

that puzzled me somewhat, though I did it without following any definite rule. I am a beginner and would like to know how to find the lines A and A on Fig. 1 the drawing which I inclose. These are the points at which the roof of the hood intersects with the roof of the porch. The main entrance to the porch is on the corner, which is round, and the hood, as I call it, rests on top of the roof in the center of the round corner. The ridge runs back level at the same hight to the top of the porch roof. It will be seen from an inspection of Fig. 2 of the sketches that the face of the hood has two turns, one outward and the other upward. It will also be seen that the lines A and A run partly on the turned portion of the porch roof. The lines A A, as represented, are approximately the shape of the hood, but if any of the readers of *Carpentry*

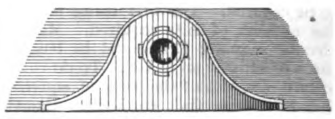


Fig. 2.—Face of Hood.

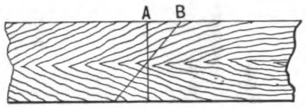
and Building will explain or give a rule for obtaining them I shall be greatly pleased to see it published.

Discussion of Handrailing Problems.

From J. G., *Brazil, Ind.*—While I have not been a very extensive reader of *Carpentry and Building* and thus far have contributed nothing to its columns, I have always spoken well of it and advised others to take it. With no desire to flatter, I wish to say that I consider it the best publication for the money in the world. I have been very busy during the past year and have had time to give it only casual examination. I notice many things in its columns which interest and at the same time amuse me and frequently articles from men of ability in their profession. In the November number of *Carpentry and Building* for 1889 I see an article on the question of builders' contracts, by "W. K. H.," of Chase City, Va. What this correspondent says meets my views exactly. I also see two articles on stair-building, one of which is from J. V. H. Secor of New York. The method is very familiar to me, as I saw it used as a starting piece from the newel nearly 35 years ago in Cincinnati. It is a pattern with a partial easing in it, while the rail-piece

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requires a full easing. What it lacks must naturally be worked in, making as a result a cramped easing at the newel. The most that I can see in it is that it flattens the upper easing and it may require thicker lumber to get out the piece of rail. I also notice an article from James H. Monckton, of Brooklyn, N. Y., in which he scores "J. B.," of Omaha, Neb. I do not remember seeing the article from "J. B.," and for all I know to the contrary he may be getting his just deserts. Since I first saw Mr. Monckton's works on stairbuilding I have regarded him as an able author on that subject. There is one thing he knows or at least he ought to know, and that is that nearly every face mold pattern is some part of the surface contained between two proportional ellipses. It matters not what process of lines are employed to delineate



Sketch Submitted by J. G.

those curves, so long as they are correct. The greatest acute or obtuse angle that may be used in the application of a pattern which is a part of the surface contained between these two elliptical rings, is the angle between the transverse or major axis and the perpendicular when the elliptical rings are in position and everywhere plumb over the given circles in the plan. Now if any part contained between these rings is used for a face mold draw a line on it parallel to the transverse axis, mark the pattern on the plank and cut through square. The plank will have a line on both surfaces corresponding to the line on the pattern, which is parallel to the transverse axis. Now take the bevel between the transverse axis and the perpendicular and apply it to the timber as shown in the sketch. Draw a line in the center square to the edge of the plank when the distance A B will be the distance to slide the pattern on the upper and lower surface of the plank. When this is done, if the tangents are marked on both sides of the timber it will be found that the pattern can be cut out of the pieces of rail just the same as when the tangent bevels are used. There is in my opinion a great error made by nearly all authors on stairbuilding and similar subjects, in not giving the reason why a thing is so, and the reason why a line is drawn from, say A to B. They appear to think that every person understands the subject just as well as they, or they think the student should be content with "Do as I say and you will go all right. You need not know why it is so." This is all right for those who are experienced, but according to my mind the learner, to duly comprehend the subject, should know the reason why every point is made and every line drawn. I know it is difficult to be understood without the necessary drawings and description, and I do not desire to take up space in your paper which might be filled with some valuable and interesting matter to the general reader. But just at this time there appears to be little use for continued rail stairs. At the same time I would not have the young stairbuilder neglect the opportunity to do such work When the craze of the Queen Anne architecture and the taste for dog-leg stairs have had their day, there will be finer productions in the way of continued rail stairs than ever before. I am an old-timer and profess to know something about geometrical stair lines. If any correspondent of *Carpentry and Building* wishes to interview me, whether he be an amateur or a professor, let him do so, and, as far as my time will permit, I will be at his service. The first books of note on the subject that came under my observation were those of a Mr. Cooper, of New York; Reynolds, of New Orleans, and Riddell, of Philadelphia.

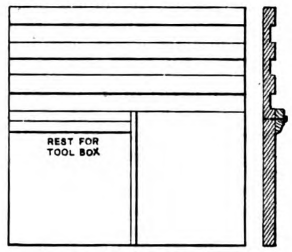
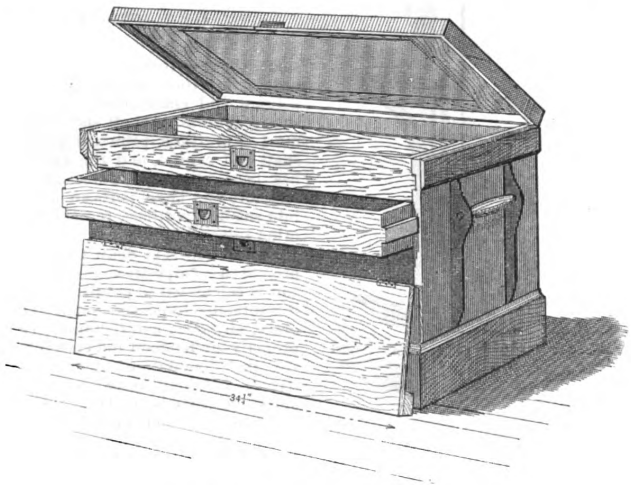


Fig. 2.—Detail of End of Chest.



Convenient Tool Chest.—Fig. 1.—General View.

Convenient Tool Chest.

From C. L., *San Jose, Cal.*—In reply to R. S. M., whose inquiry appeared in a recent issue of *Carpentry and Building*, I send a design for a tool chest, which I think will help him out of his difficulty and may perhaps be of interest to others in the trade. By the arrangement shown in Fig. 1 the drawers slide forward through the front of the chest as clearly indicated in the sectional view, Fig. 3. This gives ready access to any part of the chest without removing a lot of loose tools as is usually the case. The long slides of the drawers give them a very easy motion without any hitching. Below the drawers is space for bench planes while back of the drawers is a tool box for saws, etc. Below this tool box is a rack for moulding-planes and other heavy tools. A detail of the end of the chest is shown in Fig. 2. I would say in this connection that the slides for the drawers should be made

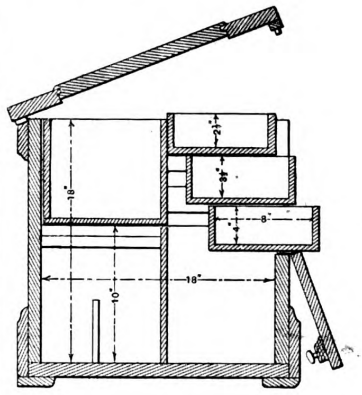


Fig. 3.—Sectional View.

of hard wood, ⅛ x 1½ inches and long enough to reach across the chest. My plan is to make the chest 18 inches wide and the same in hight inside measurement, but it can be made longer if desired. At each end of the tool box the end of the chest is double in order to protect the slides.

Rake Moulding Intersecting a Level Moulding.

From S. J., *Dallas, Tex.*—In reply to J. N. B., Jr., whose inquiry appeared in a recent number of *Carpentry and Building*, I would say that a level and raking moulding will miter and member if the level moulding is laid down flat; in other words, if it is put down in the same way that would be adopted in connection with a raking cornice.

Measurement of Roofs.

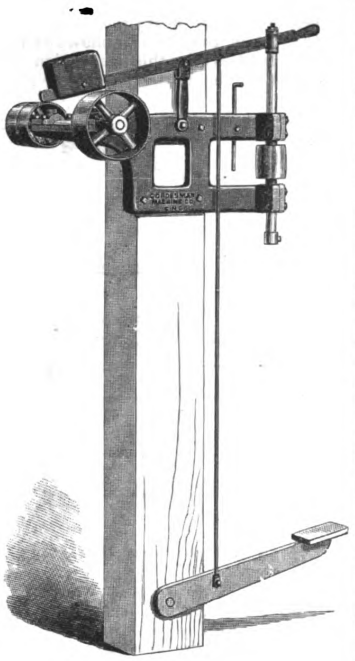
From C. S. S., *Smith's Falls.*—In obtaining the superficial measure of a tin roof, is it customary to take into consideration the amount of tin required for cleats?

Answer.—We would suppose that in measuring up a tin roof in order to determine the number of squares, the actual exposed surface should alone be considered and that the price per square should allow for the nails, cleats, solder, rosin, charcoal and wear of soldering-coppers, fire-pots, tinners' overhauls, labor, profit, &c. If one was to make a contract with a tailor for a suit of clothes at a certain price, it would hardly be expected that the button-holes would be brought in as extras. It is equally out of place to make an extra out of cleats. With the exception of Baltimore and in a little territory of which it is the natural center, the rule where prices are made by the square is to charge for the actual exposed surface of the roof. In and around Baltimore we believe they measure in the seams.

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Post Boring Machine.

The Cordesman Machine Company, of Cincinnati, Ohio, are introducing some new post-boring machines, illustrations of which are presented herewith, Fig. 1 of the cuts represents the company's belt post-borer, so called because the spindle is driven by a quarter twist belt. The machine is constructed entirely of iron and steel, and it is claimed can be run at



Post Boring Machines.—Fig. 1.—*Belt Post Borer.*

a high speed. The spindle slides through sleeves cast to the pulley and has an 8-inch stroke. The bit may be brought down to the work by the hand or foot, the arrangement being very clearly indicated in the engraving. It will be noticed that the lever is provided with a weight or counterpoise which is designed to withdraw the bit from the hole, thus giving the operator the use of his hands for the purpose of placing the material in position for a new hole. The table, which is not shown in the engraving, may be adjusted within a height of 10 inches. In Fig. 2 of the illustrations is presented a view of the company's geared post-borer, also made of iron and steel and designed for use in carriage and other shops for boring both wood and iron. The spindle of this machine has an 11-inch stroke and is controlled in the same manner as the spindle in the machine shown in Fig. 1. In Fig. 3 is shown a general view of the company's chair borer, having a capacity to bore a hole 6 inches deep. The spindle, together with its housing, slides in dovetailed ways with gibs to take up the wear. The bit is brought down to the work by means of the treadle, clearly indicated in the cut. It is withdrawn from the hole by means of a strong steel-coil spring. The table has a 16-inch adjustment and slides on dovetailed ways with gibs to take up the wear. By means of the hand-wheel shown just below the tables and operating a pair of gears and screw the operator is enabled to place the table in any desired position. The countershaft works in self-oiling bearings, the lower one being provided with a brass step to hold it in position.

Orders of Architecture.

We have in the past frequently received inquiries from correspondents for information bearing upon the subject of entablatures and the orders of architecture, and as a reply to these we this month devote our entire plate pages to a reproduction of the orders from some of the standard authorities. The orders are five in number known respectively as Tuscan, Doric, Ionic, Corinthian and Roman or Composite. The word order is from the Latin, *ordo*, meaning a method. Nicholson's Architectural Dictionary is authority for the statement that "order" is a word equivalent to arrangement, and in architecture "may be considered as a decorative imitation of such a portion of the primitive hut of a certain construction, as might comprehend the whole design by a continuity and repetition of its parts. The hut originally consisted of a roof or covering, supported by posts made of the trunks of trees, in four rows, forming a quadrangular enclosure. Beams were laid upon the tops of the posts, in order to connect them, in their longitudinal direction, in one body. To support the covering, timbers were laid from beam to beam across the breadth; and to throw off the wet, other beams were laid parallel to those resting upon the posts, but jutting further over on each side of the edifice; and these again supported inclined timbers which overhung their support, and formed a ridge in the middle of the roof

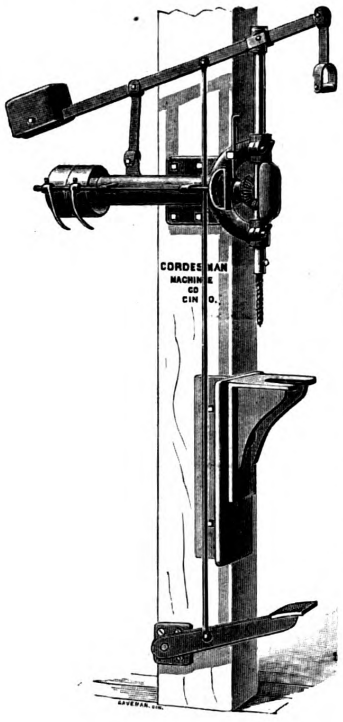


Fig. 2.—*Geared Post Borer.*

for throwing off the wet; and thus the part supported formed three principal distinct portions, which, in process of time, were decorated with certain moldings or other ornaments, each part still preserving its distinct mass, though perhaps not exactly similar to the original form. The three parts, taken as a whole, were called the entablature; the lower part, consisting of the lintelling beams, was called the epistyle or architrave; the middle part, which receded from the epistyle, was called the zoophorus or frieze, and the upper part, which projected considerably over the frieze, being in imitation of the ends of the roof, was called the cornice. Therefore, the entablature consists of a cornice, frieze and architrave. The posts received the name of columns, which always consisted of two principal divisions, at least, and frequently of three. The columns were ornamented at the top in imitation of the stones laid upon the posts in the original wooden hut for throwing off the rain. These decorations at the top received the name of capital and each of the wooden posts that of shaft. When ornaments were added to the foot of the

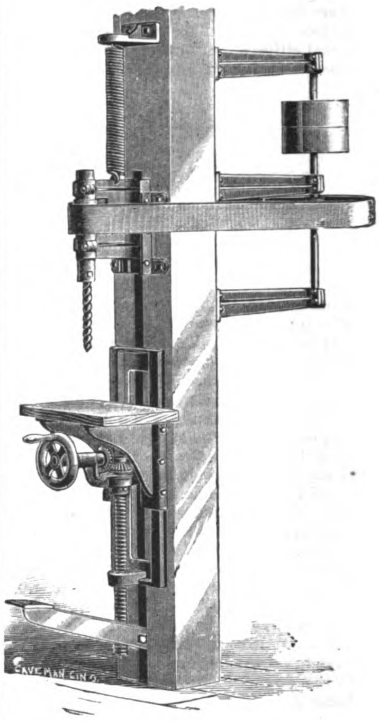


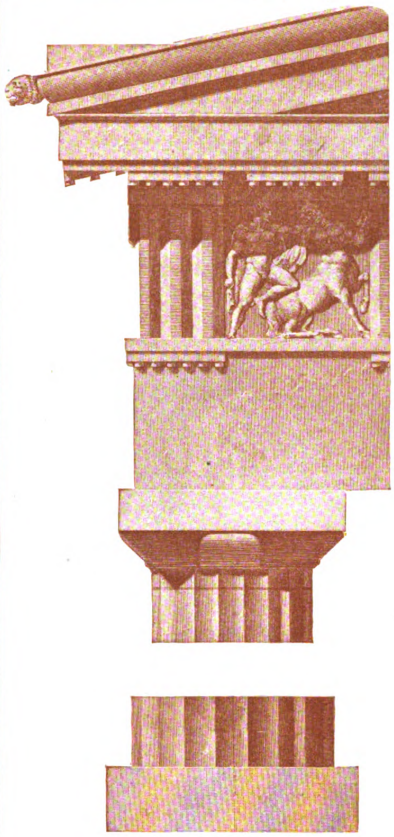
Fig. 3.—*Chair Borer.*

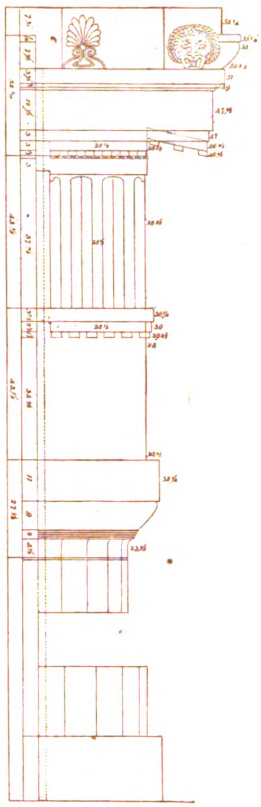
shaft they were termed the base. The order, therefore, consists principally of a column and entablature. The column is subdivided into a shaft and capital, or at most into three principal parts, a base, shaft and capital, and the entablature, as has been observed, into architrave, frieze and cornice. These parts are again divided into smaller portions, termed moldings or other ornaments.

Each order, says Shaw's civil architecture, is a composition peculiar to itself, and is calculated to produce the expression it is intended to possess—namely, strength, grace, elegance, and richness. The orders, properly understood and correctly applied, are the foundation upon which architecture has long rested as an art. The oldest of these is the Doric; the next in order the Ionic and the Corinthian last.

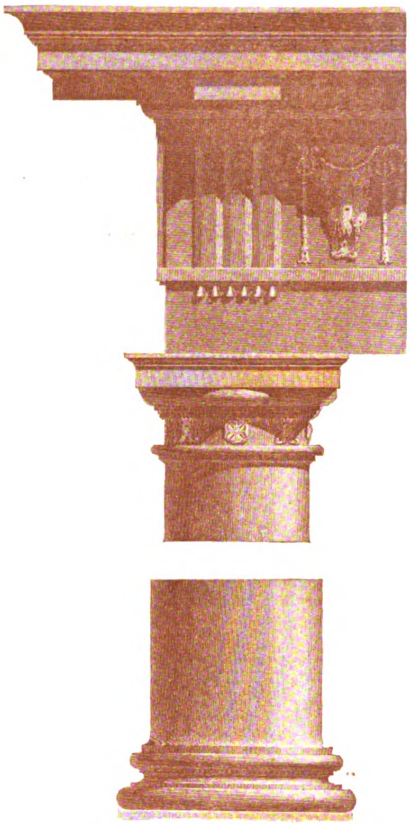
The Romans added the Tuscan or Etruscan to the Grecian orders, as the Doric, Ionic and Corinthian were called, as they subsequently did the Composite. The idea of the Tuscan is no doubt derived from the Doric order, from which it differs, according to the view taken of it by Aldrich, as much as the appearance of an inhabitant of the country does from one of a city. It is the first of the Italic orders and is called Tuscan, as having been originally employed by the inhabitants of Tuscany. Vitruvius refers to it as rustic, even to deformity, and the later masters do not appear to have regarded it with especial favor. Except in the general forms

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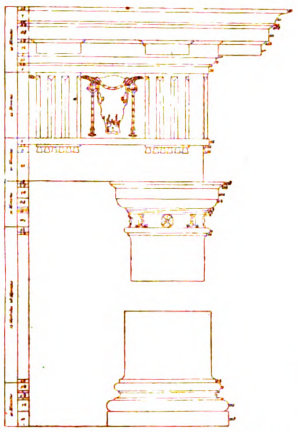




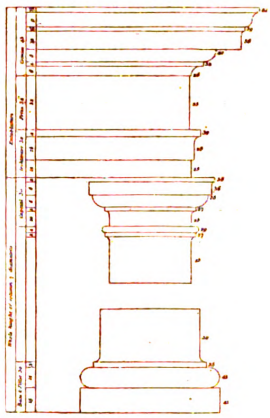
Outline and Pictorial Elevations of the Grecian Doric Order.



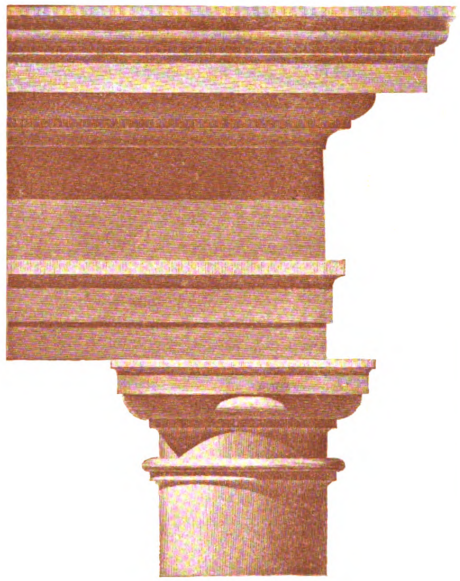
Pictorial Elevation of the Roman Doric Order.

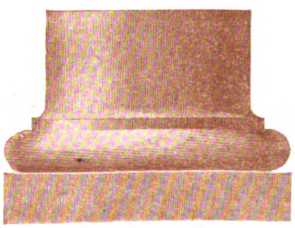


Outline Elevation of the Roman Doric Order.



Outline of the Tuscan Order.



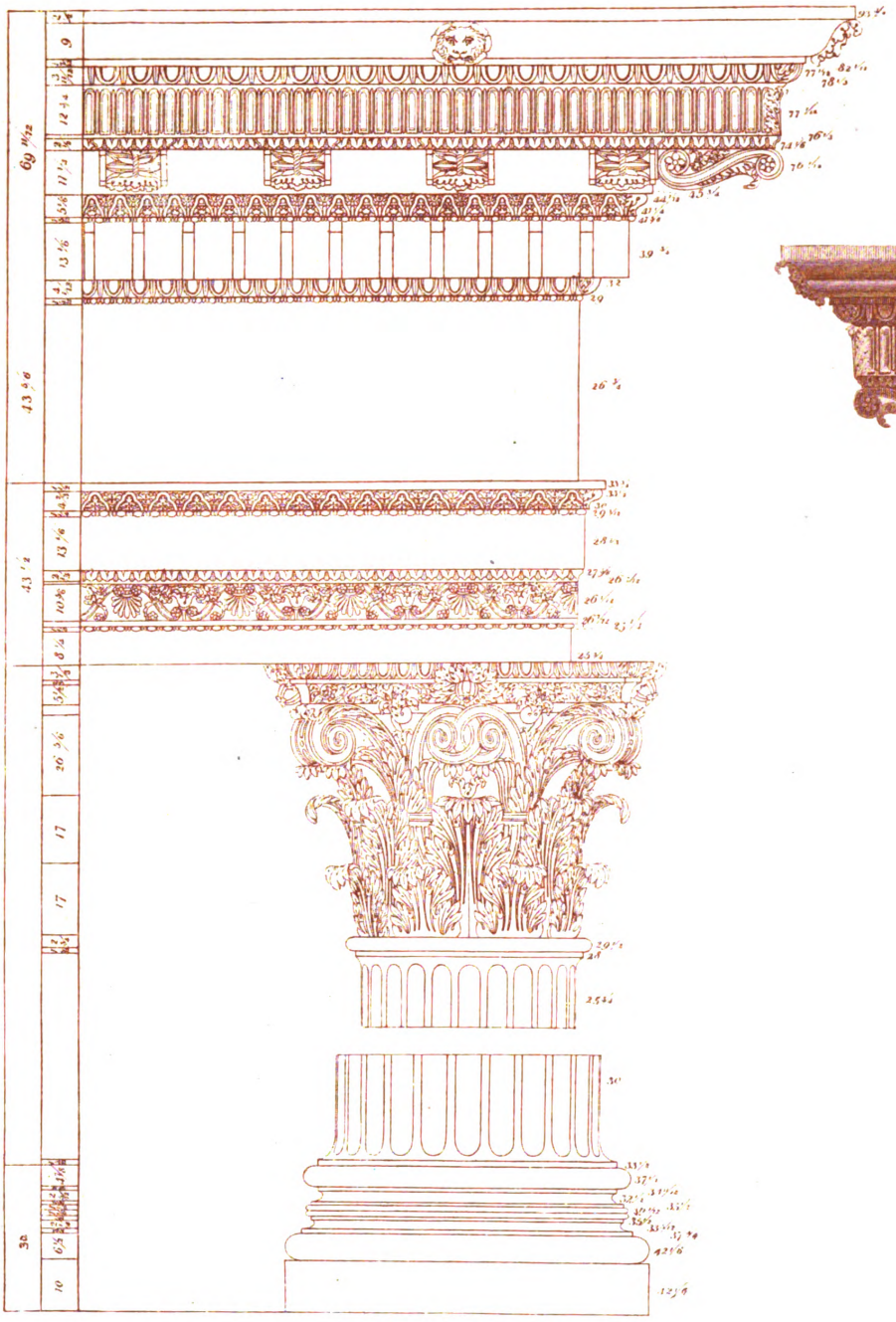


Pictorial Elevation of the Tuscan Order.

ORDERS OF ARCHITECTURE.

See page 40.

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OUTLINE ELEVATION OF CORINTHIAN ORDER.

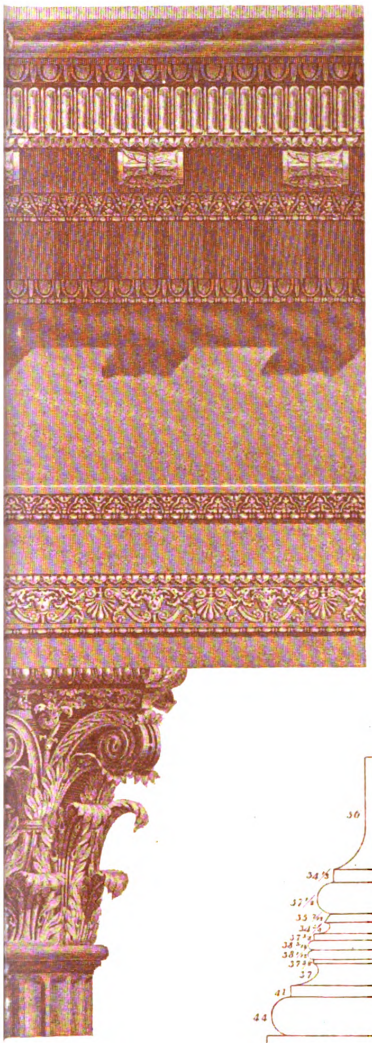


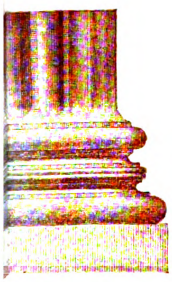
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ORDERS OF ARCHITECTURE.

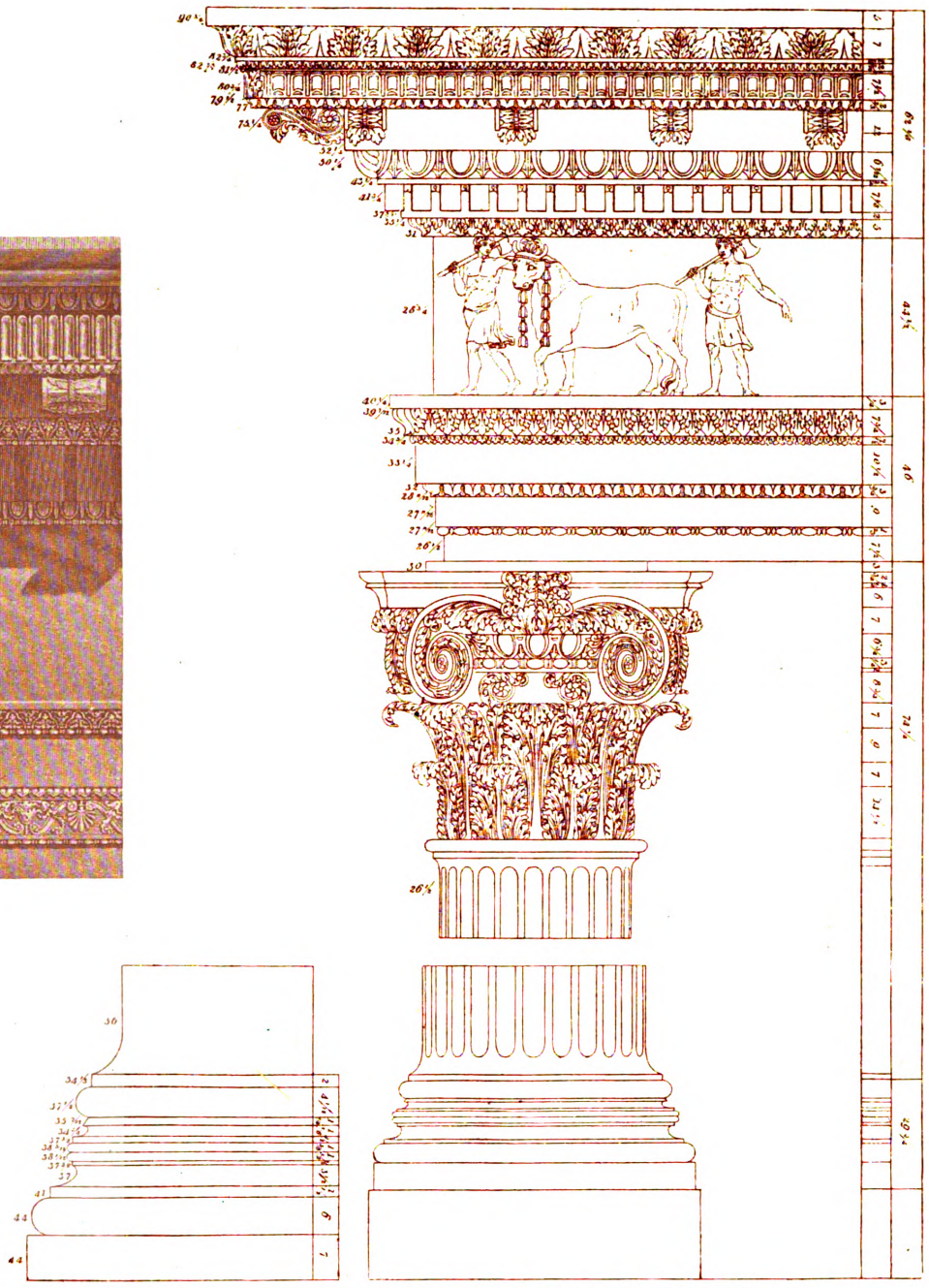
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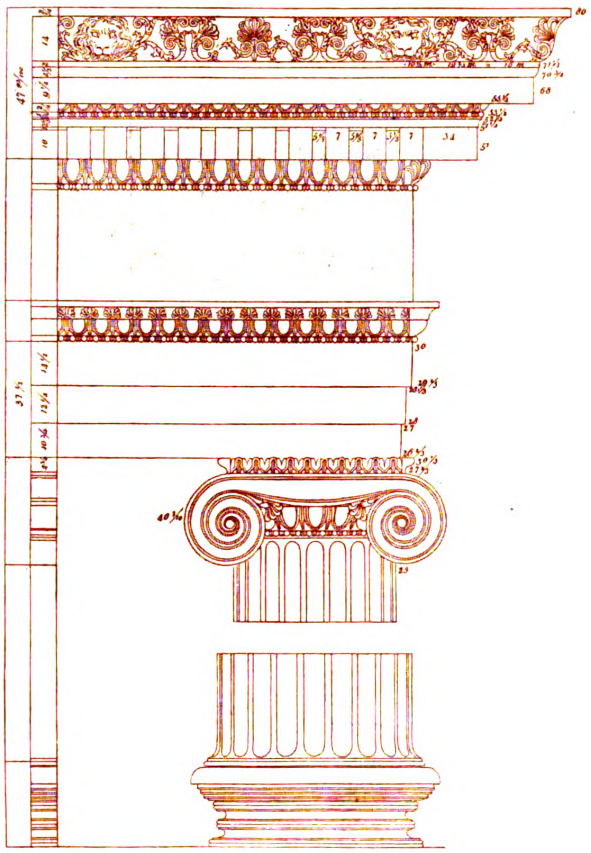


CORINTHIAN ORDER.

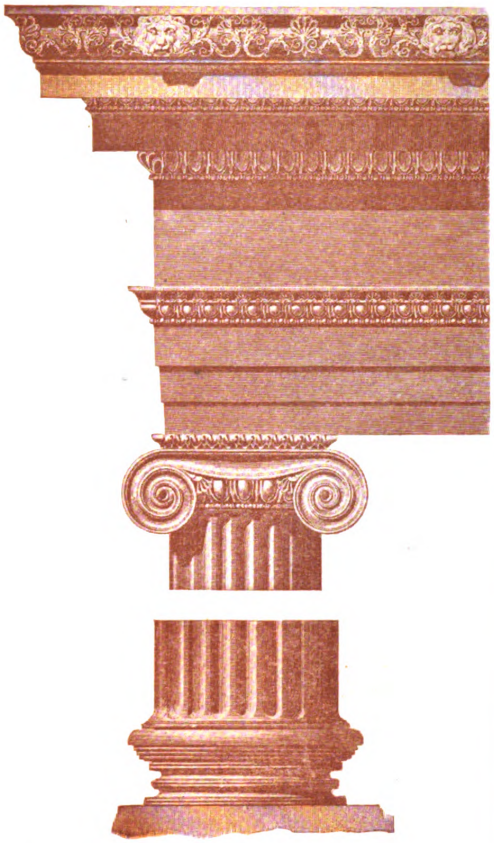


OUTLINE ELEVATION OF ROMAN COMPOSITE ORDER.

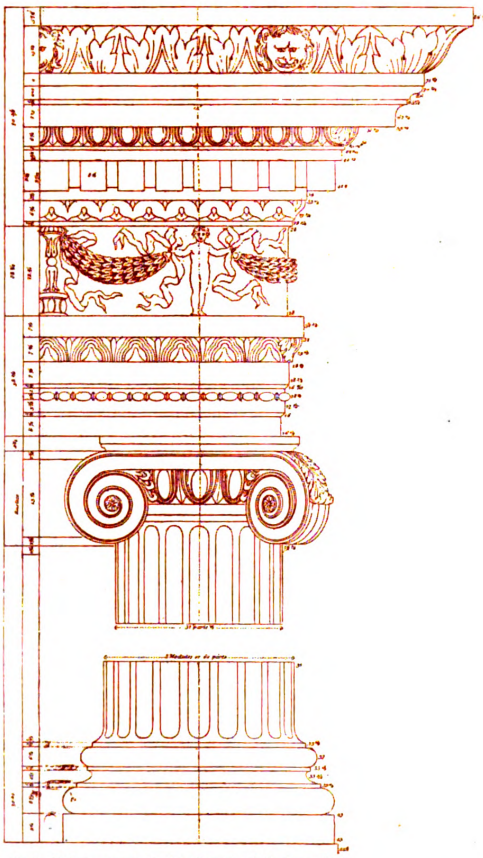
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Outline Elevation of Doric Order.

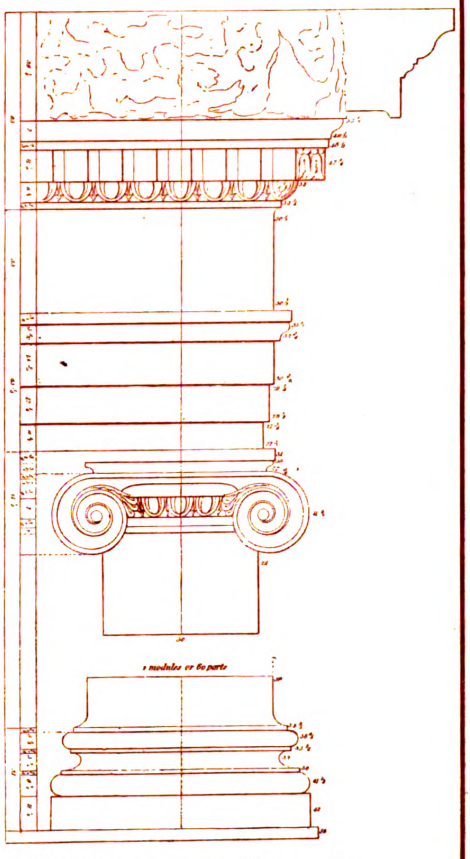


Pictorial Elevation of Doric Order.



Ionic Order as seen in the Temple of Fortune Virilis.





Ionic Order as seen in the Theatre Marcellus at Rome.

ORDERS OF ARCHITECTURE.

See page 40.

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above specified, there is no standard of proportion common to the orders, each having its own symmetry. The capitals are their distinguishing features. The Doric entablature is peculiar to the Doric. The Ionic tablature may be applied to the Corinthian with equal propriety, as the remains of the Grecian antiquity amply testify. The proportions of columns vary in the Doric, Ionic and Corinthian orders from five to ten diameters, the standard being the diameter of a section of a shaft at the bottom. The shafts of the columns are the frustums of cones; they are sometimes of a conoidal form, which, however, is not so agreeable to the archetype as the conic frustum, and in the antique they are generally fluted. The fluting of the Doric is peculiar in itself. The columns of this order are in hight fewer diameters than those of the other two just mentioned, and supposing the diameter at the base in the three orders to be equal the altitudes of the columns will increase from the Doric to the Corinthian, so that the Ionic column is the medium between the other two. The hight of the entablature of each order may be generally stated at two diameters of its column. The diminution of the shafts is not equal in all the orders; that of the Doric varies from one-fourth to one-fifth; the Ionic and Corinthian from one-fifth to one-sixth. Neither are the cornice, frieze or architrave in an equal ratio to each other. The hight of the Doric cornice is about one-fourth of the hight of the entablature, that of the Ionic one-third, and in most examples considerably more. The hight of the architrave and that of the frieze of the Doric entablature are in general equal. In the Ionic and Corinthian the architrave is higher than the frieze, but of less hight than the cornice.

The Roman order was invented by the Romans from the Ionic and Corinthian orders, and has thus obtained the name of the Composite Order. This name is of modern application, and has been applied in consequence of the numerous examples to be found at Rome and other parts of the ancient Roman territory, of an order compounded of the Ionic and Corinthian which is of a very uniform character. The upper part of the capital is of the Ionic order and the lower part the Corinthian. The entablature as found in the ancient remains of Roman architecture is Corinthian.

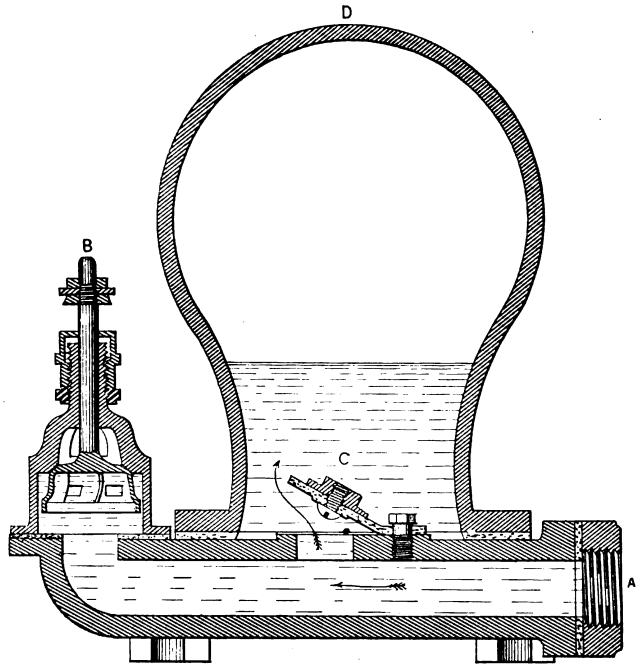
There are also recognized two other orders of architecture known as the Persian or Persic and the Caryatic. The former, in architecture, is a name common to all statues of men, serving instead of columns, to support entablatures. They only differ from Caryatides, in that the latter represent women. The Persian is a kind of order of columns, first practiced among the Athenians on occasion of a victory their general, Pausanias, obtained over the Persians. As a trophy of this victory, the figures of men dressed in Persian mode with their hands bound before them, and other characters of slavery, were charged with the weight of Doric entablatures and made to supply the place of Doric columns. Persian columns, M. le Clerc observes, are not always accompanied with the marks of slavery, but are frequently used as symbols of virtues, vices, joy, strength, valor, &c., as when made in the figures of Hercules, to represent strength, and of Mars, Mercury, fauns, satyrs, &c., on other occasions. The Caryatic is an order of architecture whose entablature is supported by female figures instead of columns, the figures themselves being called Caryatide, Caryates or Carians. The Caryatic order differs from the Persian in having the entablature supported by females, whereas in the latter it is supported by males.

The five orders of ancient architecture constitute the elements of the modern styles of architecture known as the Italian, German and French Renaissance. Each of these particular styles has its own characteristics, with which we have no doubt many of our readers are more or less familiar.

The Hydraulic Ram.

A correspondent recently addressed us asking for information about the hydraulic ram, and, as we believe there are many of our readers in addition to this correspondent who desire to learn something of the construction and working of this useful machine, we illustrate and describe it at some length. In the preparation of this article we are indebted to W. & B. Douglas, Middletown, Conn., the well-known manufacturers of hydraulic machinery, for a copy of a valuable circular on the ram which they issue, besides sketches and other information. The engraving presented herewith is a sectional view, from which the operation of the ram will be understood and in which its several parts are clearly shown. Referring to the cut, A is the coupling of the drive-pipe which brings the supply of water to the ram. As the water enters at this point it passes on, as shown by the arrows, until it reaches the impetus-valve B, and the spindle of the valve is suddenly raised up to its seat, as shown in the illustration. The outlet is thus closed, and the momentum of the stream of water suddenly stopped raises the valve C and the water enters the air-chamber D, compressing the air. When the flow has ceased entirely the impetus-valve B drops from its seat and the water immediately begins to rush through and waste; the pressure of the atmosphere in the air-chamber D at the same time closes the valve C. As the flow of the water escaping increases in velocity the valve B is raised to its seat, and the recoil again forces the water into the air-chamber D through the valve C, further compressing the air. The operation is repeated, one valve opening and the other closing and the water entering the chamber D until it rises to such a point that the pressure of the contained air drives it out of the discharge outlet of the machine up to the point desired. The principle the machine operates upon is the sudden stoppage of a rapidly flowing stream of water, which forces part of it into the air-chamber until the pressure within the air-chamber is sufficient to force the water through the discharge-pipe to the desired elevation.

In setting the ram the drive-pipe should ordinarily be about 25 feet in length and of a size adapted to the capacity of the ram, and should not be longer than 50 feet. The fall should be about 1 foot for every 10 feet it is desired to elevate the water. A medium hight or fall to place the ram under is about 8 feet, but, of course, this is varied according to circumstances. The discharge-pipe is required to be only about one-half the diameter of the drive-pipe. In setting a ram it is well to place it in a pit 2 or 3 feet, sufficient to protect it from frost, with a ditch running from the pit to carry off the waste water. The pipes also should be properly covered underground, so as to be protected from frost or injury.



The Hydraulic Ram.—Vertical Section.

While 8 feet, as we have stated, is a medium hight, the ram will work with excellent results where no more than 18 inches fall can be had; yet the greater the fall applied the more powerful the operation of the machine and the higher the water may be conveyed. The relative proportions between the water raised and wasted is dependent entirely upon the relative hight of the spring or source of supply above the ram and the elevation to which it is required to be raised; also the distance which the water has to be conveyed and consequent length of pipe has some bearing on the quantity of water raised and discharged by the ram, as the longer the pipe through which the water has to be forced by the machine the greater the friction to be overcome and the more the power consumed in the operation; yet it is common to apply the ram for conveying the water distances of 100 and 200 rods and up elevations of 100 and 200 feet. Ten feet fall from the spring or brook to the ram is abundantly sufficient for forcing up the water to an elevation under, say, 150 feet in hight above the level of the point where the ram is located; and the

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same 10-foot wall will raise the water to a much higher point than above last named, although in a diminished quantity in proportion as the hight is increased. When a sufficient quantity of water is raised with a given fall it is not advisable to increase the fall, as by so doing the wear and tear of the machine is proportionably increased and the durability of the same lessened; so that economy in the expense of keeping the ram in repair would indicate that no greater fall should be applied for propelling the ram than is sufficient to raise a requisite supply of water to the place of use.

To enable any person to make the calculation as to what fall would be sufficient to apply to the ram to raise a sufficient supply of water to his premises, we would say that in conveying it an ordinary distance—say 50 or 60 rods—it may be safely calculated that about one-seventh part of the water can be raised and discharged at an elevation above the ram five times as high as the fall which is applied to the ram, or one-fourteenth part can be raised and discharged, say, ten times as high as the fall applied; and so on in that proportion as the fall or rise is varied. Thus if the ram be placed under a head or fall of 5 feet, of every 7 gallons drawn from the spring 1 may be raised 25 feet, or ¼ gallon 50 feet, Or with 10 feet fall applied to the machine, of every 14 gallons drawn from the spring 1 gallon may be raised to the hight of 100 feet above the machine, and so on in like proportion, as the fall or rise is increased or diminished.

The following table gives the capacity of the several sizes of Douglas rams and the dimensions of the pipe to be used in connection with them:

Size of ram.	Quantity of water furnished per minute by the spring or brook to which the ram is adapted.	Length of pipe.		Caliber of pipes.		Weight of pipe if of lead, or if of wrought iron then of ordinary weight.		
		Drive.	Discharge.	Drive.	Discharge	Drive-pipe for any head or fall not exceeding 10 feet.	Discharge-pipe for not over 50 feet rise.	Discharge-pipe for over 50 and not exceeding 100 feet in hight.
		Feet.		Inch.	Inch.			
No. 2.....	3 quarts to 2 gallons.	25 to 50	Where desired.	¾	¾	6 pounds per yard.	8 pounds per rod.	14 pounds per rod.
No. 3.....	1½ gallons to 4 gallons.	25 to 50	"	1	1	8 " "	11 " "	16 " "
No. 4.....	3 " 7 "	25 to 50	"	1¼	1¼	10 " "	11 " "	16 " "
No. 5.....	7 " 14 "	25 to 50	"	2	1¼	23 " "	20 " "	28 " "
No. 6.....	12 " 25 "	25 to 50	"	2½	1	40 " "	6 pounds per yard.	8 pounds per yard.
No. 7.....	20 " 40 "	25 to 50	"	2¼-2¾	1¼	40 to 45 pounds per yard.	9 " "	11 " "
No. 10.....	25 " 75 "	25 to 50	"	4	2	16 pounds per foot cast-iron.	20 " "	23 " "

Table Giving Capacity of Rams.

If the ram is to be placed under a greater head or fall than named in the above table, it will, of course, be necessary to increase the weight and strength of the drive-pipe; also if the water is to be forced to any greater hight than above mentioned, the discharge-pipe should be proportionately increased in weight and strength. Where the water is to be forced any great distance (say more than 75 rods) it is preferable to use a discharge-pipe of larger caliber than named in the above table.

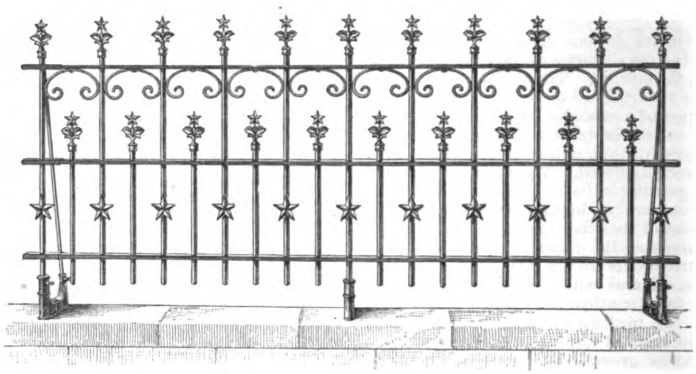
With a given supply of water under a great fall, the ram is not required to be of as large size as for the same quantity of water under a less fall. That is, the No. 4 ram would be of sufficient capacity for taking the water from a spring or brook furnishing 7 gallons per minute where the fall is 8 or 10 feet, when if there is not over 3 or 4 feet fall to the same spring or brook, then a No. 5 ram would be better adapted to the place.

In their circular Messrs. Douglas state that the water from the spring may be varied by the same machine by means of their adjuster, which they say is especially useful when used in connection with springs or brooks that are variable and affected by the droughts and rains.

ram having a separate drive-pipe connecting it with the spring.

Fence Around Texas Capitol.

The building of the State Capitol, Texas, has in various ways attracted more attention than almost any other structure of a public character that has been put up in many years past. Not only was the way in which the money was raised for the building peculiar, but the capitol building in itself has features of design and construction that have attracted attention and led to newspaper comment. That to which we direct attention at the present time does not concern the building but the inclosure of the building. The accompanying cut is made from a photograph of a section of the iron fence which was furnished by Mast, Foos & Co., of Springfield, Ohio. The fence is composed of three rails which are of 2 x ⅝ inch channel bar iron, weighing 3 pounds to the foot. The pickets are ¾ inch square, the long ones being 42 inches in hight and the short ones 27½ inches. The picket tops and the other ornaments shown are of malleable iron, as are also the line posts, bases and connections. The fence is mounted on a granite coping. The panels are supplied in 8-foot lengths with malleable support in the center. The malleable connecting ends of rails have expansion joints. It will be noticed that the design bristles



Section of Fence Used Around State Capitol, Texas.

about 18 cubic feet. No. 2 occupies ¾ cubic foot space and No. 6, say, 4 cubic feet.

If the stream is a large one and a greater supply of water is wanted than what one of the above-sized machines will supply it is better to increase the number of machines rather than to get a single ram of larger capacity. Several rams may be set so as to play into one discharge-pipe, each

with the emblems of the "Lone Star State."

The stars are of malleable iron and those on center of picket are 5 inches across and are made double so as to show the same on both sides. The picket passes through the star and the several parts are riveted together. The scrolls under the top rail are made of 1 x ⅜ inch steel and are firmly riveted in place in such a manner that the scroll cannot turn. In mounting the fence supports are leaded into the coping. The design is tasteful, the construction workmanlike and the result is a fence appropriate for the place and substantial in all its features.

Brick-Making in the United States.

Some idea of the magnitude of the brick-making industry in the United States can be gained from the following table, which shows the number of bricks used in 12 cities during the year 1888, the total of which is 2,730,000,000. These figures are, of course, far from complete:

New York City	1,000,000,000
Chicago	440,000,000
Philadelphia	300,000,000
Boston	150,000,000
St. Louis	200,000,000
Cincinnati	100,000,000
Washington	125,000,000
Cleveland	84,000,000
Pittsburgh	80,000,000
Omaha	80,000,000
New Orleans	36,000,000
Indianapolis	35,000,000

The capital invested in the operation of this business is immense. The 300 dele-

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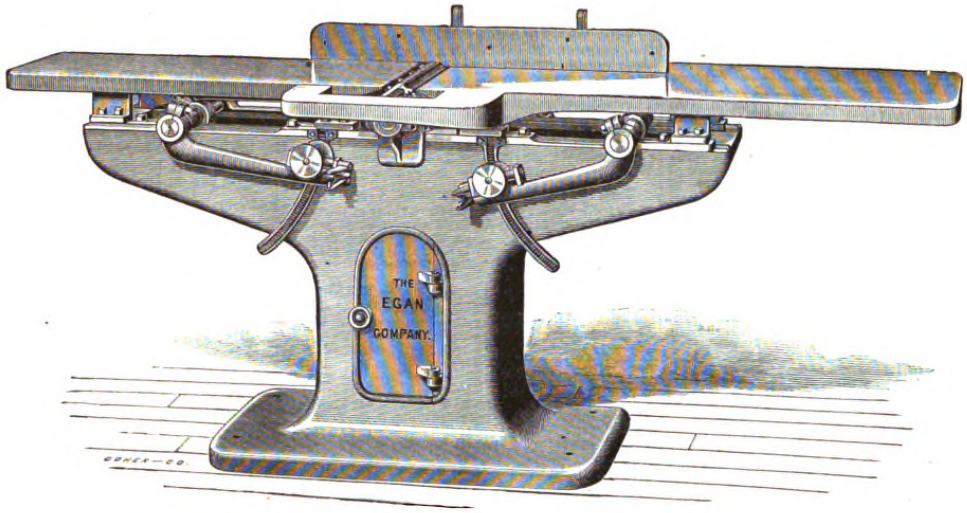
gates to the National Brick Manufacturers' Association, who met in Philadelphia several days ago, represented a capital of over $150,000,000, which is but about half of the total sum used in the United States in carrying on this great business. Having visited and studied the modern brick-factories of England, Holland, Belgium, France and Germany, the authority for the above figures says that "in all the countries, ancient and modern, . . . there is none in which the business of brick-making is carried on so extensively, and on the whole so satisfactorily and profitably, as it is in the United States."

A Case of Typical Defective Plumbing.

A curious state of affairs has been revealed in the Municipal Building, Chicago. So many of the officials quartered there have recently suffered from headache and other malarial symptoms that an investigation into its sanitary condition was ordered. Chief Andrew Young, of the tenement and factory inspectors, assigned T. S. Barrow to the duty. His investigation disclosed a most wretched condition of the sanitary appliances of the official building. The plumbing fixtures are defective and not separately trapped, the waste and soil pipes are not properly ventilated, the sewers are defective and so are nearly all of the water-closet rooms. The inspector discovered that there was an open sewer into the air shaft for the indirect heaters, and the foul gases are daily being sent up through the building by an air pump, as it were. The basins for the hand holes on the sewers are partly filled with filthy drainage. The catch-basin at the south elevator tank is partly filled with bad sewerage and improperly covered, and as if to take especial revenge on the Health Office, there is a defective trap on the sink directly under the private office of the Health Commissioner. The inspector also looked through the prison-house of the Central Station, and he reports that "the cells in the police department are very offensive and the closets are stopped up." Not only this, but the closet for the detectives is fitted with a defective trap. A worse state of affairs could hardly be found, and Inspector Young says the Department of Public Works will be called upon to take immediate action. As the health of the city officials themselves is at stake, the evils will probably be corrected without much delay.

A New Hand Planer.

In the accompanying illustration we present a general view of a new Hand Planer which is being introduced to the trade by the Egan Company, of Cincinnati. The construction of this machine is such, it is claimed, that glued joints, either concave or convex, planing out of wind, cornering, chamferring, beading, grooving, gaining and rabbetting may be successfully executed by its use. The column is one casting cored out, the inside being used as a tool box. The top is planed true, giving a solid foundation for the incline plate to work upon. The journal boxes for the cylinder are a part of the main column. It is stated that the tables, which are over 7 feet in length, are planed true and are provided with a rabbetting table which supports the stock either for cutting across or with the grain of the wood. Long straight knives are employed for this purpose, effecting a saving of both time and money. The cylinder is made of solid hammered steel. Two sides are made plain for the purpose of receiving the long knives, while the other two sides are slotted for putting on beading, molding or other shape of knife, according to the work to be done. Attention is called to the fact that the Patent Bevel Fence is simple in construction and serves an excellent purpose. The fence is planed true and suitable provision made for adjusting it at any point across the table. Each table may be raised or lowered independent of the other and can be adjusted any fraction of an inch to suit the work to be done.



Hand Planer Made by the Egan Co.

Crushing Strength of Brick-Work.

A recent issue of the *American Architect and Building News* presents comments upon an interesting letter written to the *Clay-Worker* by Prof. Ira O. Baker, of the University of Illinois, on the crushing strength of brick-work which will be appreciated by our readers.

It seems that at the recent convention of brick makers one of the members expressed himself as being "provoked" at the "absurd ideas" commonly entertained in regard to the resistance of brick-work to crushing. During the discussion which followed this declaration another member said that "a brick wall, laid in excellent mortar, 2 feet thick and of ordinary brick, will stand its weight 200 feet high," while a third referred to chimneys that had been built 200 or 300 feet high. As these chimneys were, of course, built thick at the bottom and thin at the top, their hight affords no indication whatever of the crushing strain upon the base; and the second speaker's impression that a good brick wall would stand the pressure due to its own weight if built 200 feet high is far within the limit accepted by those "absurd" persons, the architects and engineers, who commonly allow a pressure of 15 tons per square foot on good brick-work, equivalent to the weight of a column of the same brick-work of uniform dimensions in plan and about 268 feet high. Professor Baker, however, throws the usual data completely aside and says that in some experiments made by himself brick piers in lime-mortar have resisted a pressure of 108 tons per square foot, while piers in Portland cement have stood 180 tons per square foot. He asks whether "any one ever heard of brick masonry being crushed by any load brought upon it in an actual structure," and evidently thinks that the ordinary limit for crushing strength of brick-work is set far too low. In regard to his question whether any one ever heard of the actual failure of brick-work by crushing under the load brought upon it in a building, we can say at once that we have. Some years ago a building fell in Denver, Col., under circumstances which showed plainly that the failure was due to the crushing of the brick-work under the ends of a large wooden truss which supported the front above the first story. It is true that the bricks, a sample of which was sent to us, were poor, but the load on the wall, which we computed at the time, was far less than that which Professor Baker's piers sustained safely. How many other cases of the kind there may have been we cannot say, but our impression is that they have been tolerably numerous. The former Superintendent of Buildings in New York, Mr. Esterbrook, would not pass plans which showed that the possible load on any pier or wall of brick exceeded 14 tons per square foot, and as this limit is different from that given in any book with which we are acquainted, we suppose that it must have been founded on experience with the New York bricks, which are ordinarily of excellent quality. In most places, we think, the limit is 15 tons per square foot, which is about equivalent to Professor Baker's result for crushing,

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with a factor-of-safety of seven; and as a factor-of-safety of six is commonly used for members subjected to a crushing strain in buildings, and is specified by law as the minimum in some places, we doubt whether, even on Professor Baker's results, the usual limit can under ordinary circumstances be with prudence exceeded.

TRADE NOTES.

A VERY INTERESTING ADVERTISING novelty which is being distributed to the trade by the Wabash Novelty Woodworks, Wabash, Ind., consists of a condensed calendar for the new year, so arranged that it may be hung up or it may serve as an easel upon the desk. The card is inclosed in a heavy leather frame, the borders of which are inscribed with the name and address of the company and a reference to the line of goods which they manufacture. Beneath the calendar is a second card bearing a telegraph code designed for the use of customers who may wish to order goods by wire.

THE SECOND CONGREGATIONAL CHURCH SOCIETY, of Rockford, Ill., contemplate the erection of a church to cost from $80,000 to $100,000. Those engaged in the building trades, who desire further particulars concerning this project, should address Mr. John Barnes, of W. F. & Jno. Barnes Company, Rockford, Ill.

THE SIMONDS MFG. COMPANY, of Fitchburg, Mass., are distributing a calendar for the new year which will be found an ornament to the desk of those who may be favored with a copy. The upper portion of the card, which is engraved by Livermore & Knight, of Providence, R. I., is embellished with a beautiful picture of an old-fashioned sawmill. The company, however, do not desire to convey the impression from this that they are at all old-fashioned, although they have been for 58 years engaged in the manufacture of cutting edge tools. The beautiful picture partially rests upon a large circular saw, which in turn covers the limbs of a large tree. Below the picture is the name of the company, the addresses of their various offices and some advertising matter relating to the saws and knives which they manufacture. The calendar proper consists of 13 leaves attached to the bottom of the card. These are printed in black on white paper, and give in addition the phases of the moon.

ROWLEY & HERMANCE, Williamsport, Pa., favor us with a copy of a classified catalogue of improved wood-working machinery which they have just issued from the press. The catalogue is somewhat voluminous in character, consisting of nearly 100 pages of carefully printed letterpress, profusely illustrated with machines manufactured by the firm. The printing is in colors and is executed with pleasing effect. This is the seventh edition of the firm's classified catalogue, and in the introduction to the trade attention is called to a number of new and improved machines that have been improved and perfected since the last catalogue was issued. The statement is made that additions are constantly being made to the firm's already large line of labor-saving machinery; that the workshops are of ample capacity to produce first-class work and that the firm is in a position to satisfactorily meet the requirements of the trade. Within the covers of the catalogue before us attention is given to an almost endless variety of wood-working machinery, adapted for use in saw and planing mills, molding, door, sash and blind factories, wagon shops and furniture establishments. Especial attention is directed to the firm's patent Common Sense journal box, the main features of which are covered by patents already secured and by others now pending. Accompanying the catalogue is a price list which will be found of interest in this connection.

THE ANNOUNCEMENT IS MADE that the business of manufacturing parquet floors, wood carpets, wainscoting and ceilings of parquetry panels, established and carried on by Peel & Metz, will hereafter be conducted by the Peel & Metz Company, which has been incorporated under the laws of the State of New York. The company after the fire in August last moved into larger and more commodious quarters, at 315 to 319 East Twenty-second street, and fitted them up with new machinery of the most improved patterns more than double their capacity. W. B. Pell is president of the new company and Anton Metz secretary and treasurer.

"POINTS ON VARNISH" is the headline of an advertisement of Murphy & Co., Newark, Boston, Cleveland, St. Louis and Chicago. The subject under discussion is the bone of contention between the builder and varnish maker, and what the firm has to say on this point we have no doubt will be appreciated by the trade.

THE ROBERT B. HUGUNIN WINDOW FIXTURE MFG. COMPANY, Hartford, Conn., set forth in their advertising space this month some of the merits of their Improved Patent Screw Sash Balance, which they are offering the trade. It is stated that this balance is easily applied, and that it can be furnished at a low cost. It is made in two widths and is adapted for use in buildings, cars, libraries, vertical sliding sash, doors, panels, &c.

THE STANLEY RULE AND LEVEL COMPANY, New Britain, Conn., are pushing the sale of what is known to the trade as Stanley's "Odd Jobs," a tool which combines many in one.

THE MERITS OF THE IDEAL SASH PULLEY, made by the Stover Mfg. Company, Freeport, Ill., are set forth in their advertisement elsewhere in this issue. This pulley is made in a variety of styles and sizes and is meeting with a large sale.

THE LUDLOW-SAYLOR WIRE COMPANY, St. Louis, Mo., are prepared to furnish a great variety of handsome designs of bank and office railings, made of wire, brass and wrought iron. They have ready for distribution a catalogue referring to these goods and containing illustrations of some of the designs in which their railing can be had.

THE CANTON STEEL ROOFING COMPANY, of Canton, Ohio, request those interested to send for a copy of their catalogue of steel roofing, corrugated iron and other specialties which they are prepared to furnish.

THE NATIONAL IRON ROOFERS' ASSOCIATION held their fourth annual convention at Cleveland, Ohio, on January 14 with a representative attendance. The sessions were of an interesting nature and the subjects considered of importance to the trade. The officers elected for the current year were, James A. Miller, president; J. G. Battelle, vice-president, and J. E. Annis, secretary and treasurer. The Executive Committee appointed was composed of C. H. Connor, J. C. Battelle and J. C. Snyder, while a Tariff Committee consisted of T. A. Scott, T. C. Snyder and R. H. Hyndman.

THE STOCKHOLDERS of the Allegheny Geometrical Wood-Carving Company, held their annual meeting and election at the office of Dr. Goehring, No. 170 Sandusky street, Allegheny City, Pa., on the evening of the 18th inst. The election resulted as follows: President, C. L. Goehring; vice-president, W. H. Graham; secretary, W. H. R. Hilliard; treasurer, Louis Marchand; directors, W. H. Graham, C. L. Goehring, William Troebe, Louis Marchand and W. H. R. Hilliard.

THE CRESTTILE CONDUCTOR COMPANY, Crawfordsville, Ind., set forth in their advertising space this month some of the reasons why the company's goods give such general satisfaction. The conductor is made in three sizes, the length of sections being 4 feet each.

AMONG THE DELEGATES of the Builders' Exchange, of Detroit, Mich., to the annual convention of the National Association of Builders at St. Paul, Minn., on January 27, 28 and 29, was Mr. W. J. Burton, president of the firm of W. J. Burton & Co., Detroit, Mich.

E. C. STEARNS & CO., Syracuse, N. Y., present in their advertising space this month some interesting particulars relative to Warner's Patent Sliding-Door Hanger, which they manufacture. In proof of the satisfaction which this device is giving, the firm call attention to testimonials from some of the leading architects who have examined into its merits and specify it in work under their charge.

THE THOMPSON MFG. COMPANY, of Cleveland, Ohio, explain in their advertisement this month why it is that they are enabled to quote such low figures on their product. They request those who are interested to send for a copy of their roofing catalogue claimed to be one of the finest ever published.

CHARLES A. STERLINGER, Detroit, Mich., present in their advertising space this month some interesting remarks relative to the stock of woodworkers' tools which they can furnish. Their catalogue No. 12, containing 200 pages and over 700 illustrations is ready for distribution and will be sent to applicants on receipt of eight cents in postage stamps.

NEW PUBLICATIONS.

CONVENIENT HOUSES WITH FIFTY PLANS FOR THE HOUSEKEEPER. By Louis H. Gibson, Architect, 321 pages. Illustrated. Board Covers. Published by Thomas Y. Crowell & Co. Price $2.50.

This work the author states has been brought out to meet the popular taste, and from the examination which we have given it, we are inclined to believe it will prove successful. It is written in an entertaining style, is amply illustrated and appeals to the taste of the man of moderate means, as well as to that of his wealthy neighbor. The aim of the author has been to deal with the subject of houses, their construction and arrangement largely with reference to the requirements of the housewife, keeping in mind as well convenience, stability and beauty of surroundings. The first portion of the volume deals with economical housekeeping, to which four chapters are devoted. The second section comprises ten chapters and describes a journey through a house, beginning at the porch and passing through the different rooms, stopping now and then to consider the various details. The author then takes up the consideration of plans of fifty convenient houses, most of which represent work actually executed. Following these are ten chapters devoted to practical house-building, while the 37th chapter considers the business points involved in building, such as the methods of letting contracts with a view to securing the best results without waste of money. How to secure a home is told in the three chapters that complete the work.

Church Roofs.

In dealing with the subject of roofs Mr. W. Burges says:

I am not so much of an antiquary as to advise the use of oak instead of deal for our roofs. Oak was the common wood of our ancestors and deal is the common wood of our own time, and had the case been reversed I am quite sure that our forefathers, like sensible men as they were, would have employed fir. But if we look at the majority of thirteenth and fourteenth century churches we shall find very few open roofs. On the contrary, the roof is generally of the simplest construction, often with tie-beams, to keep everything together, and boarded to the bellies of the rafters, sometimes even a flat boarded ceiling. This afforded space for painting and provided an air-chamber between the church and the outer rafters. Hence the edifice was cool in summer and warm in winter. A small window opened into this air-place and afforded means of ventilation. Now, compare this with a modern church roof. The timbers are of the smallest possible scantlings; the roof is open to the top, so that in reality we see the straight-lined arch magnified to its fullest possible extent; and the little window, deprived of all use, twinkles up above and only serves to throw in light where it is least wanted and to expose the poverty of the whole affair. In the present day so many people have got to consider an open roof as a *sine qua non* in mediæval art that it is very difficult to persuade them to the contrary. An open roof to look well requires very large and very intricate timbers, or it is almost certain to look poor. Most of the open roofs of our own country are of a comparatively low pitch, and the space between the principals was frequently boarded and painted and treated like a ceiling. The same objection may be made to our church furniture. It is generally very poor and miserable. It is very true that the moldings in wood-work should be more slender and cut out than in stone, but then they are generally combined in masses and the whole effect is sharp and solid, as it ought to be. The best pieces of ancient woodwork I know of are the stalls of Amiens Cathedral.

A CIRCULAR is being distributed by G. Bickelhoupt stating that a notice having been sent to the trade by some persons who do not give their names that they are doing business under the name of Bickelhoupt Skylight Works, he deems it proper to notify the trade that he has no connection with such concern and that the parties comprising the same are only the successors of Adam Bickelhoupt. Mr. G. Bickelhoupt adds that he continues to do business as successor of Bickelhoupt Bros. at the only genuine Bickelhoupt Skylight Works, Nos. 243 and 245 West Forty-seventh street, New York.

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CARPENTRY AND BUILDING.

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A MONTHLY JOURNAL FOR THE BUILDING TRADES.

DAVID WILLIAMS, - - PUBLISHER AND PROPRIETOR.
A. O. KITTREDGE, - - - - EDITOR.
JOHN S. KING, - - - BUSINESS MANAGER.
66 & 68 DUANE STREET, NEW YORK.

MARCH, 1890.

Some Changes.

Even a casual examination of this number of *Carpentry and Building* will show the reader that we have made a number of changes since the last issue. No doubt many will be greatly pleased at what we have done; others, perhaps, will regret that any change whatever should have been made, not that there has been no improvement, but simply because there is a feeling cherished and encouraged by some people that what is is best, and that any change is less desirable than what at present prevails. For ourselves we feel that ruts are most excellent things if they are not too long and too deep. From the commencement of this paper up to the present time we have in a sense been in certain ruts, not that our work has been without variations, nor yet lacking in enterprise, nor has any one complained that he was tired of the ruts. The changes which we are now making proceed from the feeling that we can do some things that we have not heretofore attempted, also do the same things as in the past a little differently, and thus please our readers individually and collectively much better thereby. Variety, we think, will add zest to the feast.

Nature of the Improvements.

It is hardly necessary to catalogue the changes that we have made. Some of them are, perhaps, radical; others are likely to be described as mere matters of taste in arrangement, as, for example, the change in the way in which illustrations are combined with the text. Still other changes, however, appeal more directly to the reader in view of what they will mean to him in the course of a year's time. The paper is to be larger than formerly; pages have been added and the increase is intended, principally, to affect the Correspondence department. This we feel certain will meet with approval. One other change which has been made to meet the expressed wishes of a large number of readers should be mentioned, and that is the new position of "Novelties." Instead of this department occupying a prominent portion of the so-called editorial space, it has been transferred to the advertising portion of the paper. Descriptions of new tools and new machines, new features of construction and new building appliances in general will be no less valuable to those of our readers who are specially interested in such matters because they are sandwiched between advertising pages; while, on the other hand, the removal of the Novelty department from the editorial to the advertising portion of the paper meets the views of many who have considered such matters less important to them than other features.

Still Other Changes.

Now, we have not got done making changes in *Carpentry and Building*, for others are already decided upon, and in all probability some little variation at least will be made in every number that is brought out, comparing it with previous issues, for a long time to come. All the changes undertaken will be made with a view to pleasing the reader, but how can we make these changes intelligently unless we hear from our readers, thus learning what they like and what they do not like? Our readers know of old that in a sense they are partners in the management of this paper. If it is not what they want it to be they have only to describe what will please them better in order to secure it. We shall not change our policy in this regard. This suggests something which we have often expressed before, and, in all probability, will express again, perhaps frequently, in the future—namely, that we would like numerous letters from our readers criticising our work and telling us just what they think of what we are doing. Speaking of enlargement, we have mentioned that it will apply more particularly to the Correspondence department. This portion of the paper interests a very large number of our subscribers, and can be made still more serviceable by having a larger number of contributors. We propose devoting more space to it simply with a view to serving our readers more acceptably. We request, therefore, that our readers at large co-operate with us in using space to the best possible advantage. Let us have both suggestions and communications for publication.

Cause of Fires.

The alarming frequency of disastrous conflagrations in various cities of the Union has turned the attention of the Philadelphia Fire Department to the manner in which the woodwork contiguous to hot-air flues in buildings is protected. The investigation has been in progress for some time, and the chief officers have discovered, they believe, the secret of many of the conflagrations with which the city has been visited. It is stated that the faulty work is for the most part hidden by imposing mantel-pieces, the flues, which are seldom the width of the mantel-piece, being hemmed in by masses of lath and plaster, which, coming into contact with the hot-air pipes, are carbonized. This charred wood subsequently ignites and the combustion develops into a fire, entailing a loss of property and not infrequently a loss of human life. Another cause assigned for the frequency of fires is found in the manner in which wainscoting is run over a brick flue. It is stated in such a case that it is necessary to drive wooden plugs into the bricks and to nail the wainscoting to these plugs. The latter carbonize and then ignite, with the result that the flames are communicated to the wainscoting. Fire Marshal Thompson is understood to vigorously condemn the practice of building narrow flues and filling up the remaining space behind the mantel-piece with inflammable materials.

Sea Green Roofing Slate.

For some time past the slate market has been embarrassed by the large amount of sea green roofing slate which has been produced at the quarries and which has been piled up far in excess of the demand. Sea green roofing slate makes just as good a roof perhaps as any slate that can be named, but unfortunately it is not an unfading slate. It has the habit of changing appearance in various ways after being laid upon a roof, so that in time the parts which are covered by it present to the eye a "calicoey" appearance. For factories and outbuildings and for all purposes where the roof is not made a part of the design and embellishment of the building, sea-green slate is undoubtedly desirable, but the unfortunate habit of changing color, to which we have referred, makes a comparatively small demand for it. The market, as we have already mentioned, is at present overstocked. An agreement was entered into by the quarrymen a short time since to reduce the output one-half until the present accumulation begins to move off. It is hoped that this effort will produce the desired result, because the presence of so large a quantity of a single kind, for which there is no adequate demand, in a sense threatens the stability of the market for the other kinds.

Mechanical Drawing.

In discussing the importance of a knowledge of drawing to the mechanic engaged in any of the building trades, one of our English exchanges observes: "The interpretation of drawings by artificers connected with building will be necessarily imperfect till the art is made one of the acquirements of the workman. In England the subject has never been brought down to the level of the workman's knowledge, and only of late years has there been any attempt to teach drawing to workmen in a systematic manner. The technical schools in France and Germany have long made drawing an essential mode of training the eye and hand. Every trade has to pass through the stages of drawing. Copying from paper examples is forbidden in some schools, and the system is to get the pupil to draw from models, so as to teach him to apprehend the meaning of lines in perspective, as well as to make him understand geometrical delineations. In our opinion drawing can only be properly taught by the aid of models, and a course of well-directed model drawing will do

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more to instruct the eye and mind than all the flat copies and diagrams of the text-book."

Architectural Competitions.

The general question of the utility of competitions among architects in determining what plans shall be accepted for a given building is one of perennial interest to the profession, and one that is constantly discussed in the architectural papers. A writer in the *Building News* a short time since advanced some thoughts on this subject which may interest our readers. He said: "Whether better results attend the giving of a commission to one architect, or a competition in which a large number of the profession are invited to send in designs, is a question that cannot possibly be answered under the present conditions. Are architects who compete more or less able than those who are content to depend on their private practice? Do the chances of competition make it probable that a more thoughtful or skillful design can be acquired than by instructing a professional architect of known ability and experience to prepare one? The chances in favor of obtaining a better design by competition are increased by the number of those responding and the competency of the competitors; but these two elements are uncertain unless the inducements to enter the lists are great. For important public buildings the chances are decidedly in favor of competition when properly conducted, even if some of the *élite* of the profession remain out of it, for the simple reason that a certain number of able architects, unknown to fame, are inclined to try their luck. So very much, however, depends on the terms of invitation and the discretion of the committee of selection or their assessor, that it may be safely asserted that the contributions of unknown talent and the chances of securing the best designs may be practically thrown away or lost."

Faults of Competitive Designs.

The same writer continues: "Were we to sum up the errors and weaknesses of competition design we should discover that they were mainly the results of rapidity of execution and of the want of personal attention and thought. They are such faults as we do not find in designs prepared in the ordinary manner. The plan roughly sketched is given to a lot of clerks to work out, the elevations and perspective sketches are handed over to draughtsmen to make the best they can of them. Between them a set of drawings are prepared that bear evidences of disagreement in several particulars—elevations that do not agree with the plans, plans that show no careful revision, that are full of errors and crudities, while the general absence of detail and finish show the work has been done piecemeal by different hands not under the immediate control of one mind. One great merit of dividing a competition into two parts—a 'sketch' and a 'final stage'—is that there is much less of this crudeness and imperfection of design possible. The 'preliminary or sketch" designs are the work of one hand —the architect himself—who has time to think over and revise his arrangements between the first and final competition. There is evidently more likelihood of obtaining studied designs by this mode than when only one set of finished drawings are to be sent in on a short notice."

Matters and Things.

The most notable fact in the building trades at the present time is the tendency toward co-operation manifested by the various local associations which have been formed, and by the National Association of Master Builders, which has recently held its fifth annual convention. Plumbers, masons, bricklayers, steam-fitters, sheet-metal workers, roofers and many others, through local associations, district organizations and national assemblies, have been brought into intimate acquaintance with their fellows in the same line of trade, and that, too, with the most beneficial results. Men who formerly feared and hated each other as dangerous and unscrupulous competitors have come to respect each other as honorable business men. Whenever a question arises affecting any trade as a whole it is met at present by the entire trade acting together, while formerly there was not and could not be any concerted action because of the jealousies that existed and which had full sway. Uniformity in contracts, consistent action in the matter of apprentices and trade schools, equitable laws concerning liens, readjustment of relations between principal contractors and sub-contractors, and proper distribution of responsibilities among owner, architect and builder are only a part of the questions which have already received attention through these various organizations, and which will continue to be discussed until the building trades have been raised to that high plane of honor and dignity to which their importance entitles them.

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—One very marked effect of this movement is the driving out of the building business of the irresponsible general contractor, and the consequent elevation of the sub-contractors, who in the past have been both his dependence and his source of profit. The scandal of a building being let to a general contractor for 10 to 50 per cent. less than its value, of the undertaking being commenced under the management of a plausible but utterly irresponsible builder, dependent entirely upon the mechanical ability and capital of the sub-contractors to carry forward the work, and of an ultimate abandonment of the job by the contractor before completion or of the final loss to the sub-contractors of a large portion of their bills, is becoming a thing of the past. Sub-contractors standing shoulder to shoulder in the management of their affairs give the jerry builders, the Buddenseiks of the trade, and the contractors with straw bondsmen very little opportunity to pursue their course. Square business dealing is being made a necessity—a condition precedent—to the advantage of all concerned.

***

—Less credit perhaps is due the various building trades for this co-operative action than would at first be accorded them by those unacquainted with the facts. Money interest and self protection are strong incentives to any line of action, and it was nothing less than these, under the stress of the threats of workmen, that first started the movement. Organized labor on the one hand made organized employers a necessity on the other; but while the associations among the masters were first brought about to deal with labor, their functions since they were established have been greatly broadened. Nor has labor been defeated. On the contrary, labor has found it easier to enforce its reasonable demands since the employers have been organized than ever before. Builders are not averse to higher wages and shorter hours in themselves. They are, in fact, disposed to favor them so long as their profits are not consumed thereby. Accordingly, the completion of organizations among the master builders has had the good effect of putting the entire building interests into harmony in asking of the general public a reasonable advance in the price of buildings.

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—I was asked a few days since what I thought would be the effect upon building interests of a decision in the question of a World's Fair in favor of New York as the site. I replied that it could not be expected to have any other effect than to make building very active not only in the metropolis itself, but also throughout all the towns and cities near by. This was the immediate effect upon Philadelphia when arrangements came to be made for holding the Centennial Exhibition in that city, and by analogy the same results may be expected to follow in the present instance. The private subscription in aid of the fair is something over $5,000,000. The City of New York is empowered to raise $10,000,000 more. Taking these amounts as an estimate of the cost of inaugurating the fair and adding what is likely to be spent by the exhibitors themselves in getting their displays into shape, the cost of the various national, state, district and city structures certain to be built, the new hotels, flats and apartment houses likely to be erected near the grounds and the buildings necessary to the new transportation lines that will be called into existence, we have a partial view of the special activity likely to follow upon the World's Fair project. New York and Brooklyn in the past, when there has been no special incentive to building operations, have expended as much as $100,000,000 in a single year. To get ready for the crowds that may be expected to visit these cities upon this occasion and to provide amusement places for them may be depended upon, I think, to swell the regular building business to its maximum, and then added to this will be the special outlay already referred to. Building at the near-by watering places and summer resorts has not been active for years past. The fair will restore life there also, and it will be strange therefore if large operations are not seen at different points on the Long Island and Jersey Coasts. The same general principle applies to Chicago or to any other city that may secure the fair. There will be a large increase in the building business of that city, whichever it may be, not only in the preparation of the fair buildings, but also in the preparation which the business men and citizens see fit to make in anticipation of the event. It is to be expected also that the special activity will draw to whatever city the fair is finally located in, a number of builders as well as mechanics, and that accordingly there will be no lack of help for doing the required work.

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—While speaking of building matters in and around New York the thought of what is likely to take place the present year throughout the country is suggested. During the past few weeks I have had the opportunity of conversing with builders from various points, as well also as interviewing architects in the different large cities. The universal expectation seems to be that of a large and profitable building business for the year. In some parts of the country numerous new factories are in contemplation, while almost everywhere additions to existing establishments are being provided. In some of the cities large business structures, hotels and theaters are projected, while city residences are also numerous; but what is most important to builders in general is the prospect of vast numbers of dwellings of moderate cost in almost every community. From a casual inspection of the field it would seem that more people are preparing to build just now than ever before in the history of this country.

OLIVER.

THE PLATES.

In Plate IX we give a perspective view and floor plan of an attractive district school-house, produced from drawings by C. Powell Karr, of New York City. A description more in detail will be found in another column.

Plates X and XI are devoted to two elevations of a church erected at Holly, Mich., from plans prepared by A. C. Varney & Co., architects, Detroit, Mich. The details and description are published on page 53.

Plate XII shows the perspective view and floor plans of a conveniently-arranged house of moderate cost, designed by W. P. Robinson, architect, Albany, N. Y. The description and details are published on pages 55 to 57.

Plans have been completed for the Williamson Free School of Mechanical Trades, in Philadelphia, and it is expected that the school will open in May, 1891.

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MEASUREMENT OF ROOFS.*

By TRIANGLE.

IF SPECIAL RULES were required for estimating the area of the few figures presented in the preceding article the mechanic or apprentice not conversantwith the higher mathematics might doubt his ability to cope with the difficulties presented. From the inspection of a trapezium it might appear that some special rule was required to estimate its surface, a rule that would be difficult to understand. That such is not the case we hope to show in the present article. A rule has been given for calculating the area of triangles which is so simple it is believed all can understand it, and by its aid the mechanic can calculate the area of almost any plane figure he may encounter in roofs, no matter how irregular its form may be, as all such figures can be resolved into triangles. Such being the case, extreme or special rules will not be used in determining the area of any of the following figures, so the tinner can feel confident of his ability to estimate the surface of a roof of any shape.

In Fig. 24 is shown a square figure whose area is determined by multiplying the length of its two sides together. Supposing the sides of the figure to be 20 feet long, the area would be 20 × 20 = 400 square feet. By drawing a line diagonally through opposite corners of the figure as shown by the dotted line A C the square is resolved into two triangles, the area of each being one-half of the square, which gives us an opportunity of proving our rule for finding the area of triangles to be correct, to multiply the base by the hight and take one-half of the product. Thus the area of either triangle A B C or A D C is equal to 20 × 20 ÷ 2 = 200 feet, being one-half of 400 feet, which proves the rule to be correct. All rectangles, as Fig. 25, are figured in the same general manner as the square, the length of side being multiplied by the width, as 30 × 10 = 300. Rectangles can be resolved into triangles as shown by the dotted line A C, which divides the rectangle A B C D into triangles, C B A and C D A. One of the shapes often met with in roof surfaces and one rather difficult to figure to those not accustomed to calculations of this kind is the rhomboid. The area of this figure can be obtained by drawing a line from opposite corners, thus resolving it into two triangles, as has been done with the rectangle. An easier way is to multiply the length of one of the parallel sides by the hight. Referring to Fig. 26, the area would be obtained as follows: 30 × 10 = 300 square feet. In estimating the area of this figure the mis-

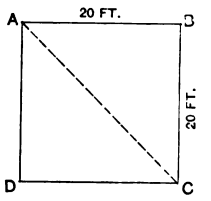


Fig. 24.—Area of Square.

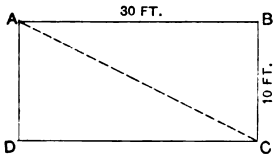


Fig. 25.—Area of Rectangle.

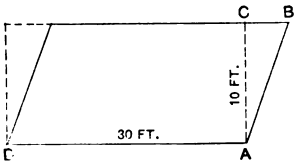


Fig. 26.—Area of Rhomboid.

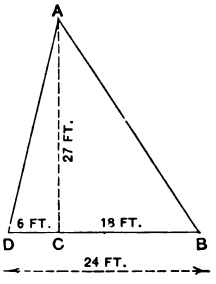


Fig. 27.—Illustrating Rule for Calculating Area of Triangles.

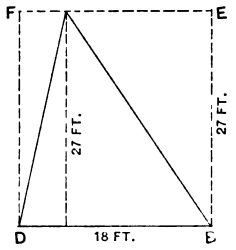


Fig. 28.—First Step with the Rule.

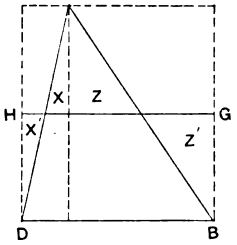


Fig. 29.—Second Step with the Rule.

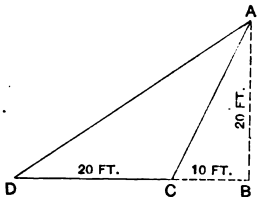


Fig. 30.—Further Illustration of Rule.

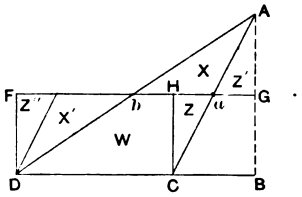


Fig. 31.—Triangle Changed to Rectangle.

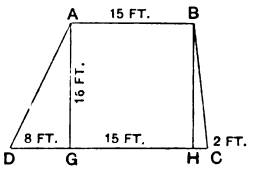


Fig. 32.—Analysis of a Trapezoid.

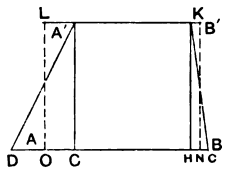


Fig. 33.—Trapezoid Changed to Rectangle.

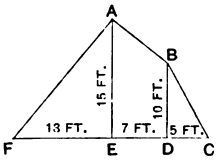


Fig. 34.—Analysis of a Trapezium.

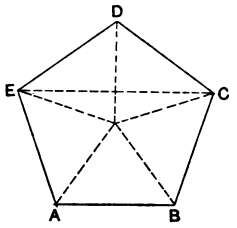


Fig. 35.—Analysis of a Pentagon.

MEASUREMENT OF ROOFS.

* Continued from page 31, February issue.

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take should not be made of multiplying the length A D by the side A B, but by the hight A C. The hight in this case, as in that of triangles, is the hight taken perpendicularly to the side or base. It may be well to show further that the rule for calculating a triangle—namely, to multiply the base by the altitude or hight and take one-half of the sum—is applicable to all triangles regardless of shape. As an illustration of this let us take a triangle of irregular form, as shown in Fig. 27. The altitude is found by dropping a line from the apex A to the base B D at C. We will suppose the base to be 24 feet in length and the altitude 27 feet; the area would be obtained thus: $24 \times 27 + 2 = 324$. It will be noticed that the dotted line A C resolves the triangle into two right-angled triangles, the base of one of which is 6 feet and the other 18 feet. If we were required to prove our rule to be correct we could do so by figuring the areas of the two triangles, adding the results, which would be the same as the area of the triangle A B D. The area of the first triangle, A C D, is $27 \times 6 + 2 = 81$ feet; of the second, B A C, $27 \times 18 + 2 = 243$, and the sum of these two products is $81 + 243 = 324$, being the same result as obtained by first method. In the previous example it has been shown how a square, rectangle and rhomboid can be resolved into triangles if desired, and that the area of the figure was the same as the area of its triangles added together.

In order to show how the rule for finding the area of triangles is obtained we have drawn Fig. 28. When we multiply the base (18 feet) by the altitude (27 feet) we really obtain the area of the rectangle F E B D, and by dividing by 2 the figure is cut in half, as shown in Fig. 29, H G B D, which gives the area of triangle in Fig. 28, as Z being put in the place Z′ and X at X′, the figure H G B D is formed, which is one-half of Fig. 28 in area or having the same area as the triangle in Fig. 27. The reader can perform similar experiments with other triangles. In Fig. 30 another form of triangle is shown. A line dropped from the apex A perpendicular to the base falls outside of the figure, and it might appear to some that our rule had encountered a rather hard customer in Fig. 30, but as it is we have only to prolong the base until it meets the perpendicular. By our rule we multiply the base by the altitude and divide by 2, which gives $20 \times 20 = 400 + 2 = 200$. That this is correct we will prove in two ways. First, to obtain the area of the triangle A C D we will first obtain the area of the triangle A B D, from which we will subtract the area of the triangle A B C; or in other words the area of A C D is equal to the difference between the two right-angled triangles A B D and A C B. An inspection of the figure will show one that the areas of the two triangles A B D and A B C can be obtained by the rule already given. The area of the larger triangle of the two would be $30 \times 20 = 600 + 2 = 300$. The area of the smaller triangle would be $10 \times 20 = 200 + 2 = 100$. Subtracting the latter from the former we have $300 - 100 = 200$, the area of the triangle A C D, being the same result as obtained by the first method. In Fig. 31 the rule is shown to be correct in another manner. Multiplying the base by the altitude and dividing by 2 is the same as drawing the line F G, which cuts off the triangle X; and multiplying by the base D C might be said to cut off the triangle C, as is done by the line C H. Let us suppose the triangle Z to be hinged to X at *a* and X to be hinged to W at *b*, we can turn Z to the position shown by Z′ and then turn Z′ X to the position occupied by Z″ X′, so the rectangle D C H F is equal to the triangle D C A; D C being 20 feet and C H (one-half of the altitude) 10 feet, we have $20 \times 10 = 200$, the same result as obtained by the two previous methods. In Fig. 32 an illustration is given of a trapezoid, which figure, as will be seen on inspection, can be resolved into shapes that are easy to figure. By drawing the dotted lines G A and H B the figure may be changed so as to consist of the rectangle A B H G and the two triangles C H B and A G D. Being considered as in this shape its area is calculated as follows: The area of the rectangle is obtained by multiplying the base, 15 feet, by the hight, 16 feet, $15 \times 16 = 240$ feet. The smaller triangle has a hight of 16 feet and a base of 2 feet, which would give us $(16 \times 2 + 2 = 16)$ 16 feet. The larger triangle has a base of 8 feet and a hight of 16 feet, which gives $(8 \times 16 + 2 = 64)$ 64 feet, making a total of $240 + 16 + 64 = 320$ feet. This operation can be greatly simplified by averaging the parallel sides and multiplying by the width G A. Thus the base D C is $8 + 15 + 2 = 25$ feet, and the top B A is 15 feet. Adding the two together and dividing by 2 $(25 + 15 = 40 + 2 = 20)$ gives 20 feet as the average length. Multiplying this by the width, we have $20 \times 16 = 320$, the same result as obtained before. The operation of averaging the lengths is shown in Fig. 33. O is half way between D and C and N between H and C, the triangle A being placed at A′ and B at B′, producing the rectangle O N K L. Fig. 32 can also be resolved into triangles by drawing lines obliquely from D to B or C to A. Fig. 34 shows a trapezium, the area of which can be calculated by the principles already explained. If so desired this figure can be calculated by resolving it into two triangles, which can be done, as in the case of Fig. 38, by drawing lines obliquely from F to B or from C to A. We have adopted another plan, however, as an examination of the figure will show, and have resolved it into two triangles—namely, F E A and D B C, and a trapezoid, a figure the area of which has just been calculated. The two triangles are figured by the rule already explained. Taking the larger triangle first, we have: $13 \times 15 + 2 = 97\frac{1}{2}$. The smaller triangle would give us $5 \times 10 + 2 = 25$. Then the central portion of the figure, the long side added to the short side and averaged, gives us $15 + 10 = 25 + 2 = 12\frac{1}{2}$. This average of the two sides multiplied by 7, the width, equals $87\frac{1}{2}$. Then we have $97\frac{1}{2} + 25 + 87\frac{1}{2} = 210$, the area of the trapezium F C B A. Of the various figures, such as the pentagon, octagon, &c., their area can be figured by the rules already given, as an illustration of which let us take the pentagon (Fig. 30); drawing lines from the various points A B C, &c., to the center it is resolved into five triangles, or a line can be drawn from E to C, which will resolve the figure into one triangle and one trapezoid.

National Builders' Convention.

The Fourth Annual Convention of the National Association of Builders was held in St. Paul, Minn., according to programme, commencing January 27. There were present 119 delegates, representing 33 exchanges in as many leading cities of the country. The convention was opened by an address by the Mayor of St. Paul, who extended to the members of the association the freedom of the city. The president of the association, E. E. Scribner, delivered an address covering in some measure the scope of the work of the organization, following which was the transaction of routine business, preliminary to the consideration of the topics announced for discussion. The treasurer's report indicated a balance on hand, while that of the secretary showed an increase in the membership, seven leading cities having been admitted during the past year. A resolution instructing the Executive Board "to consider the practicability of organizing local and State societies, and a national society composed of employers and employees of all trades and callings of the working people, with a view to bringing them into closer communion with each other in relation to employment, labor and compensation," was offered and before the close of the meeting adopted. The morning session of the second day was devoted to a discussion of trade topics. The Legislative Committee presented a resolution to the effect that Congress be petitioned to authorize the Secretary of the Treasury to furnish to the Builders' Exchange in various cities plans and specifications of all public work, to the end that members might estimate and submit proposals for the same. The subject, "Shall the National Association recommend the adoption of the eight-hour day in the building trades, and if so when and under what conditions," brought out a great deal of animated discussion and a comparison of the number of hours of work current in different cities. It was finally decided to leave it to the local bodies to adjust the number of hours of labor as circumstances and conditions by which they are surrounded should dictate. The establishment of the system of payment by the hour was also recommended as an absolutely necessary safeguard. The discussion of the subject of lien laws was interesting, and was participated in by George C. Prussing, who advocated their repeal, and by Richard Deeves, who took a stand in favor of equitable lien laws. Mr. M. J. Sullivan read a paper on the subject of "Sub-Contracting" which was listened to with deep attention. At the close of his remarks a resolution was offered to the effect that the system of sub-contracting be not encouraged, for the reason that on the whole the system is unjust to the master mechanic, detrimental to the progress of mechanical skill and knowledge, and that it tends to do away with the reasonable profits of the sub-contractor. The matter was, however, referred to a committee of five to report at the next convention, to be held in New York in February, 1891. During the session of the third day a paper by B. McCarthy on "Manual Training in Public Schools" was read by Mr. Purrington in the absence of the author. This paper strongly advocated the introduction of manual training as an auxiliary to the high schools, if not as a substitute for them, and awakened no little interest on the part of the attending delegates.

The following officers were elected for the ensuing year: President, John J. Tucker, New York; first vice-president, A. M. McAllister, Cleveland; second vice-president, Anthony Iltner, St. Louis; secretary, W. H. Sayward, Boston, treasurer, George Tapper, Chicago.

THE STANDARD MFG. COMPANY, of Pittsburgh, recently made a very large shipment of bathtubs for use in the California Hotel and Theater, now being erected at San Francisco. The building is owned by Mrs. Kate McDonough and the work is in charge of J. M. Woods, architect and engineer. The tubs were made especially to order, the words "The California" being cast on the sides of the tubs and also on the brasswork, which is particularly finely finished. Two cars were necessary to transport the tubs, which were shipped direct from the works of the Standard Company, in Allegheny City, Pa. The firm inform us that they consider the receipt of this order as a strong indorsement of the merits of their goods, as Mr. Wood visited a number of plumbing supply houses in different parts of the country before placing the order.

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PROPERTIES OF THE ELLIPSE.

By J. H. MONCKTON.

HISTORY INFORMS US that the works of Apollonius and Archimedes were the first in which conic and cylindric sections were treated of. Archimedes is reported to have been killed 208 B. C., but these ancient philosophers did not know that the planets move in elliptic orbits. One of the most interesting and useful linear geometrical figures is the ellipse. The splendid architectural structures of the ancient Greeks were largely embellished with moldings of the elliptic form; those of the Romans were composed of parts of circles. The form of the ellipse is made use of for the arches of bridges and often to crown the openings of doors and windows in the exterior of modern houses; and has also various applications in their interior construction and ornamentation. The ellipse is designated as a mathematical oval. Also all other figures which resemble the ellipse are ovals, though with very different properties. In Worcester's Dictionary the ellipse is defined simply as "an oblique section through the opposite sides of a cone." In Nicholson's Architectural Dictionary, under the head of "ellipsis or ellipse," we are informed that "the ellipsis is a conic section formed by cutting a cone through the curved surface, neither parallel to the base, nor making a subcontrary section." In the last-mentioned dictionary 13 different methods are given for describing ellipses and two for representations of the ellipse. By far the larger number of methods given for drawing ellipses are useless or inconvenient for the purpose; and, in fact, it would seem that some of the peculiar examples of producing the elliptic curve are put forward more in the nature of curiosities than as likely to be practically useful. In the following examples I shall give only the more useful ways of describing an ellipse, explaining some of its properties not generally known and not to be found in any of the works treating on geometry, dictionaries of architecture, cyclopedias or textbooks used in colleges and schools for teaching this branch of mathematics.

To Describe an Ellipse, Using Three Pins and a Thread.—Let F D, Fig. 1, be the given major axis; bisect F D in J; through J draw H C at right angles to D F; make J C and J H equal the required semi-minor axis; take J D, the semi-major axis, for radius and with one foot of the compasses on C describe the arcs A and B; drive pins at A and C; then stretch and tie a thread between the three pins A, C, B; remove the pin at C, and with a pencil, keeping the thread stretched, describe the curve C E F H D C; B is a focus and A is a focus; B and A together are foci. The exact length of the thread equals the major axis F D, and the sum of two lines formed by the thread from foci A B to any point in the curve is constant and equal to the major axis; as, for example, let E be a point in the curve, continue the line A E to G indefinitely, make E G equal E B; then A G equals F D,

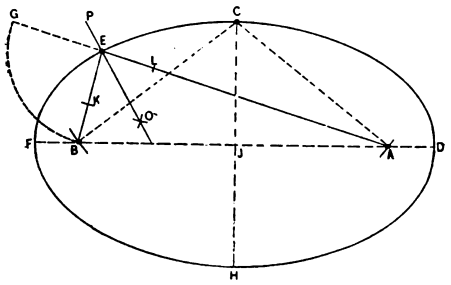


Fig. 1.—Method of Describing an Ellipse, Using Three Pins and a Thread.

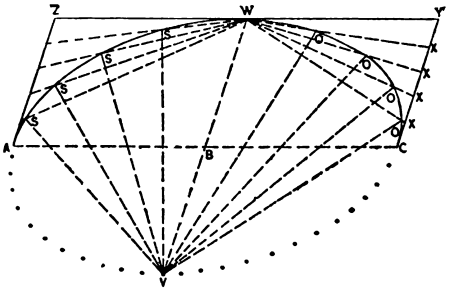


Fig. 4.—Diagram Showing Method of Obtaining Semi-Ellipse.

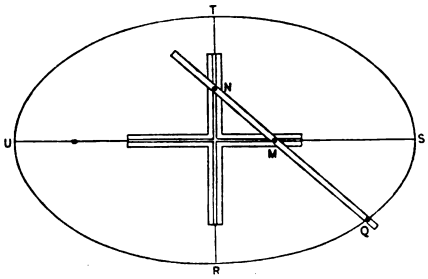


Fig. 2.—Describing an Ellipse, Using Trammel.

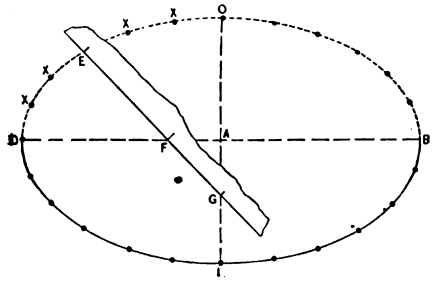


Fig. 3.—Method of Using Straight Edge in Describing an Ellipse.

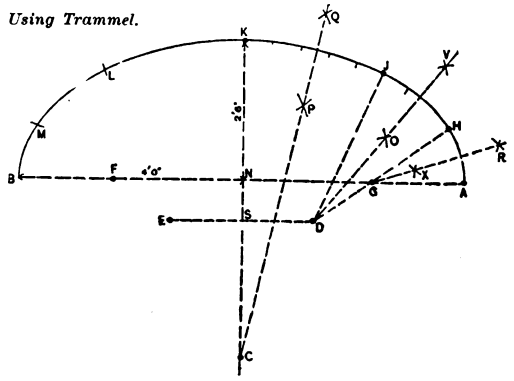


Fig. 5.—Representation of an Ellipse.—Scale, 1-3 Inch to the Foot.

THE ELLIPSE.—A SECTION OF A CONE AND A CYLINDER.

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the major axis. This mode of projecting the ellipse is theoretically perfect, but in practical use its objections are the stretching of the thread, thereby making the figure imperfect ; also the pin-holes in the paper when the drawing is required on that material, or variations consequent on inexact tying of the string. Unlike the circle, joints cannot be obtained through the curve by drawing lines from the center, but anywhere between the axes are found as follows: Let E, for example, be a point through which a joint is required; bisect the angle formed by drawing lines from the foci A B, as A E and B E, setting off equal distances E K and E L; then, with any radius greater than L K, on L and K as centers, describe intersecting arcs at O; through E draw O P, the normal or joint line sought. A tangent to the point E will be a line passing through E at right angles to O P. Where many joints through the elliptic curve are required a new and much more simple method of finding their direction is given in *Carpentry and Building* of January, 1889, page 9.

To Describe an Ellipse by Means of a Trammel or Ellipsograph.—This instrument, commonly called a trammel, gives the most perfect means known for drawing ellipses. It consists of a grooved cross, Fig. 2, made of wood or metal, with its arms set at right angles; also a rod with pins or other devices that slide lengthwise on the rod, and are fixed as required for drawing ellipses of various dimensions. Let S U and R T be given axes of an ellipsis; on the rod let Q be the place of the pencils, Q M the semi-minor axis, Q N the semi-major axis; then M and N will be the places to fasten the pins, which are moved through the grooves of the cross as shown, while the pencil at Q describes the ellipse Q S T U R Q. The difference between the semi-minor and semi-major axes, which is M N, will always give the length of the arms of the cross from the center each way.

To find the circumference of an ellipse multiply half the sum of the axis by 3.1416.

To Describe an Ellipse by Finding Points in the Curve, Using for That Purpose a Straight Edge of a Strip of Paper or Wood.—Mark on the edge of the strip (Fig. 8) the following: E as the place of pencils; E F, equal to A O, the semi-minor axis; E G, equal to A B, the semi-major axis; then move the strip and mark the point each time, as shown at X X X X, keeping at each movement G on the minor axis H O and F on the line of major axis B D; through these points trace the ellipse. The strip here made use of takes the place of the trammel-rod described in the previous figure; the points F and G, the pins of the rod, are here moved on the lines of axes H O and D B, instead of in the grooves of a cross. Not many points, X X, &c., are required to trace the curve; there are only five in each quarter of this ellipse.

To Describe a Semi-Ellipse Through Points found by the Intersection of Lines.—The lines forming the parallelogram C Y Z A, Fig. 4, are tangent to the ellipse at C W and A. C A is the major diameter and V W the minor, and, although these are the diameters as stated, they are not the axes of the ellipse; therefore this method of intersecting lines is made use of to describe the elliptic curve. The axes of an ellipse are always at right angles, and when given the curve may be traced to better advantage by proceeding as explained at Fig. 3. Let C Y, A Z, C B and B A each be divided into an equal number of parts; draw lines from the points of division X X X, &c., to W; also from the divisions at A Z to W; draw lines from V through each of the divisions at C B, touching the corresponding side lines at O O, &c.; draw lines also through the divisions at B A from V, touching the corresponding lines S S, &c., and through the points thus found trace the elliptic curve C W A. The dots at C V A merely indicate the remaining half of the ellipse.

To draw a Representation of an Ellipse.—Make this drawing to a scale. Let the major axis A B, Fig. 5, equal 8 feet and the semi-minor axis N K equal 2 feet 6 inches. Describe the quarter-ellipse A K by the method given at Fig. 3, and divide the curve into ten equal parts; take five parts K J, and on J as center, with any radius greater than J K, describe an arc at Q and P; on K, with the same radius, describe arcs intersecting at P and Q; through Q and P draw the line Q C; make K L equal K J; on C as center describe the arc J K L; take three parts J H, and on H as center, with any radius greater than H J, describe arcs at V and O, and on J, with the same radius, describe intersecting arcs at O and V; through V and O draw the line V D ; at H A, the two remaining parts, on H, with any radius greater than A H, describe an arc at R and X; on A, with the same radius, describe intersecting arcs at R and X; through R X draw R G; prolong H G to D; on D as center describe the arc J H; on G as center describe the arc A H ; parallel to A B draw D E ; make S E equal S D, and N F equal N G; make B M equal A H; on E as center describe the arc L M; on F as center describe the arc M B. For drawing an approximate ellipse the above method is the most perfect for ellipses of any proportion. Measuring the axes to a scale, and drawing one-quarter an exact elliptic curve and dividing this curve into ten equal parts makes it possible to fix suitable centers from which the different portions of an ellipse may be described very nearly; and being a scale drawing, the proper centers may be set off for drawing a full-sized ellipse just as correctly. These centers may be controlled at pleasure. For instance, if the curve at J H is found to be too convex the center D may have increased radius on the line V D. Again, other centers may be found by including, say, from K, on the quarter A K, four parts, three parts, two parts and one part, instead of five, three and two parts, as given. Also, if thought desirable the quarter-ellipse A K may be divided into fifteen parts and centers fixed by the methods shown for five parts, three and two parts.

The Ellipse as Derived from a Cone.—Let S N T, Fig. 6, be the elevation of a given cone of which N is the vertex, N M the axis, S T the base line and M B A C M the circle forming its base, and from which the sides S N T N converge in straight lines at all points of its circumference to the vertex N. Let X Z be the line of a cutting plane; bisect X Z in Y; through Y parallel to the base S T draw W U; on O at the axis as center describe the semicircle U V W; parallel to N M draw Z Q, Y E and X P. The section produced by cutting the cone on the line X Z is an ellipse whose major axis K J equals X Z, and semi-minor axis F H or F G equals Y V. The peculiarity of this conic section is that a horizontal projection made vertically under the section obtained on the oblique cutting plane is also an ellipse, as at Q P, E D. E D equals H G.

The Ellipse as Produced from a Cylinder.—The axis of a cylinder is a line drawn through the center of the ends. The ends will be equal circles at right angles to the axis. When a cylinder is cut by a plane oblique to its axis the section produced by the cutting plane is an ellipse. The major axis of the ellipse will vary with the angle of the cutting plane, but the minor axis will always equal the diameter of the cylinder. A hollow cylinder is taken to illustrate this problem, because with it some further properties of the ellipse can be shown. Let K L N M (Fig. 7) be the elevation of a hollow cylinder cut obliquely by a plane on the line L N. The base of this hollow cylinder on the line K M is given as shaded between the two circles H E and P E and described from the center F. Parallel to B K L draw C V, E F J, D O and A N. At right angles to L N draw L Q, V R, J U, O S and N W; make L Q and N W each equal F H, connect Q W, make J X T U equal E P G H; then W Q is the major axis and J U the minor axis of the larger ellipse produced by the cutting plane L N. The axes of the smaller ellipse are S R and X T. If this cylinder were a solid the oblique section derived from it would be the larger ellipse only, but by using the hollow cylinder with its concentric circles, concentric ellipses are also produced on the same plane, showing that concentric ellipses are not and cannot be parallel ellipses (or with equidistant curve lines like concentric circles) but their axes lie on the same axial lines and are in the same proportion. Geometrically, in drawing ellipses without regard to their production from solids, let Y U W be a given quarter-ellipse, and requiring an adjoining ellipse whose semi-minor axis is Y T; then to find the proportionate semi-major axis, draw U W, and from T draw T S parallel to U W, and Y S will be the semi-major axis sought. This may also be found arithmetically by the rule of proportion.

An Elliptic Line Parallel or Equidistant from a Given Ellipse is Impossible.—The mathematical law of the ellipse is, that axes of adjoining or concentric ellipses must be in proportion; and when this law is disregarded, say by drawing another ellipse adjoining a given one, increasing or diminishing the axis equally and not proportionately, the elliptic curves approach and are only equidistant at the four points of their axes. The following diagram will serve to prove that it is impossible to draw an elliptic line parallel or equidistant from a given ellipse: Let C E (Fig. 8) be the semi-minor and C B the semi-major axis of a given ellipse; increase these semi-axes E D and B A equally for an adjoining ellipse whose semi-axes are C D and C A. With both these semi-major and semi-minor axes marked on a strip, as explained at Fig. 3, find points as shown in the curves of both ellipses at the same time, as M N, O P, F G, J K, &c. Draw lines through N M, P O, G F, K J, &c., showing the position of trammel-rod at each movement in describing the elliptic curves; also trace the curve of the given ellipse B M O F J E, and of the adjoining ellipse A N P G K D. Now, if E D or B A be taken for radius and M, O, F, J, &c., each be taken for centers, and from these centers the arcs N Q, P R, G H, K L, &c., described, two things will be observed; first, that the line A N P G K —D of the adjoining ellipse is not parallel to the given elliptic line B M O F J—E, for if it were parallel the arcs Q R H L, &c., would tangent the elliptic line A D; 2, that if a curved line be traced touching the arcs A Q R H L—D, &c., that would not be an elliptic line, although it would be parallel and equidistant to the given elliptic line B E, thus showing that parallel or equidistant elliptic lines cannot be described. The ellipse is described from two fixed points moving together on given axes constantly in line, but in this case (as both curves are produced from the same points of movement, because the increase of axes is alike) when the pencil is at J the point K of the joining ellipse will occur on the line J K; then the lines M N, O P, F G, J K, &c., show the changes as before mentioned at each movement of the trammel-rod or strip, showing, too, that the rod or strip at no point between the axes takes a position

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normal to the curve while the distance from curve to curve on these changing lines is constant, but oblique to the curves and most oblique at about the points F G and J K; and in this way the two elliptic curves approach.

An Instrument that Describes Equidistant Lines from Given Ellipses.—This instrument is provided with two slotted legs, S V, S V, Fig 9, two equal arms, V A, V A, and a slotted guide-piece, N O. instrument, describing the required line D Z C B. As the instrument moves the slotted guide-piece N O is constantly normal to the curve as originally placed and shown by X X, which is normal to the curve at the point T.*

To Describe an Oval Resembling an Egg.—One of the most remarkable properties of the oval kind is the following, which may be generated mechanically by the aid of a pivoted arm connected with a slotted strip L revolve the arm on its center, J, describing the oval L P G N L.—*Nicholson's Dictionary of Architecture.*

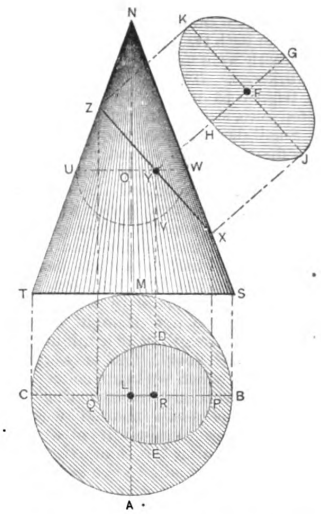


Fig. 6.—The Ellipse as Derived from a Cone.

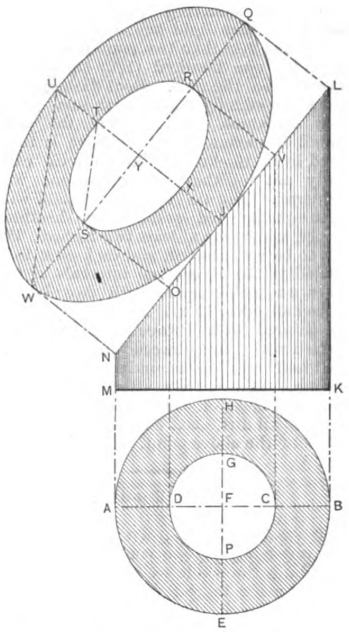


Fig. 7.—The Ellipse Produced from a Cylinder.

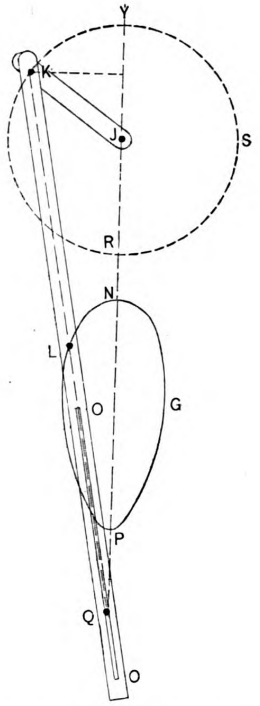


Fig. 10.—Method of Describing an Egg-Shaped Oval.

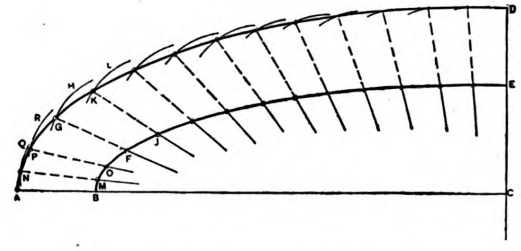


Fig. 8.—Diagram Showing that an Elliptic Line Parallel or Equidistant from a Given Ellipse is Impossible.

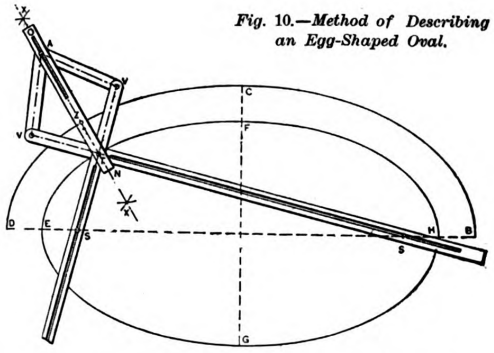


Fig. 9.—Instrument for Describing Lines Equidistant from Given Ellipses.

THE ELLIPSE.—A SECTION OF A CONE AND OF A CYLINDER.

The distance from the pivot T to either of the pivots V V is equal. The arms V A, V A move equally as the angle changes on the pivots V V, held together by the pivot at A, which also slides with the changing angles in the slotted guide-piece N O. Let H F E G H be a given ellipse, S S the foci; the string of the required length is fastened as usual with pins through the slot at S S and passed around the pivot under T, moving about it freely as the instrument is moved, the same as it would around the point of a pencil. To describe an equidistant line from the given ellipse: Place the pencil, say, at Z and with a gentle pressure at N move the

of metal or other material. Let J K, Fig. 10, be the arm and K Q the strip slotted at O O. The arm is pivoted with the strip at K, and is also pivoted at J, and in the movement revolves on the center J, describing the dotted circle K R S Y. To describe the oval let J K equal half its required length; draw the line Y R Q and the line K Q; drive a pin through the slot at Q, and with a pencil held at the point

* The instrument here described is the invention of John C. Babcock, architect and superintendent of the Mechanics' and Tradesmen's Free Evening Drawing School, New York City.

Tin Roof Formulæ.

Merchant & Co., Philadelphia, are sending to the architects a very serviceable little pamphlet that ought to save the architects much trouble, and at the same time work to the benefit of the roofing trade. The pamphlet, entitled "Formulæ; How to Secure a Good Tin Roof," is of convenient size, neatly bound in paper, and contains specifications for flat and standing seam roofs of the two common sizes of plates. The specifications, Merchant & Co. write us, are simply intended as a reference for the architects, and that while they have inserted their own brand in them yet any brand that the architect may choose to use may be readily substituted. The leaves of the pamphlet are perforated, so that the one desired may be easily torn out. The specifications following are copyrighted by Merchant & Co.

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Flat Seam Tin Roof, Using 28 *x* 20 *Inches Size Sheets.*—Roof to be covered with "Merchant's Roofing" brand of roofing tin; each sheet to be stamped with brand and thickness. Sheets to be of IC thickness, 28 x 20 inches size; flat seam. When edged the sheets are to show 19 x 27 inches exposed on the roof. The seams to be well soldered with guaranteed half-and-half solder—rosin being used as a flux. The soldering irons should not weigh less than eight pounds to the pair, using not less than six pounds of solder to every one hundred (100) square feet exposed on the roof. Roof flashed up at sides, and counter-flashed with same brand and thickness. For gutters the same brand of roofing plate as above is to be used in IX thickness. Have the tin carefully put together, and the seams well soldered. The tin to be underlaid with best quality red rosin sized sheathing paper, laid to lap at least two inches. Barbed wire nails, No. 12 x 1 inch to be used every five inches in nailing the tin to the boards. The tin to be painted with Prince's metallic paint, mixed with pure linseed oil (half boiled and half raw) on the under surface before laying. Immediately after roof is laid, carefully clean off the rosin at seams; remove all dirt, etc., and then apply two coats of the above paint.

Flat Seam Tin Roof, Using 14 *x* 20 *Inches Size Sheets.*—Roof to be covered with "Merchant's Roofing" brand of roofing tin; each sheet to be stamped with brand and thickness. Sheets to be of IC thickness, 14 x 20 inches size; flat seam. When edged the sheets are to show 13 x 19 inches exposed on the roof. The seams to be well soldered with guaranteed half-and-half solder—rosin being used as a flux. The soldering irons should not weigh less than eight pounds to the pair, using not less than eight pounds of solder to every one hundred (100) square feet exposed on the roof. Roof flashed up at sides, and counter flashed with same brand and thickness.

For gutters the same brand of roofing plate as above is to be used in IX thickness. Have the tin carefully put together and the seams well soldered.

The tin to be underlaid with best quality red rosin sized sheathing paper, laid to lap at least two inches. Barbed wire nails, No. 12 x 1 inch, to be used every five inches in nailing the tin to the boards.

The tin to be painted with Prince's metallic paint, mixed with pure linseed oil (half boiled and half raw) on the under surface before laying. Immediately after roof is laid carefully clean off the rosin at seams; romove all dirt, &c., and then apply two coats of the above paint.

Standing Seam Tin Roof, Using 28 *x* 20 *Inches, Size Sheets.*—Roof to be covered with "Merchant's Roofing" brand of roofing tin; each sheet to be stamped with the brand and thickness. Sheets to be of IC thickness, 28 x 20 inches size; standing seam. When edged the sheets are to show 17¼ x 27¼ inches exposed on the roof. The seams to be well soldered with guaranteed half and half solder—rosin being used as a flux. The soldering irons should not weigh less than 8 pounds to the pair, using not less than 1¼ pounds of solder to every 100 square feet exposed on the roof. Roof flashed up at sides, and counter flashed with same brand and thickness. For gutters the same brand of roofing plate as above is to to be used in IX thickness. Have the tin carefully put together, and the seams well soldered. The tin to be underlaid with best quality red rosin sized sheathing paper, laid to lap at least two inches. The tin to be well cleated, and each cleat to be nailed to the boards, at intervals of not over 14 inches apart with two barbed wire nails, No. 12 x 1 inch. The tin to be painted with Prince's metallic paint, mixed with pure linseed oil (half boiled and half raw) on the under surface before laying. Immediately after roof is laid, carefully clean off the rosin at the seams; remove all dirt, &c., and then apply two coats of the above paint.

Standing Seam Tin Roof, Using 14 *x* 20 *Inches Size Sheets.*—Roof to be covered with "Merchant's Roofing" brand of roofing tin; each sheet to be stamped with the brand and thickness. Sheets to be of IC thickness, 14 x 20 inches size; standing seam. When edged the sheets are to show 11¼ x 19¼ exposed on the roof. The seams to be well soldered with guaranteed half-and-half solder, rosin being used as a flux. The soldering irons should not weigh less than eight pounds to the pair, using not less than two pounds of solder to every one hundred (100) square feet exposed on the roof. Roof flashed up at sides and counter-flashed with same brand and thickness. For gutters the same brand of roofing plate as above is to be used in IX thickness. Have the tin carefully put together and the seams well soldered. The tin to be underlaid with best quality red rosin sized sheathing paper, laid to lap at least two inches. The tin to be well cleated, and each cleat to be nailed to the boards at intervals of not over 14 inches apart with two barbed wire nails, No. 12 x 1 inch. The tin to be painted with Prince's metallic paint, mixed with pure linseed oil (half boiled and half raw), on the under surface before laying. Immediately after roof is laid, carefully clean off the rosin at the seams; remove all dirt, &c., and then apply two coats of the above paint.

Carcass Roofing.

In small buildings, says J. Robison, all the rafters are of one kind; but in great buildings the whole weight of the covering is made to rest on a few principal rafters, which are connected by beams placed horizontally, and either mortised into them or scarfed on them. These are called purlins. Small rafters are laid from purlin to purlin, and on these the laths for tiles or the skirting boards for slates are nailed. Thus the covering does not immediately rest on the principal frames. This allows some more liberty in their construction, because the garrets can be so divided that the principal rafters shall be in the partitions and the rest left unencumbered. This construction is so far analogous to that of floors which are constructed with girders, binding and bridging joists. It may appear presuming in us to question the propriety of this practice. There are situations in which it is unavoidable, as in the roofs of churches, which can be allowed to rest on some pillars. In other situations, where partition walls intervene at a distance not too great for a stout purlin, no principal rafters are necessary, and the whole may be roofed with short rafters of very slender scantling. But in a great uniform roof, which has no intermediate supports, it requires at least some reasons for preferring this method of carcass roofing to the simple method of making all the rafters alike. The method of carcass roofing requires the selection of the greatest logs of timber, which are seldom of equal strength and soundness with thinner rafters. In these the outside planks can be taken off and the best part alone worked up. It also exposes to all the defects of workmanship in the mortising of purlins and the weakening of the rafters by this very mortising, and it brings an additional load of purlins and short rafters. A roof thus constructed may surely be compared with a floor of similar construction. Here there is not a shadow of doubt that if the girders were sawed into planks, and these planks laid as joists sufficiently near for carrying the flooring boards, they will have the same strength as before, except so much as is taken out of the timber by the saw. This will not amount to one-tenth part of the timber in the binding, bridging and ceiling joists, which are an additional load, and all the mortises and other joinings are so many diminutions of the strength of the girders, and as no part of a carpenter's work requires more skill and accuracy of execution, we are exposed to many chances of imperfection.

But, not to rest on these considerations, however reasonable they may appear, we shall relate an experiment made by one on whose judgment and exactness we can depend. Two models of floors were made, 18 inches square, of the finest uniform deal which had been long seasoned. The one consisted of simple joists and the other was framed with girders, binding, bridging and ceiling joists. The plain joists of the one contained the same quantity of timber with the girders alone of the other and both were made by a most accurate workman. They were placed in wooden trunks 18 inches square within and rested on a strong projection on the inside. Small shot was gradually poured in upon the floors so as to spread uniformly over them. The plain joisted floor broke down with 487 pounds and the carcass floor with 327. The first broke without giving any warning and the other gave a violent crack when 294 pounds had been poured in. A trial had been made before and the loads were 341 and 482; but the models having been made by a less accurate hand, it was not thought a fair specimen of the strength which might be given to a carcass floor. The only argument of weight which we can recollect in favor of the compound construction of roofs is that the plain method would prodigiously increase the quantity of work, would admit nothing but long timber, which would greatly add to the expense, and would make the garrets a mere thicket of planks. We admit this in its full force, but we continue to be of the opinion that plain roofs are greatly superior in point of strength and therefore should be adopted in cases where the main difficulty is to insure this necessary circumstance.

Zinc and Brick Work.

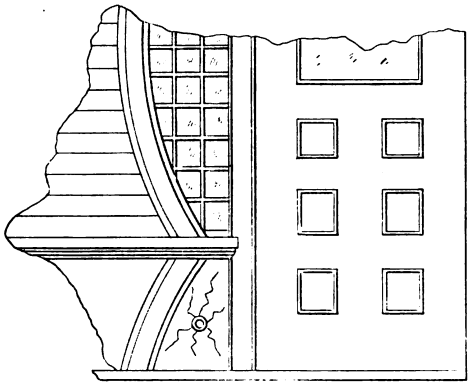
Recent experience in Germany points to the fact that under some conditions sheet zinc, when in direct contact with brickwork, suffers from rapid corrosion. It appears that in building the Berlin City market halls some sheet-zinc work which rested upon brick walls was deeply pitted at a number of places, and particularly where the metal was in direct contact with the bricks. Chemical examination of these showed that they contain as high as 1.14 per cent. of soluble salts, capable of producing the destructive effects noted, and stimulated to more energetic action by moisture. The proportion of such salts will vary with different kinds of bricks, and in some there may be nothing to induce such corrosion as that here noted. It would be an advisable, and, in the end, a cheap precaution to avoid immediate contact of sheet zinc and brickwork by inserting a layer of roofing-felt or similar material.

IT IS STATED that Knoxville, Tenn., is the center of the greatest hardwood timber belt in America. The conditions are most favorable for forest growth and the greatest variety of timber and woods are found in the territory adjacent to that city. Poplar, cucumber, white ash, cherry, walnut, hickory, several varieties of oak, chestnut, maple, beech, buckeye, red birch, elm, basswood, sycamore, gum, peawood, sourwood, holly, persimmon, white pine, yellow pine, hemlock, spruce and balsam are said to grow in abundance.

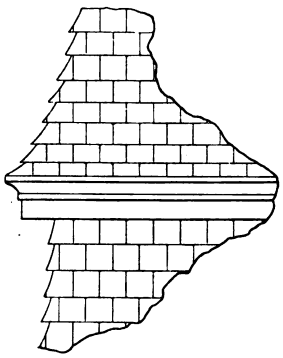
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CHURCH AT HOLLY, MICH.

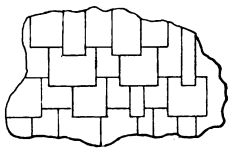
THE ELEVATIONS and floor plan which we present on our double plate this month represent a church erected at Holly, Mich., at a cost of about $8,000, from drawings furnished by A. C. Varney & Co., Architects, Detroit, Mich. It will be observed from an inspection of the floor plan that in the front of the church are two parlors, separated from each other and from the auditorium by means of drop doors, while in the rear of the church, with a door opening at the pulpit, is the pastor's study. The auditorium has a seating capacity of about 400. The building is finished inside with ash and painted outside in mild colors. Heat is furnished from a hot air furnace. The church was built for the "Presbyterian Society." The details are given on this page.



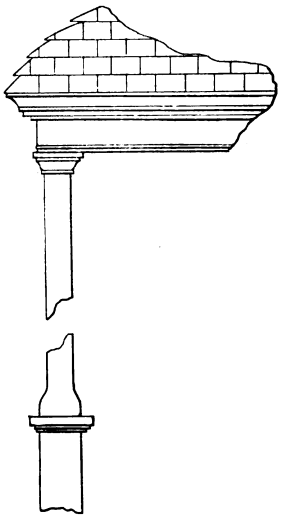
Detail at Front Door.



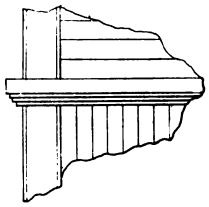
Tower Cornice.



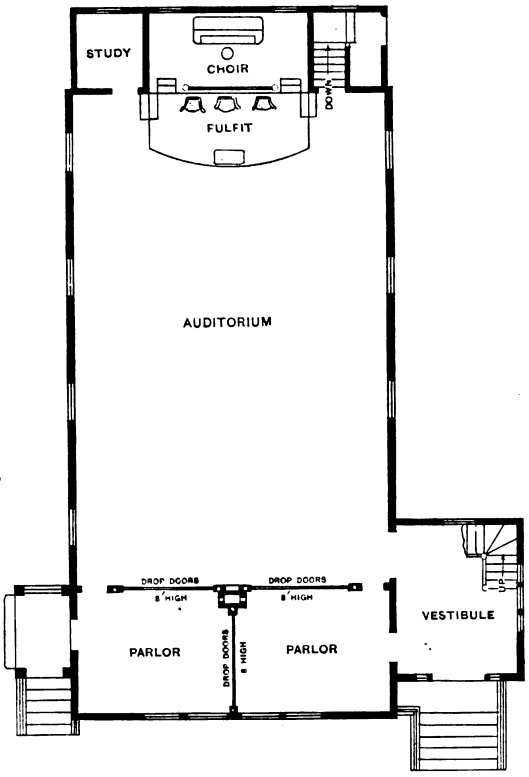
Shingling in Gable.



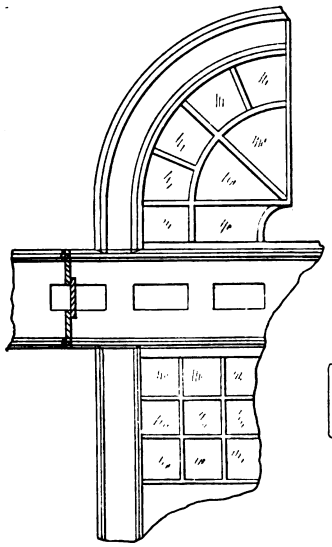
Porch at Side.



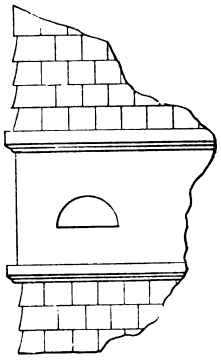
Sill Course.



Floor Plan.



Top of Large Windows.



Tower Belt Course.

Church at Holly, Mich.—Scale, Floor Plan, 1-16 Inch.—Details, ⅜ Inch to the Foot.—(Elevations See Plates X and XI.)

Vermont Slate Trust.

The committee on revision of by-laws, says the Poultney (Vt.) *Journal*, ended its labors after thorough considerations of the points requiring amendment and the annual election of officers took place Tuesday, January 14. The old board was re-elected entire The board of direction is enlarged by the election of Mr. Pinkham, of the Anifan slate trust, Boston, and Mr. Willis, of the Penrhyn Slate Company, Middle Granville. Some knotty points are understood to have come up for discussion, but happily all differences, centering mainly in the question of commissions on sales, were amicably composed and the trust enters upon its third year with better outlook than at any previous time in its history. It is known that stocks on hand in the West are down to an extreme minimum so that while December of the year just closed showed very light sales as compared with the same month in 1888, when a cut freight rate stimulated an unexampled movement in sea green slate—the spring trade soon to open will not be restricted by the plethoric condition of the market as it was a year ago by the heavy shipments of the previous

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December. Prices, on the the whole, remain about as they were, some changes being made in transposing certain sizes from one class to another. Griffith & Nathaniel remain outside the pool, but arrangements have been effected by which, with the exception above named, the whole sea green product will find market through the trust. Shipments by the trust for the year ending December 31 were 115,339 squares. Twenty-one thousand squares is the estimated quantity mined and shipped outside of the trust, making the aggregate product of the sea-green slate region 136,339 squares, or about 2730 carloads.

Design for a Schoolhouse.

We present in plate IX the perspective view and floor-plan of a district schoolhouse, designed by C. Powell Karr, of New York City. The building has two schoolrooms, with accommodations for 100 children. The material of which the building is to be erected is brick for the foundations and weather boarding to the eaves. The front porch is designed to be inclosed by the regular roof, and can be still further inclosed in winter by means of glass doors and windows. One of the features of this design is found in the provision for separate coat and cloak rooms for boys and girls, and library and teachers' study in the rear. Ventilation is afforded by means of foul air flues for each room, heated by a central smoke-flue. Transoms are provided over the principal windows, opening inward so as to prevent drafts on the heads of the pupils. The cloak-rooms are placed in a separate hall in such a manner as to be thoroughly ventilated. The author estimates the cost of this structure, exclusive of heater, at $2500 finished in stained pine, and $2800 finished in hard wood.

The Building Trades and Personal Names.

The study of personal names, their origin and precise meaning is a subject of interest to every one. Looking over a directory or glancing at the names on the business signs, or even going through the cards of one's business acquaintances, brings up many queries as to the meaning of names. Everyone has very firmly settled in his own mind a notion about the origin of such names as Smith, Brown, Gray, Wood, Stone, &c. Investigation, however, can be continued much further and some very pleasing results are sometimes developed. One of our English exchanges a short time since gave attention to the building trades of mediæval times as reflected in places and personal names. The following extract will undoubtedly prove of interest·

Shakespeare uses the term, "wearing the complexion upon the sleeve," by which a man may be known to the passer-by. We find the parallel of this in personal names, for there are numbers among whom we elbow our way in life who wear the trade names of their ancestors, which denote that some 500 years ago, or probably at the coming of William of Normandy, they were members of the then building trade. To such men it would be out of place to say "they had no grandfathers," for they wear proof in their names of a long line of ancestry. In the building trade of these early times the craftsmen were, broadly speaking, divided into three classes—viz., the workers in metal (smiths), the workers in stone (masons), and the workers in wood (wrights). These primary sources of nomenclature produce an interesting crop of shoots or branches, some of which are so warped and twisted by the attrition of time as to be scarcely recognized in our day. The great sources of iron were in Kent, South Yorkshire and the Forest of Dean. There it was smelted by wood on the highest hills, the blasts of wind on these elevated spots being the only blasts at the command of these primitive furnaces. These old iron-works are reflected in such names as Windhill, Windle, Windibank, Windlowe, Winesbank, Winship (Winsopwindhill) &c.; and the preparers of the fuel—the charcoal burners in the woods—in Collier and Coleman, names which have nothing to do with the pit coal of our day or the sea coal of former times. The ore was no doubt, wrought into ingots and bars by the smith at his anvil; but water-power was subsequently brought into use, and hence the forges, forge mills, forge valleys, &c., which abound in our rural districts, the great hammers of which, lifted by pegs in revolving beams of wood, were the forerunners of the steam-hammers and the rolling-mills of our day. The dealers in iron, the iron merchants of the past, were the Ironmongers, a surname we occasionally find.

The great trade of the ironsmith was divided into a number of branches—the locksmith, bridlesmith (lorimer), girdlesmith, nailsmith, arrowsmith, knifesmith, bladesmith, shearsmith, whittamsmith, &c. The building trade, as carried on in early times, did not call for much assistance on the part of other than the locksmith, and hence there was no special section of the great family of Smiths associated therewith.

The Masons were not, as now, divided into stone and marble masons; but they undoubtedly represented the older race of Stonehewers, a name we occasionally find clipped down to Stonier. They may further be taken as the architects of their time, so far as stone was concerned, as this was undoubtedly the office of the master masons. We do not find this as a surname; but Master, Masterman and Forman are common names, which are, no doubt, associated therewith. The sites of the old quarries are marked in such place names as Stanfield, Stanton, &c., and the works they carried out as Stonechurch, Stonehouse, Stanbridge, &c.

The most important craftsmen connected with the building trade in mediæval times were the Wrights, or workers in wood. With the exception of churches and fortifications, which, after the Norman Conquest, were invariably of stone, the building trade was principally carried out in wood, a system that obtained, broadly speaking, down to the period of the Reformation.

This great family of the Wrights, like the smiths, was subdivided; but the divisions were strictly confined to wood, although the origin of the word is "a worker generally." The earliest form in which we find it applied to wood or timber is as Tree-wright, for "tree" was the original form of wood or timber, and hence we find it used in this sense even in our day—instance, rooftree, sidetree, axletree, singletree, tree-nail, &c. The subdivisions of wright are seen in Wheelwright, Cartwright, Wainwright, Plowright, Millwright, Arkwright, Chestwright (sometimes corrupted to Cheesewright), &c., the two latter being the ark or chest makers—the cabinetmakers of those times—whilst the Wrights pure and simple were the house builders — the equivalents of the French or Norman carpenters.

We may here note that nearly all names commencing in "wood" have changed by euphony to "good." Goodlaw may be taken as a corrupted form of Woodlaw, the terminal "law" being "low"—a hill, and hence it implied woodhill. The personal names of Woodman and Goodman are often seen, whereas the varient forms of Woodfeller and Goodfellow are rarely met with. The most ordinary form in which we find the first operators upon wood is that of Woodhewer; but it is generally met with in the following forms; Woodyeare, Woodyer, Goodyeare, Goodyer, Goodyere, Goodear, Goodere, or Goodhare.

We next find it in the hands of the Sawyer, where, side by side, we find the older Teutonic form of Sager and Ager, from "sag" a saw. We next find the wood in the public markets, as may still be seen in Sweden and Norway, and hence the street and place names in our old towns; instance Wood street, Cheapside, London; Wood hill, Grantham; Timber hill, Nottingham, and Norwich, &c., all of which indicate wood markets of old.

Constructions of wood are indicated in Acchurch (oak church), Woodchurch, Woodhouse, Woodbridge, &c.

The framework of the house being put up by the old wrights, other craftsmen lent assistance in perfecting the structure. The Dauber came in with his rubble or his bricks to fill up the spaces between the oaken framing, a tradesman who was followed by the Pargiter, who would face and make good with clay or plaster; brickmakers and bricklayers are not mentioned, for bricks in these early times were called tiles, the brickmakers tilers, and the brickyards tileries or tile-houses. This does not imply that tiles were not made and used, for such was the case, although they occupied a subordinate position to bricks. Tiles properly were fixed by tilers, and hence our Tylers; but they were, nevertheless, the bricklayers of those days.

The Slater was known, but his office was connected with slats of wood or shingles. This may be taken as a distinct name, another part developing the varient form of Shingler. Shingles are in common use in Northern Europe and in America, where the trade of the shingler still exists.

The covering of buildings was an important branch, and gave name to several trades. The oldest were the helliers, a name we sometimes find in the form of Heller. It is equivalent to cealer, from whence we obtain our ceiling, a covering.

A large branch of these roof coverers were the thatchers, names which now appear as Thaker, Thacker, Theaker and Theker. The terminal "er," as in the poulter*er*, became duplicated, and hence Thackerer, Thackeray, Thackery, Thackrals, &c.

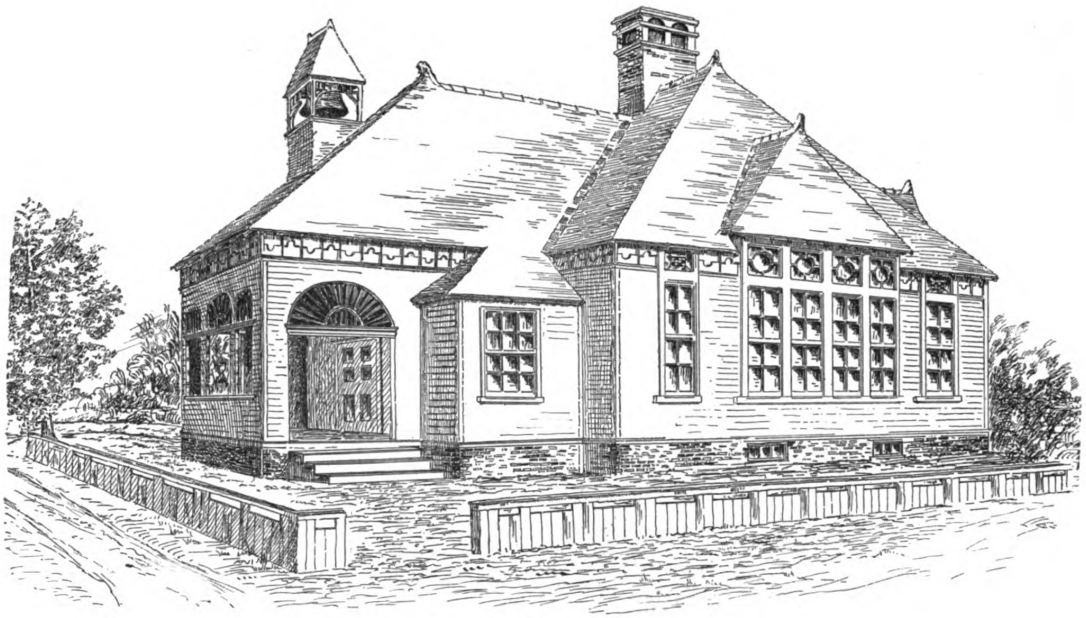
Another branch, more associated with the better class of buildings, were the lead-beaters, which are sometimes met with in the forms of Leadbitter and Leadbetter. A later form of this trade name, and one of Norman origin, is Plumber, corrupted to Plummer or shortened to Plumb.

Camden says: "Whoever reads the life of Benedict, Biscop-Abbot of Wearmouth, will admire his industry in being the first man that ever brought masons and glaziers to England." This may be true in the case of masons; but stonehewers, no doubt, existed long before his time. In the instance of the glazier it may be true, for the trade appears in such personal names as Glasier, Glasyer, Glassman and Glasswright.

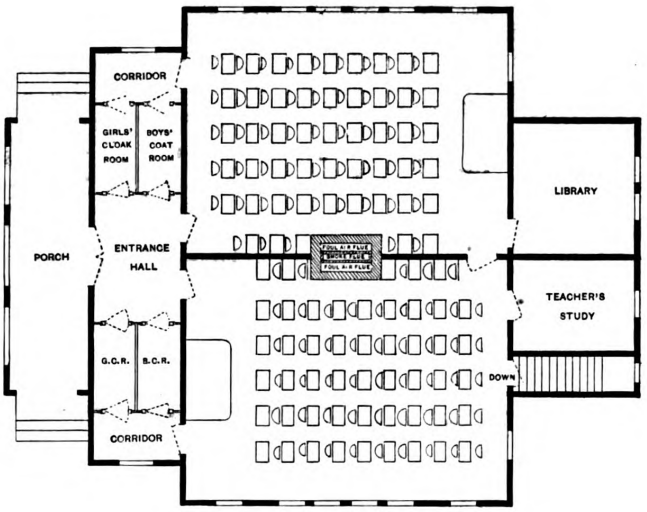
This trade followed that of the horner, for glass as a medium for transmitting light followed and gradually superseded thin plates or sheets of horn. The horners were generally supposed to have been lantern makers; but their trade extended to the glazing, so to speak, of windows, and we can instance such windows being in use in the rural districts of England down to a few years ago.

Such, then, are a few of the lights reflected upon the building trade of Mediæval times by place and personal names, a study which cannot fairly be termed either barren or uninviting.

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PERSPECTIVE VIEW.

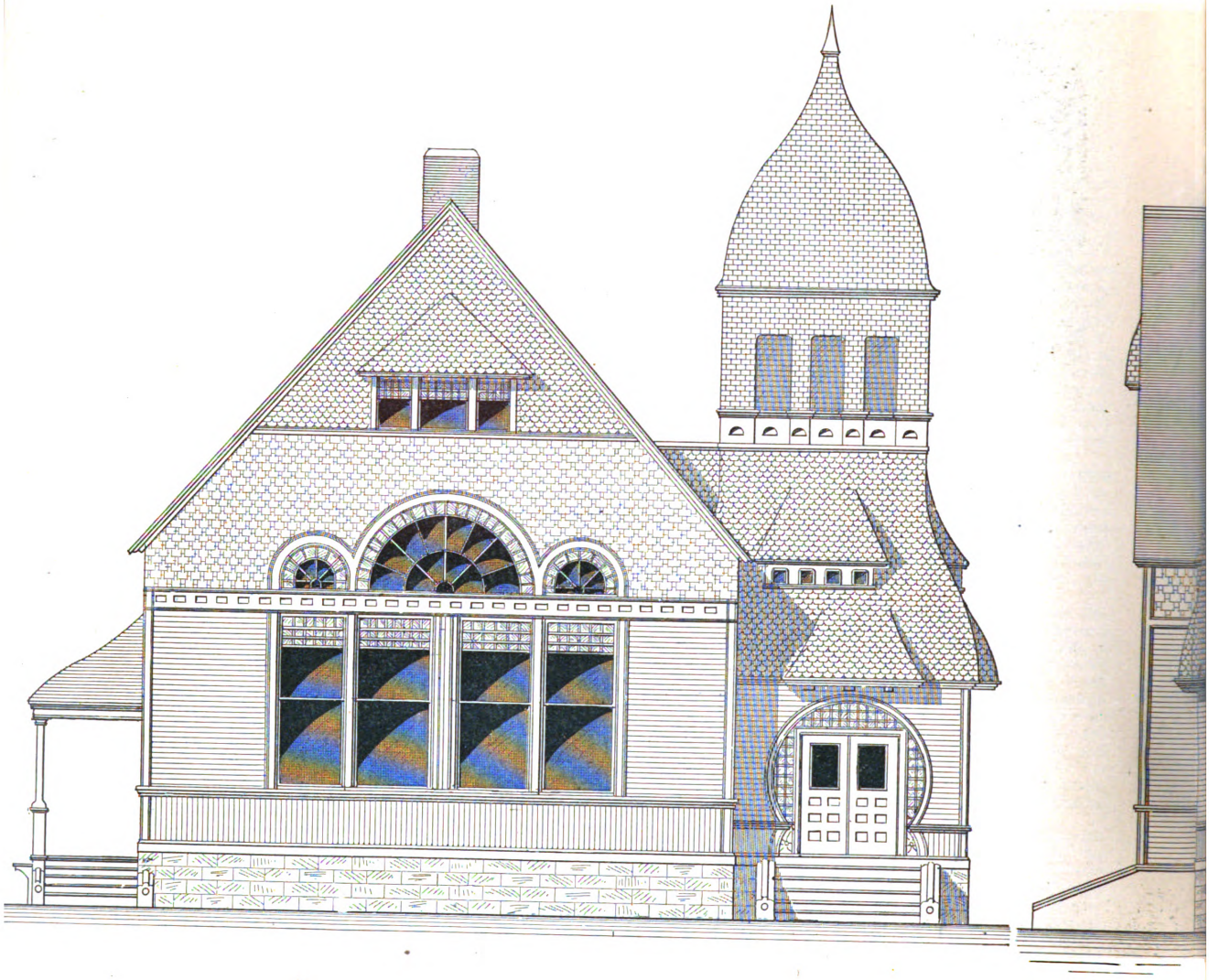


FLOOR PLAN.—Scale, 1-16 inch to the Foot.

DESIGN FOR A SCHOOL HOUSE.

C. POWELL KARR, Architect, New York.

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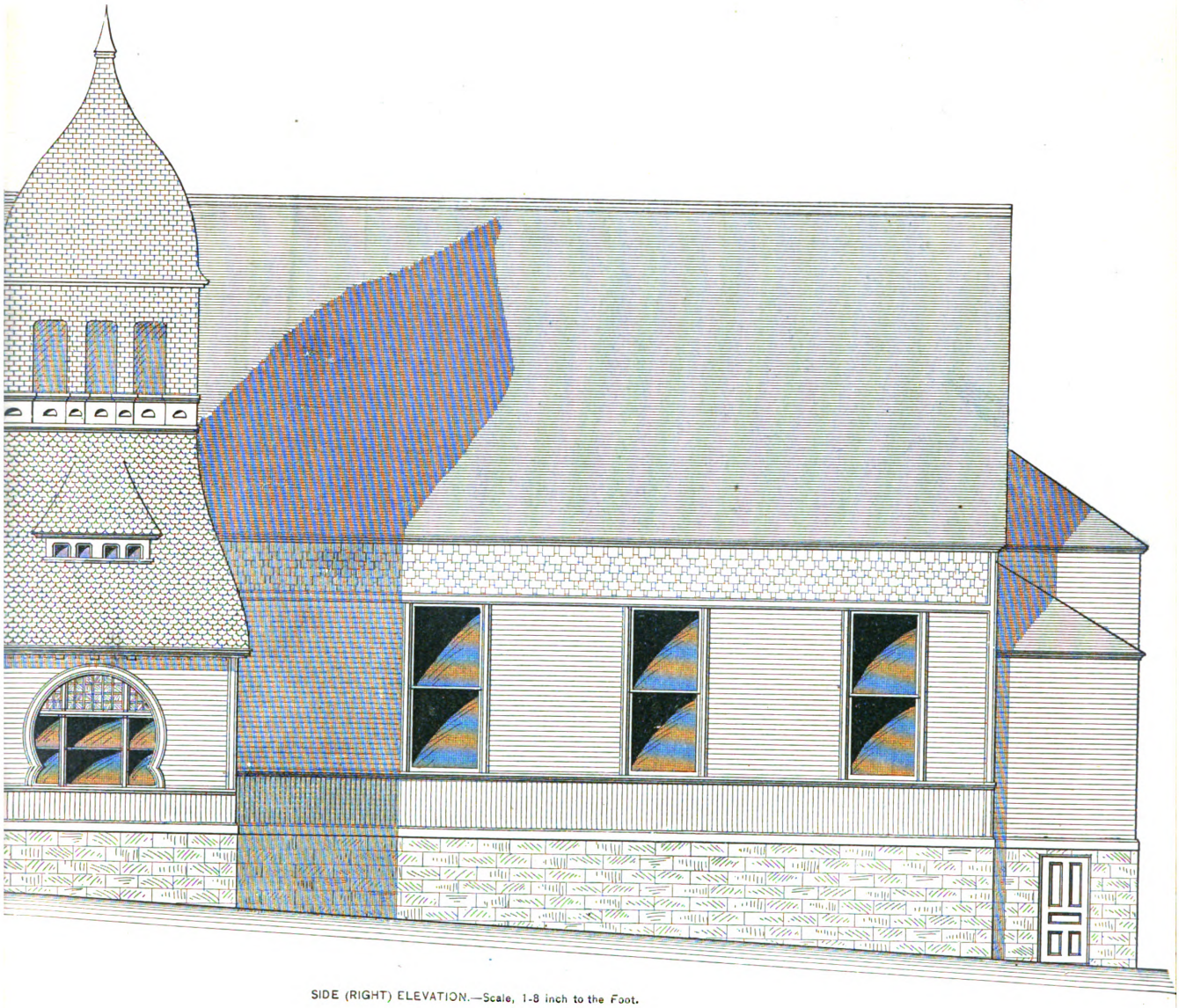
FRONT ELEVATION.—Scale, 1-8 inch to the Foot.

CHURCH AT

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SIDE (RIGHT) ELEVATION.—Scale, 1-8 inch to the Foot.

OLLY, MICH.

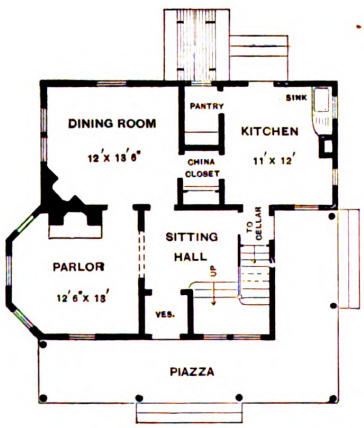
A. C. VARNEY & CO., Architects, Detroit.

For Details, see pages 53.

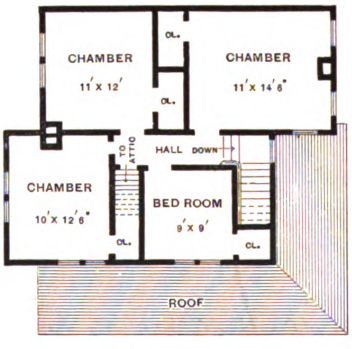
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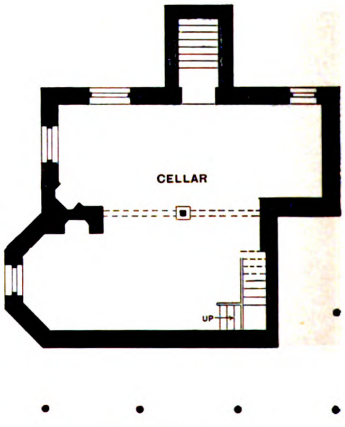
PERSPECTIVE VIEW.



FIRST FLOOR PLAN.



SECOND FLOOR PLAN.



FOUNDATION PLAN.

Scale, 1-16 inch to the Foot.

DESIGN FOR SEVEN-ROOM HOUSE.

W. P. ROBINSON, Architect, Albany, N. Y.

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A SEVEN-ROOM HOUSE.

ON THIS and the following pages we show the elevations and miscellaneous details of a house designed by W. P. Robinson, of 86 State street, Albany, N.Y. The perspective view and floor plans are shown in Plate XII. Inspection of the engravings will show that there are three rooms upon the first floor, in addition to a large hall designed to be used as a reception room. Entrance to the hall is through a vestibule, which is calculated to protect the interior from inclement weather. From the reception hall access is obtained to the kitchen, dining room and parlor. The kitchen is provided with range and sink, and has opening from it a large pantry and a china closet, the latter leading to the dining room. The china case in kitchen and dining room is provided with doors above and drawers below the counter. The cellar is reached by stairs placed under the main flight. Upon the second floor are four chambers, all of which are conveniently reached from the main stairs. Each chamber is provided with an ample closet fitted with hooks.

From the architect's specifications we learn that the first and second and attic floor timber is to be 2 x 8 inch stuff, 16 inches on centers; the sill, 4 x 6 inches; rafters, 2 x 10 inches, 20 inches on centers, doubled for hip and valleys. The short spans are 2 x 8 inches; the ridge, 2 x 10 inches; piazza sill and plate, 4 x 6 inches. The floor timbers and rafters are 2 x 6 inches, 20 inches on centers. Floor timber is to be bridged every sixth foot with ½ x 3 inch XX bridging. The studs are to be of 2 x 4 inch stuff, 12 inches on the centers and the angle stud 4 x 6 inches. The studs are to be doubled about all openings. All outside wood finish is to be of clear white pine, the outside casing being 1¼ inches thick. The ceiling of the piazza is to be of ⅝ x 3 inches matched



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



Front Elevation and Section.—Scale, ⅛ Inch to the Foot. See Plate XII for Perspective and Floor Plans.

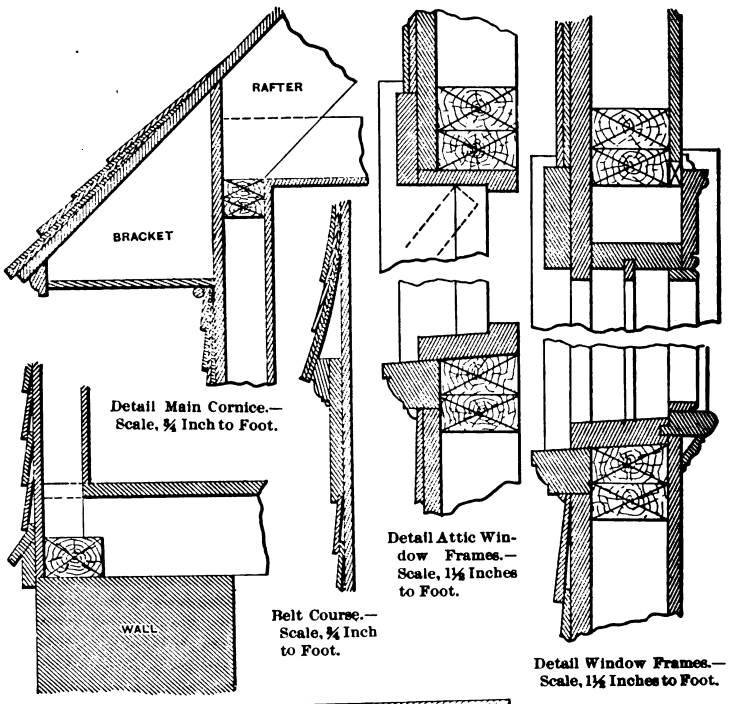
DESIGN FOR A SEVEN-ROOM HOUSE.

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and beaded battens with bead at angles. The roof, face of gable, side of dormer and under second story is to be shingled. The first story is to be clapboarded with ½ inch pine clapboards laid 4½ inches to the weather. The rail, newal, balusters and parlor mantel are to be of oak, while the other finish of first and second stories is to be of white pine. The entire exterior wood work is to be given three coats of paint, while the chimnies are to be given two coats. The roof shingles are not to be painted. The hard wood stairs and mantel are to be treated to one coat of shellac and one coat of varnish and rubbed down with pumice-stone and oil, all other work of the first and second stories is to be painted in three coats. All the windows, except attic and first story hall windows, are to be provided with blinds.

THE New York State Assessor, James L. Williams, in his annual report shows that there is an increased assessment of real estate over the preceding year of $990,583,117, and an increased assessment of personal property of $7,646,595, making the total for 1889 $4,567,429,757. The assessors say that the personal property in the State liable to taxation is fully equal to the assessed value of the real, while the real pays more than 90 per cent. Thus $2,500,000,000 escapes assessment. In 1889 $159,185,872, or about one-half of the total assessed value of personal property in the State, was invested in new corporations, and since 1886 the capital invested in corporations is nearly $600,000,000, while the bonded indebtedness of the corporations of the State, nearly all of which escapes taxation, is over $2,000,000,000. Thirty-nine counties show increases in real estate values and 21 show losses. The assessors says the complaints relative to the equalization of New York County are without foundation; that the sales public and private, made in New York show that the assessment is not more than 50 per cent. of the full value.

Contracts are soon to be awarded for extensive new market buildings in Philadelphia.



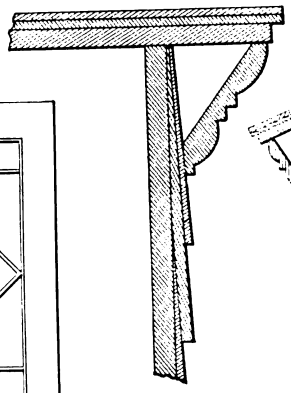
Detail Main Cornice.—Scale, ¾ Inch to Foot.

Detail Water Table.—Scale, ¾ Inch to Foot.

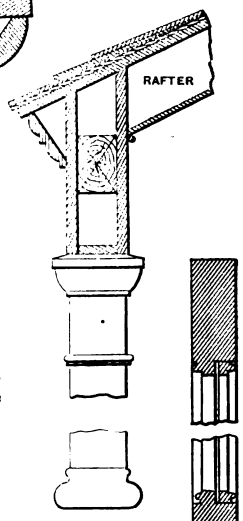
Belt Course.—Scale, ¾ Inch to Foot.

Detail Attic Window Frames.—Scale, 1½ Inches to Foot.

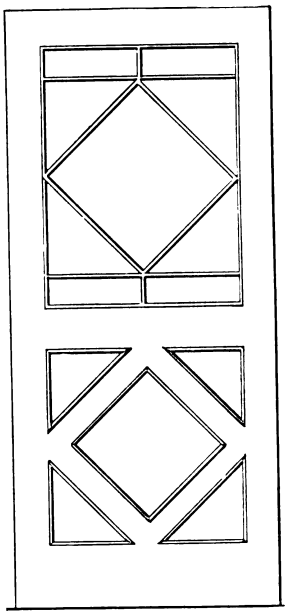
Detail Window Frames.—Scale, 1½ Inches to Foot.



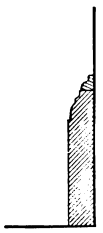
Detail of Rakes to Gables.—Scale, 1½ Inches to Foot.



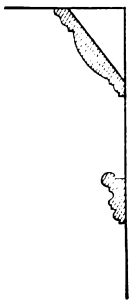
Detail Piazza Cornice.—Scale, ¾ In. to Foot.



Front Door.—Scale, ½ Inch to Foot.



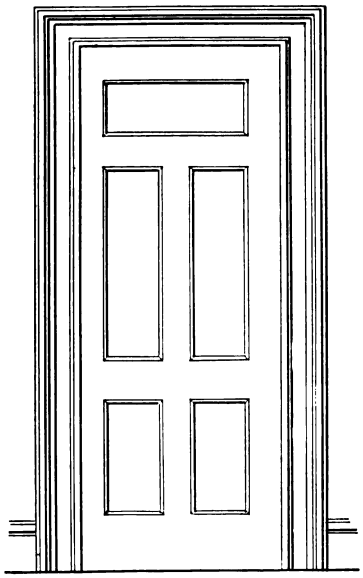
Wainscotting.—Scale, 1½ In. to Foot.



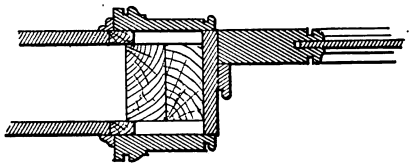
Detail Cornice and Picture Mold.—Scale, 1½ Inches to Foot.



Section of Front Doors.—Scale. 1½ In. to Foot.



Detail of Doors.—Scale, ½ Inch to Foot.

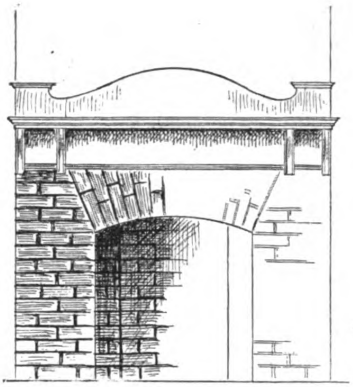


Section through Inside Doors.—Scale, 1½ Inches to Foot.

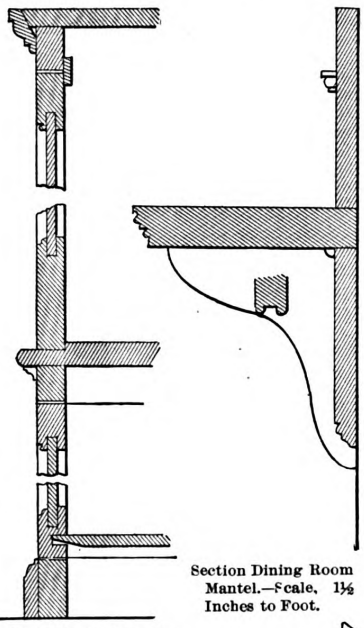
DESIGN FOR SEVEN-ROOM HOUSE.—DETAILS.

(*See Plate XII for Perspective and Floor Plans.*)

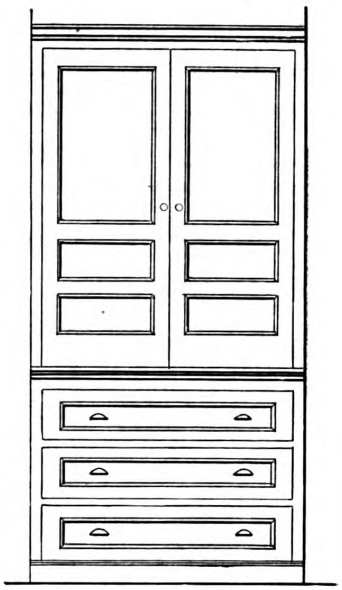
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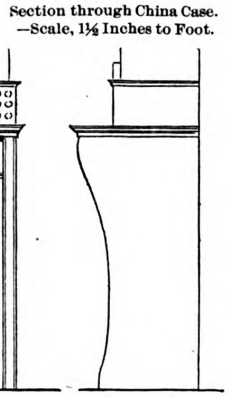
Elevation of Dining-Room Mantel.—Scale, ⅜ Inch to the Foot.



Section Dining Room Mantel.—Scale, 1½ Inches to Foot.

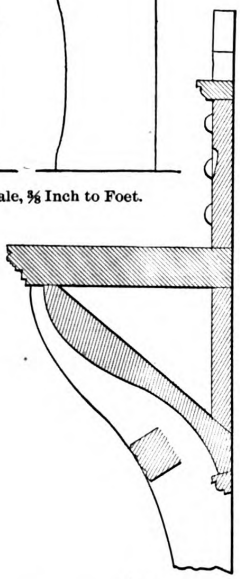


China Case.—Scale, ½ Inch to Foot.

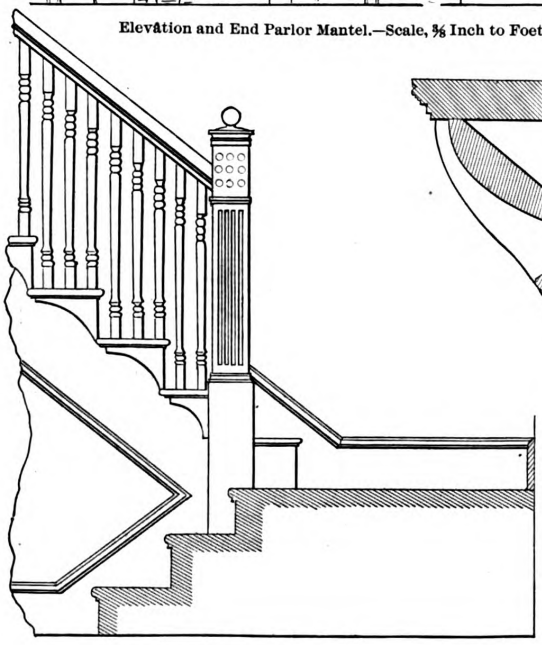


Section through China Case.—Scale, 1½ Inches to Foot.

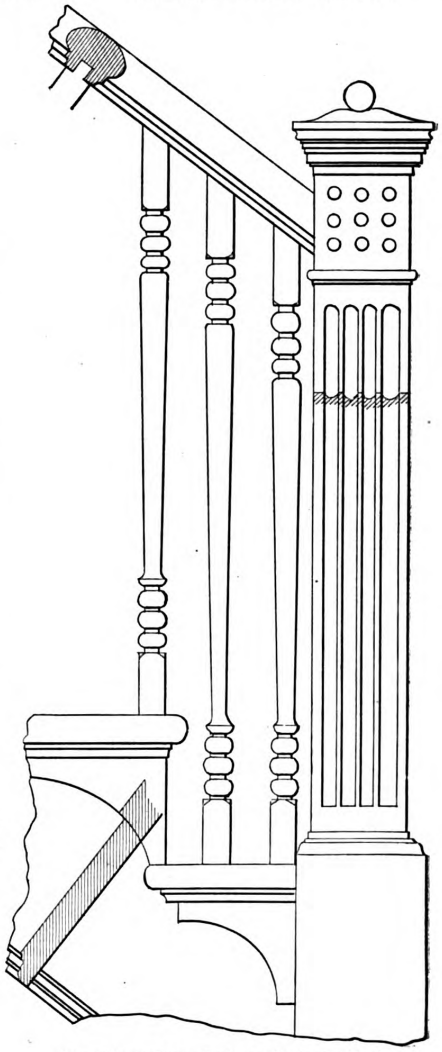
Elevation and End Parlor Mantel.—Scale, ⅜ Inch to Foot.



Section Parlor Mantel.—Scale, 1½ In. to Foot.



Main Stair Case.—Scale, ½ Inch to Foot.



Detail Stair Case.—Scale, 1½ Inches to Foot.

DESIGN FOR A SEVEN-ROOM HOUSE.—DETAILS.

(*See Plate XII for Perspective and Floor Plans.*)

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PITCH OF ROOFS.

A CORRESPONDENT in a recent issue of the *Building News* presents the following particulars relative to the pitch of roofs and strains on roof-ties, which will be found of more than ordinary interest to many of our readers:

It may safely be assumed that some professional gentlemen and others engaged in building construction have not always the formula at their finger-ends to calculate the strain on roof-ties when the rafters are placed at the various angles as required in ordinary practice. The following particulars are the result of careful experiment repeatedly checked to ascertain if any difference was perceptible. The experiments were conducted at the side of a street under heavy traffic, consequently the vibration was similar to that of a roof on any building adjoining a street. The foot of "principal rafters" were dressed smooth, oiled and placed on level bearings of polished plate-glass to reduce the friction as much as possible. If accurately calculated the angles and strains indicated on the accompanying drawings and described in the following table are not uniform, but sufficient to enable any one to arrive at a safe working section of tie and connections to principal rafters.

The load is calculated at 100, and the figures above each diagram show the minimum strain required to resist increase of span. If the connections in tensile strain are made of ordinary wrought-iron the safe working section should be equal to five times the minimum strain. This margin of safety will be sufficient to overcome any defects in ordinary welding or irregularity in the iron.

If the tie and connections are made of mild steel, well forged, a safe working section to resist four times the minimum strain will be sufficient—that is, with mild steel resisting 28 tons per square inch and not less than 20 per cent. of elongation at destructive test.

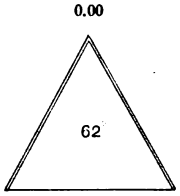


Fig. 1.

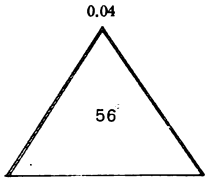


Fig. 2.

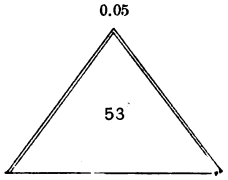


Fig. 3.

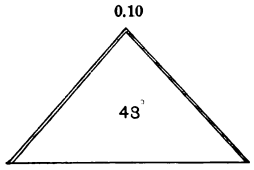


Fig. 4.

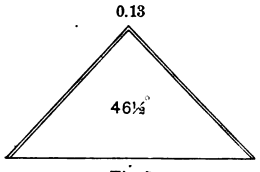


Fig. 5.

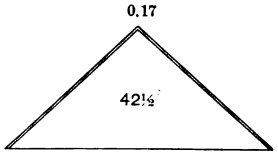


Fig. 6.

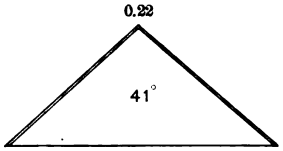


Fig. 7.

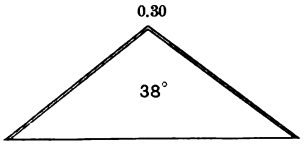


Fig. 8.

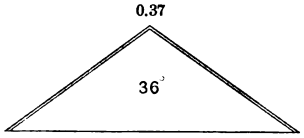


Fig. 9.

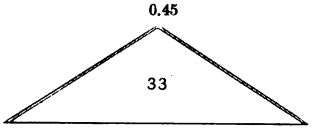


Fig. 10.

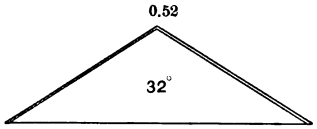


Fig. 11.

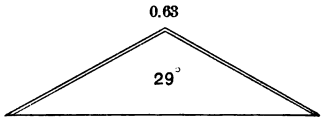


Fig. 12.

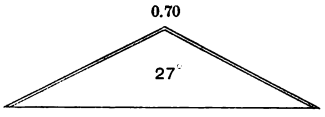


Fig. 13.

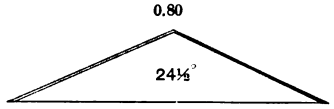


Fig. 14.

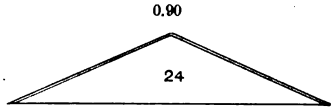


Fig. 15.

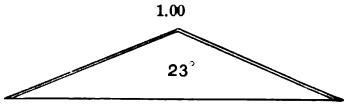


Fig. 16.

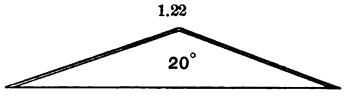


Fig. 17.

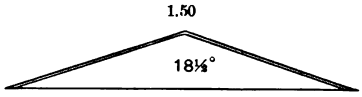


Fig. 18.

Number of Figs.	Load on roof.	Angle of roof.	Minimum strain.	Maximum strain on tie of mild steel.	Maximum strain on tie of wrought-iron.
1	100	62°	0.00	0.05	0.06
2	100	56°	0.04	0.16	0.20
3	100	53°	0.05	0.20	0.25
4	100	48°	0.10	0.40	0.50
5	100	46½°	0.13	0.52	0.65
6	100	42½°	0.17	0.68	0.85
7	100	41°	0.22	0.88	1.10
8	100	38°	0.30	1.20	1.50
9	100	36°	0.37	1.48	1.85
10	100	33°	0.45	1.80	2.25
11	100	32°	0.52	2.08	2.60
12	100	29°	0.63	2.52	3.15
13	100	27°	0.70	2.80	3.50
14	100	24½°	0.80	3.20	4.00
15	100	24°	0.90	3.60	4.50
16	100	23°	1.00	4.00	5.00
17	100	20°	1.22	4.88	6.10
18	100	18½°	1.50	6.00	7.50

Table of Load, Angle of Rafter and Strains.

Pitch of Roofs.—Diagrams Showing Different Degrees of Pitch and Minimum Strain Required to Resist Increase of Span.

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CORRESPONDENCE.

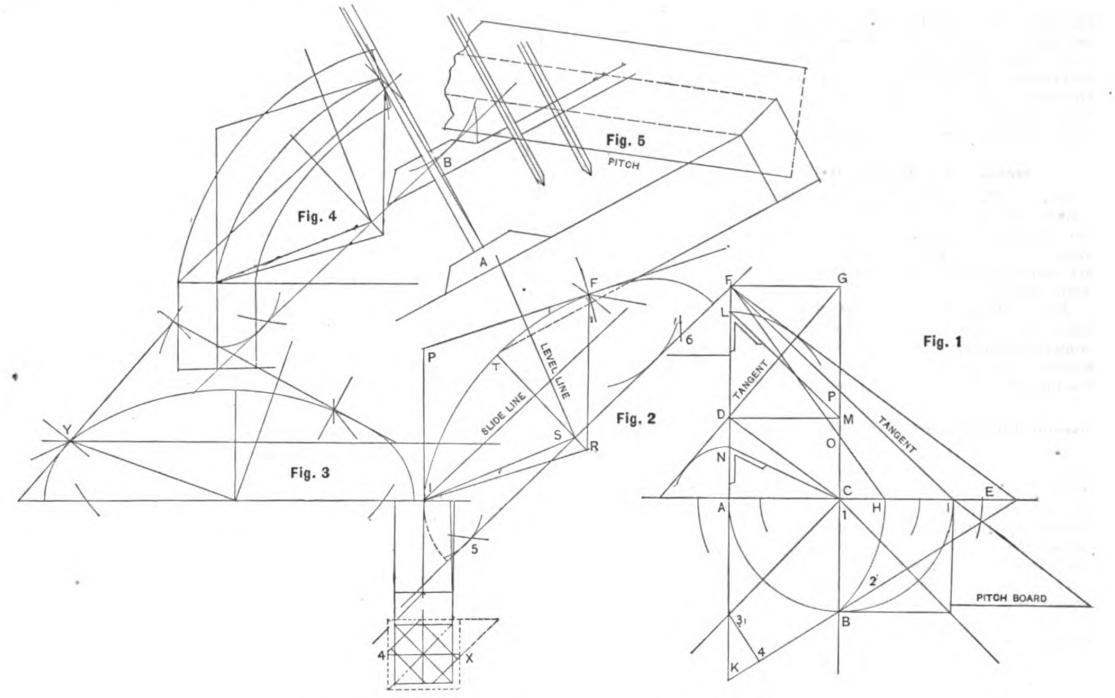
Hand-Railing.

From A. D., *Beloit, Wis.*—In glancing over a copy of *Carpentry and Building*, which accidentally came under my notice, I observed numerous inquiries from mechanics asking for information concerning problems in hand-railing. As I have had considerable experience as a a stair-builder during something like 60 years of my life, being now 85 years of age, I thought I would send a letter showing what I have learned by a study of the subject, which has been continuous since the year 1825. Inclosed I send a drawing of my system in a single problem, trusting that it may contribute to aid the young men of the present day and stimulate them to excel in the noble science of hand-railing. Referring to Fig. 1 of the sketches A B C is a quadrant of the center of the rail. Draw C D and E F to the pitch of the stairs. A F tangent will be tangent to the ellipse. Draw the line I S and at right angles to it draw the level line. Parallel to the major axis draw the slide line. Fig. 3 is another way of obtaining the same result and needs no further explanation, as the measurements are the same as Fig. 2. Fig. 4 is the mold for the rail. Draw the same as Fig. 2 for the central line at the end containing the most acute angle. The mold is made ⅛ inch wider on each side so as to square the joint, although the rail can be obtained from a plank the same thickness or width of the rail.

Fig. 5 is intended to show a method for drawing the lines to square the vertical sides of the rail. Take a piece of pine or other wood and cut it by the pitch board. Bevel the pitch line by the bevel for the straight wood, as shown at L of Fig. 1 and by the dotted lines of Fig. 5. Nail on a piece of board sufficiently wide to steady the rail piece, as shown. Fix a round piece sufficiently thick to hold it firm, as shown at A. Make a gauge, as shown at B, with a hole through it so that it will slide easily on the pin. Provide two holes for the pencils. Lay the rail piece on an inclined plane, bringing it out or in or up or down, so that the pencil coincide with the lines on the end of the rail. Then strike the lines for the vertical sides. The pencil must be from the sliding pin the same as the inside and outside on the plan. It will be seen that the block at A is on the line above the base; it should be at the dotted line. I place it there so as not to interfere with the lines at Fig. 2. To avoid confusion all lines entering the cylinder must be the tangent lines and no others, whatever direction they may take after leaving it.

This is the science of hand-railing and must be complied with. Any deviation from it is an abortion and defect, leading to confusion and doubt and causing delay in its execution. I would advise the inexperienced to cut out, after drawing the mold, from a ⅞-inch or ½-inch board a rail piece and squaring it. This will give confidence and the full knowledge that it is right. Discard then the flexible rods and you will with confidence proceed with your work and produce a result both gratifying to yourself and satisfactory to your employer. I do not know that I can add anything further in explanation of the subject. If anything is not understood and any further explanation of the subject is desired, it would afford me the greatest pleasure to know it. I shall be much gratified if I have contributed anything to make clear this sublime science and aid the young men anxious to acquire a full knowledge of the art.

I omitted to mention that if the gauge shown at A and B of Fig. 5 is used, the center must be shifted for the underside



Hand Railing.—Diagram Accompanying Letter of A. D.

is the hight of two risers, there being four winders in the cylinder. Draw D G indefinitely. Draw the arc B H and the line from H to F. Draw the arc B I and the line from I to F. Draw E B and extend it to K. Draw the arc touching the pitch line and draw L. M. Draw the arc touching the tangent line and draw N C. Draw the lines 1 2 and 3 4.

For the mold draw I P of Fig. 2 equal to I P of Fig. 1. Draw the arc I F equal to H F of Fig. 1. Draw the arc P F equal to D G of Fig. 1. Draw F R equal and parallel to I P. With the distance 1 2 of Fig 1 in the compasses and with F as a center draw an arc. With the distance 3 4 in the compasses and from I draw another arc. Tangent to these draw the major axis. At right angles at R draw the minor axis. From S set up the line S T equal to the radius A C of Fig. 1. With the distance O F of Fig. 1 in the compasses, and with F as a center, intersect the major axis at 5 and 6—the places for the pins. Draw the ellipse with a trammel or string and it will pass through the three points. The

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Prick through it. Bolt and finish it. Work the pattern on the ends and mark to it.

Right and Left Hand Doors.

From G. F. M., *Penn Yan, N. Y.*—There appears to be considerable dispute here between prominent mechanics as to what constitutes a right and what a left hand door. One claims that a right-hand door is one which, when going from the street into the house the knob is grasped with the right hand and the door swung around to the right. Another claims the opposite, because in going the reverse way the knob is grasped with the left hand and the door swung around to the left. The point of dispute seems to be as to which is the face side of the door—the one toward the room or the one toward the street. Of course this same rule would apply to inside doors. I do not criticise, but I think if the drawing in *Carpentry and Building* were made with a less lavish use of geometrical lines and rules it would give greater satisfaction to the majority of mechanics. Many of the problems can only be figured out by an architect and are of very little practical use to the average workman. If any of the readers see fit to throw any light upon the question which I have raised I trust they will submit drawings of the simplest form possible.

Design of a Mortar Mill.

From J. W. A., *Ishpeming, Mich.*—I have looked through *Carpentry and Building* for some months past, hoping to find a design for a mortar mill. I should be glad to see something of this kind published in your columns.

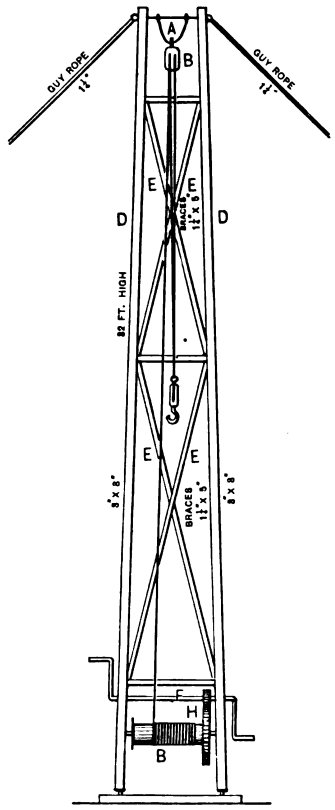
Note.—Will not some of our readers who have experience in this direction furnish something in reply to this question? The subject is one that can be discussed to advantage by a number among our readers.

Green Lumber for Roof Sheathing.

From J. W. D., *Pueblo, Col.*—In reply to the question in the November issue of *Carpentry and Building* as to green lumber for sheathing under a tin roof, I desire to say that I have had a good deal of experience in roof sheathing, especially in large areas, such as warehouses with roof surfaces about 1800 x 200 feet. I have found in my experience that all sheathing intended for tin roofs should be well seasoned heart lumber. It should also be sized to a thickness, so as to insure a smooth, even surface. All boards should be laid close together and always on the bias. If any other than a shed roof, each side should be run in opposite directions. The advantage of laying on the bias is that it will be a strong brace and support for the rafters without any bridges. It is a well-known fact that all tin roofs will sweat, consequently something must be done to prevent the tin from rusting. For this I recommend that the tin be painted one coat on the under side and that the sheathing be spread with one layer of soft felt paper. This will not only prevent the tin from sweating, but will exclude all moisture from the under side, besides deadening the noise or rattle during wind storms. On one occasion while I was superintendent of bridges and buildings for a certain railroad company we had to erect on very short notice a warehouse 90 x 506 feet. I found that we did not have lumber enough on hand to finish the building and, as we were in a hurry, I ordered what was wanting from the mill. Among the orders was one for 20,000 feet of 1-inch sheathing. This they did not have in stock, so had to cut green stuff. We put it on green on one end of the building. This was in May. We left the roof unpainted until sometime in October, when it was found that that part which was laid on the green sheathing was so buckled that the tinner had to anchor through the middle of the sheets of tin with nails and solder over the heads of same, while that part which was laid on seasoned lumber remained smooth and even.

Raising a Barn.

From E. S. L., *Columbus, Ohio.*—In a recent number of *Carpentry and Building* I notice an inquiry from a correspondent as to the best way of raising a barn. In reply I submit a rough sketch of a derrick which I have seen employed with very satisfactory results. It required but six men to raise the largest building and with far greater safety than with the old method of raising by hand. The sketch which I inclose is self-explanatory. A is a bail of 1¼-inch iron; B is a double iron block, while C is a single block. The uprights D D are 3 x 8-inch stuff, and may be of any



Derrick for Raising Buildings.—By E. S. L.

length desired, although 32 feet is the usual length. The braces E E are of 1¼ x 5 inch stuff, mortised in. The rod F is made of iron as are also the cranks. The capstand G should be made of hard wood, red elm being the best. The large cog-wheel should be at least 18 inches in diameter. The rope employed must be determined to a large extent by the size of the building to be raised, but in the instance to which I refer it was 1⅛ inches in diameter. The stay ropes are made 1¼ inches in diameter.

Making Blue Prints.

From E. E. C., *Bradford, Pa.*—In reply to "N. D.," whose inquiry in regard to the manner in which blue prints are made or taken from the vellum drawings of architects, appeared in the February number of *Carpentry and Building*, I would offer the following: Make a frame of ample size containing a clear glass, with a back of wood divided in the center and hung with hinges. It should be so arranged that one side can be turned down and the drawing examined. The tracing should be put in with the outside against the glass. If it is desired to reverse the drawing, put the tracing in with the right side against the glass. The prepared paper should be placed behind the tracing. I usually place two or three thicknesses of newspaper between the paper and the wooden back, so as to make it perfectly tight and the paper smooth. It also prevents the paper from shifting when examined. This operation must be performed in a dark room, red or yellow light being used, but not too much of it. Set the frame in the sun and expose from 5 to 20 minutes, according to the brightness of the light. Now take it in the dark room and wash gently in a bath of pure clean water, preferably rain water. When the lines have become distinct, take it out and pin on the top edge to dry. I am of the opinion that better results can be obtained by drying in the dark. My bath consists of a wooden frame about two inches deep, with a glass bottom set into it, and melted beeswax run in the corners to prevent leakage. The bath should be sufficiently large to allow the paper to be placed in it flat—that is, without doubling. I print all my plans and specifications in this manner. I write specifications on tracing cloth with very black ink, using preferably drafting ink. As a general thing there are a number of scraps of tracing cloth that are not large enough for drawings, and these answer very well for the purpose named. I tack the cloth over a ruled blank so that the lines will be straight. Prepared paper can be obtained at any store carrying architects' supplies, but I make my own at a very little expense. I use the following formula: Water, 1 ounce; red prussiate of potash, 30 grains; Ammonia citrate of iron, 60 grains. Apply with a soft sponge to good, heavy paper in a dark room, and hang up in the dark room to dry. Great care must be used to keep the paper from the light. Red prussiate of potash is difficult to obtain, as it is rarely kept in stock. Twenty-five cents, however, sent to Moore & Hubbard Company, druggists, Buffalo, N. Y., or any other wholesale druggist will procure a supply sufficient to last for years. Another recipe which is very good and leaves the image to be transferred in a different color is the following: Coat suitable paper with a 2 per cent. solution of bichromate of ammonia to which a little grape sugar has been added, and dry in the dark. The paper containing the drawing is laid upon it and exposed to the light until the prepared paper has assumed a gray color. Now dip into a 1 per cent. solution of nitrate of silver, one-tenth the volume of which consists of acetic acid. The image developed thereby consists of bichromate of silver, which becomes dark brown upon drying.

Framing a Barn.

From F. K., *Kieler, Wis.*—I notice in the December issue of *Carpentry and Building* a sketch of a barn frame submitted by J. R. T., Lake Benton, Minn., who asks the readers of *Carpentry and Building* for their criticism of it. For my part I am free to say that I do not like it very much. I think it would bulge out on the sides if it was to be filled with hay. The people in this section of the country would not build such a barn at all. I will try to show how the barns are built out here. I enclose a few sketches which may assist the reader to a better understanding of what I propose to present. In the first place I do not like drop-siding. Every heavy rain will beat through them from the side, and the boards will be just as wet

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inside as outside. This, of course, is calculated to cause the sill to rot. Out this way it is the custom to employ shiplap. If good eight-inch shiplap is put on up and down when they are dry no water can get through. In the second place I would splices of the plates must be made good so that the brace will not spread them apart. This is for the purpose of strengthening the end and to attach it more firmly to the side. A board is nailed between the gable shiplap on the end plate and to the corner post. The end plates must be well mortised with a double tenon to the corner posts. The braces are also mortised except two in each gable of the gable purlin posts. Fig. 5 of the sketches shows a barn as usually constructed in this section

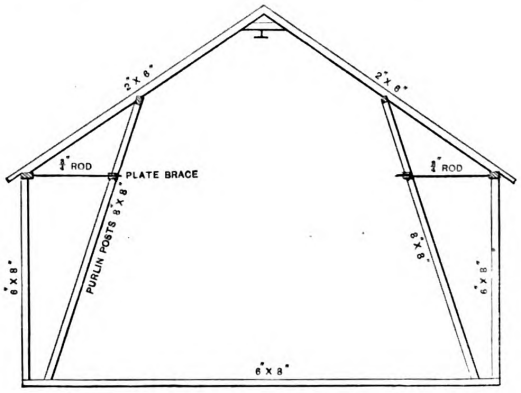


Fig. 1.—Gable End of Barn.

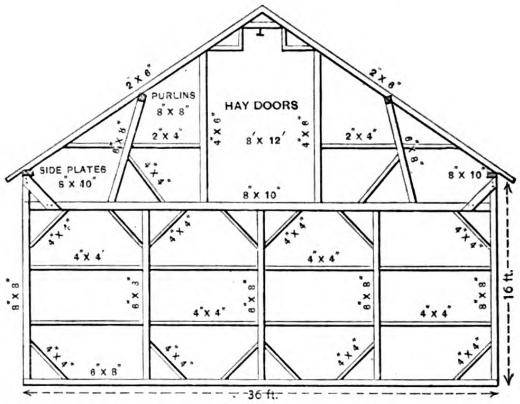


Fig. 2.—Showing Position of Purlin Posts.

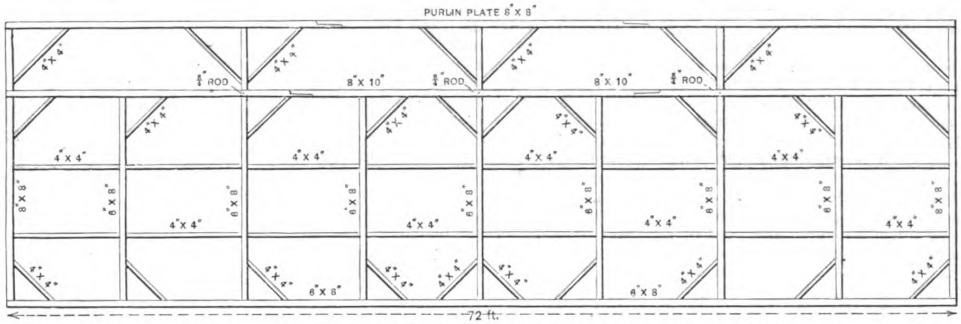


Fig. 3.—Side Elevation of Barn.

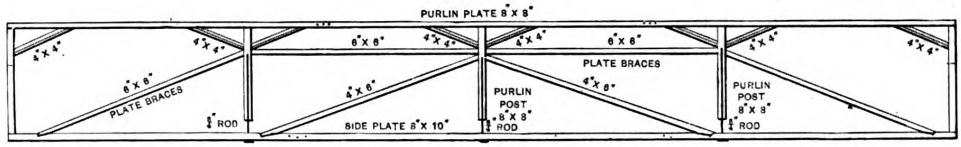


Fig 4.—Top View of Side Shown in Fig. 3.

put in plate braces. It costs less if properly constructed, and is stronger by far.

Now, I will endeavor to show how I would build a barn according to this method. Fig. 1 of the sketches shows the gable end of a barn, 36 feet wide and 16 feet high on the sides. I cannot understand why J. R. T. allows his hay-door to go down to the bottom of the barn. A hay-door 8 x 12 feet, as shown in the sketch, is large enough for any hay-carrier or fork. Fig. 2 of the sketch shows how the purlin posts run up from the side. Below they are two feet from outside of siding post to inside of purlin post. The purlin plate runs nearly through the center of the rafters. There is a sill running crosswise where the purlin post stands. Fig. 3 shows the side elevation of the barn, while Fig. 4 shows the plate braces, side-plate and purlin plate from above. The plate braces run out level with the top of the side-plate to the purlin posts and are mortised with a tenon 2 x 6 inches and 1½ inches deep, so as not to weaken the post too much. A ¾-inch rod goes through the purlin post to the side-plate. The center rod has two taps on one end on account of the center brace, which does not go quite out to the post. The

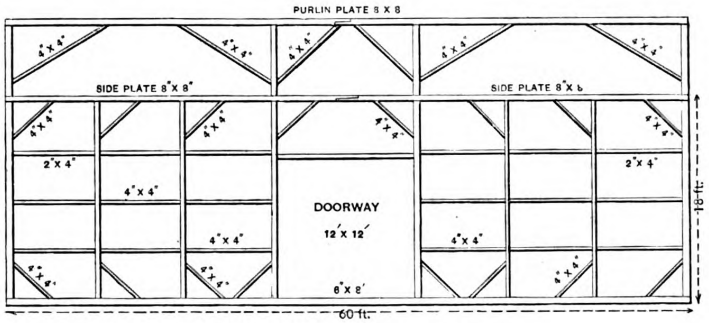


Fig. 5.—Framing of Side of 60-foot Barn.

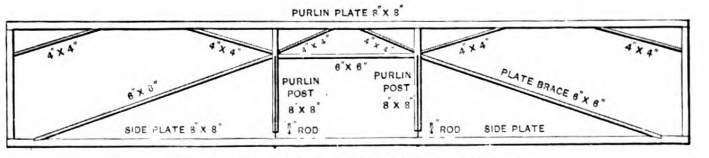


Fig. 6.—Top View of Side Shown in Fig. 5.

FRAMING A BARN AS SUGGESTED BY " F. K."

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of the country. It is 60 feet long and the hall or driveway is through the center. It is 18 feet high at the sides. By making it this hight the crossrails will come more closely together for nailing the shiplap. The farmers here have a granary at one end of the barn and stalls for horses, the remainder of the space being intended for hay. When the barn is not so long as that stated it is much cheaper to build it with plate braces although a barn could be made with plate braces even if it were over 100 feet long. Some barns built in that way have stood now for a number of years without the least indication of sagging of the roof in the center. In fact there is not a barn built that does not have plate braces put into it. Narrow barns using no purlin plates can be constructed in the same manner, by putting a couple of common braces below the plate braces to keep them in place instead of the purlin posts. If there are any readers of the paper who do not understand this method of construction, and desire further information, I shall be glad to know it.

Strength of Timber.

From J. P. T., *Patchogue, N. Y.*—Having noticed in the December issue of *Carpentry and Building* the question of "J. S. H." regarding the strength of timber and the answer thereto, I desire still further light on the subject. I thought I understood the rule given to find the breaking load for a stick of timber where the span and all dimensions were known, as given in the answer to "J. S. H." Referring to page 244 of the same issue of *Carpentry and Building*, it is mentioned that some tests were made at the car shops of the Northern Pacific Railway, among them one of a piece of white pine 2 x 4, the clear span being 3 feet 9 inches; also that of a piece of oak of the same dimensions and span, and in each case loaded at the center. Now, if I understand the rule given to "J. S. H." and applied to the stick of white pine referred to above, it would be its depth (4) squared, multiplied by its breadth (2), and that product multiplied by 450, the co-efficient for white pine given in the table published. The product thus obtained would be divided by 3.75, the clear span, and would give the load in pounds at which the stick would break. Now, $\frac{4^2 \times 2 \times 450}{3.75} = 3840$. As the stick broke at 1610 pounds, I would ask if my conception of the rule is correct? It is also stated that one-third part of the constants should be taken in practice, which means, I suppose, $\frac{4^2 \times 2 \times (450 + 3)}{3.75}$ as the load that could be carried with safety. As that means 1280 pounds, and it broke at 1610, the margin is only 330, which seems to me rather small. As in the tests referred to it is not stated whether white or red oak was used I will not make the comparisons here, but simply state that by the above method neither would be to my satisfaction. As it is possible that others may be as ignorant as myself, an explanation might benefit many besides the writer.

Answer.—In reply to the above we would say our correspondent's understanding of the rule as to strength alone is correct, and that the reference to the breaking of the beams at the Northern Pacific Railway car shops is timely; by referring to the continuation of the reply to "A. H.," in the January number, "J. P. T." will find other instances of discrepancy cited in rules offered by our authorities which will doubtless confirm the unsatisfactory impression he has formed of empirical formulæ which we have submitted. The difference in results for strength alone is obtained by the adoption of different *moduli* of rupture, which in turn have been obtained in various manners by different men. It would trespass too much upon the time of our readers to enter into a history of this branch of strength of materials, interesting as it is to refer to it here, but it should be borne in mind that it is not the breaking strength which should be considered in designing a beam, but its safe load within its elastic limit. This limit has been ascertained to be such a deflection at the center which will not crack plastering sustained by the beam, or a deflection not greater than $\frac{1}{360}$ of the span. By referring to our rule No. 3 and testing the beam of Michigan white pine and using Trautwine's co-efficient of elasticity we find as follows:

$$\frac{4 \times \text{co-ef. of elasticity} \times B \times D^3 \times \text{def.}}{\text{cube of clear span in inches}} = \frac{4 \times 1{,}600{,}000 \times 24 \times 65 \times .09375}{45 \times 45 \times 45} =$$

$$\frac{76{,}800{,}000}{91{,}125} = 842 \text{ pounds} = \text{safe center load,}$$

or using second rule, which is greatest center load within this deflection limit, $= \frac{B \times D^3}{S^2 \times C}$

$$= \frac{2 \times 4 \times 4 \times 4}{3.75 \times 3.75 \times .0128} = \frac{128}{.18} = 711 \text{ pounds.}$$

The two results ought to agree; that they do not proves that the co-efficients of elasticity taken were not identical. We prefer to use for white pine a co-efficient of elasticity which is based upon Professor Lanza's experiments with large timbers, full size. Mr. Trautwine's data are based upon tests of beams, small both in sectional area and space, and would indicate greater strength than it would be safe to count on. The co-efficient of elasticity suitable for good, sound white pine, free from knots and shakes, may be taken at 700,000 instead of 1,600,000 as above. By introducing this value in Rule 3 we obtain a result of 368 pounds as the safe center load within the elastic limits for a beam 2 x 4 inches and 3.75 feet span. A beam designed upon this basis would have a factor of safety of more than four, at least, which it should have to be reliable.

The piece of timber referred to seems, so far as the report shows, to have received but one test; we presume this is inaccurate. It is only by the average of a vast number of tests that we can establish a criterion for future use. We think, under the circumstances, complete confidence cannot be placed in these results, as enough data have not been given for comparison with other well-known tests.

Bevels for Ventilator Slats.

From A. L., *Stockton, Cal.*—In the September issue of *Carpentry and Building* for 1889 I notice a communication from J. C. Y., of Springfield, D. T., giving a method of obtaining bevels for ventilator slats and jambs. I will give a method of obtaining the same with the square. Suppose the jamb to have a pitch of 9 inches rise and 12 inches run, and the pitch of slats and sills to be 6 inches rise and 12 inches run. Apply the square to a piece of straight edge board with rise and run of jamb as shown in Fig. 1 of the accompanying sketches. As the rise of the sill is only 6 inches, square from this on the tongue of the square over to B as shown. Take A B on the tongue of the square and swing up to C, as shown by the dotted lines. The bevel at C is the bevel or jamb at sill. To obtain the bevel for the face of the sill and slats take A E on the blade and A F on the tongue of square and apply in the same manner as indicated in Fig. 1 of the sketches. The bevel will be at the tongue of the square. If the sill is the same pitch as the jamb take A I on the blade of the square and swing to D. The bevel thus formed at D is for face of jamb at sill, while the bevel formed by the upper dotted line at A is for the sill or the slats. I take it for granted that the edge bevels are understood. Fig 2 of the sketches is lettered to correspond with Fig. 1 and is introduced for comparison. A miter-box with suitable cuts in it is the best place to cut the slats, especially when they are worked as shown in Fig. 3. The above explanation is applicable to any pitch in ventilators, hip roofs, &c., also for square wreaths in stair railing, with some changes as may be briefly explained by the use of Fig. 4 of the sketches. This cut represents a stretchout of tangents around a quarter cylinder of 12-inch radius with rise of 6 inches over tangent C E and 9 inches over tangent B D. Without giving the manner of obtaining bevels I will assume that they are correct. Make *f a* equal B C, the right over first tangent. Continue *f b* to *b*. Draw *a b* parallel to D B; *a b* is the same length as A B. Therefore it will be seen that the hight raised over one tangent and the hypotenuse over the other taken respectively on the tongue and blade of the square and applied as shown in Fig. 1 gives the required bevel. The reason why I take the hight instead of base is because the plane of joint being at right angles to tangent the arrangement is reversed and the hight becomes the base. Where the tangents are equal take the hight and hypotenuse as above described, as the bevels are the same in all sizes of cylinders when the pitch of tangents are the same. Any part of the rise and hypot-

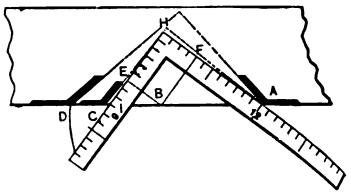


Fig. 1.—Obtaining Bevel by Use of the Square.

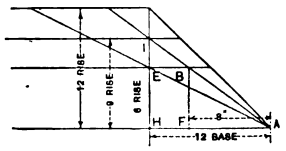


Fig. 2.—Diagram for Comparison with Fig. 1.



Fig. 3.—Section of Slat.

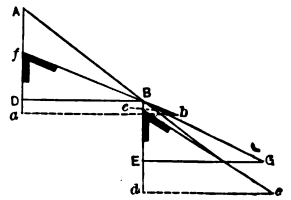


Fig. 4.—Stretchout of Tangents Around a Quarter Cylinder.

BEVELS FOR VENTILATOR SLATS.

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enuse taken in the same proportion as above described will give the desired result.

Æolian Harp.

From J. W. P., Jr., *Kokomo, Ind.*—In the November (1889) issue of *Carpentry and Building* "W. H. P." asked for information about making an æolian harp. I have never made one of these instruments myself, but have lately read of an inexpensive way of constructing them, and take pleasure in giving "W. H. P." the essential directions. Make a box with the top, bottom and sides of thin beech-wood—say ¼ or ⅛ inch thick, and the ends 1½ inches. Form it the same length as the width of the window in which it is to be placed. The box should be 3 or 4 inches deep and 6 or 7 inches wide. In the top, which serves as a sounding-board, make three circular holes about 2 inches in diameter and an equal distance apart. Glue across the sounding-board, about 2½ inches from each end, two pieces of hard wood ¼ inch thick and ½ inch in hight, to serve as bridges. Now procure from any musical instrument maker twelve steel pegs similar to those on a piano and twelve small brass pins. Insert them in the following manner into the beech: Commence with a brass pin, then insert a steel peg, then a brass pin, and so on, alternating one with the other, placing them ½ inch apart until 12 have been used. On the other end commence with a steel peg, placing it exactly opposite the brass pin at the other end. Follow with a brass pin and then with a steel peg, alternating to the number of 12. By this arrangement a steel peg and a brass pin will be opposite each other, the object being to secure a uniform tension to the strings on the instrument. Now string the instrument with twelve first violin strings, making a loop at one end of each string, which put over the brass pins and wind the other ends around the opposite steel pegs. Tune them in unison but do not draw them tight. To increase the current of air a thin board may be placed about 2 inches above the strings supported at each end by two pieces of wood. Place the instrument in a partially opened window. If the draft is not sufficient it may be increased by opening a door opposite.

Hanging Sliding Doors.

From C. M. S., *Marion, Ind.*—In reply to the inquiry of "H. W. S.," Elizabethville, Pa., I would say that I never saw any doors hung before the partition is plastered. I always put in the tracks and line up the partition on the inside with matched lumber and then hang the doors after the plastering is put on. When I put up the tracks I cut the proper pockets in them to receive the rollers. The pieces cut out of the track for pockets are secured with screws. There are directions with each set of hangers, also detailed drawings, showing the manner of putting up the tracks. I cannot understand why "H. W. S." hangs his doors before putting on the plastering when it is so easy to do it afterward. In order to properly hang sliding doors the work must be correctly performed, the partitions must be plumb and the tracks level.

From J. L. H., *Seattle, Wash.*—I am a reader of *Carpentry and Building* and am greatly interested in many of the questions asked and answers given thereto. In regard to the question given on page 247 of the December number, 1889, I would say that the best and most substantial method I have experienced of hanging sliding doors on rollers above is to line the partition on both sides with flooring, that is the insides, and put on the track. I then cover the top of the track with 1 x 6 stuff, or whatever the width of the pocket may be, and then the doors may be put up before plastering. The doors can be run back in the pockets as no plaster can fall either on the track or doors. This construction makes a strong partition, and there will be no danger of warping, which is so often the case on account of light partitions.

Question in Handrailing.

From F. P. C., *Lincoln, Neb.*—In reply to the question of "J. C.," Cedar Rapids, Iowa, relative to handrailing, and published in the December number of *Carpentry and Building* for 1889, I take the liberty of sending the following solution: The sketch submitted by "J. C.," shows all the winders inside the cylinder which, according to his idea of constructing a rail for a quarter circle of winders, is the best possible way of obtaining a wreath. Permit me to differ with "J. C." For beauty of grace and ease, the arrangement is decidedly wrong. It makes the ramps at the top and bottom too abrupt. Fig. 1 of the sketches I submit as being the shortest, the most simple and the most easy of application of any method I have of getting over a quarter circle of winders to connect with straight rail at top and bottom, making the wreath all in one piece. By unfolding tangents, steps and risers in the cylinder and connecting them with a square step and riser at top and bottom, we have the pitch of straight rail and pitch over tangents *b c* and *c d*, being *g h* and *g f*. The pitch over *b c* and *b d* being equal to the diagonal *a c* becomes the directing ordinate and the diagonal *d d* will become the seat. Set up from *d* the hight *g k* and join *l e*.

Referring now to Fig. 2: To produce the wreath pattern proceed by drawing a line the entire length. Assume *a''* as center and set off right and left *a'' a* and *a'' a* equal to *e l*. Make *a e* of Fig. 2 equal to *a e* of Fig. 1. Make *a'' c* of Fig. 2 equal to *a c* of Fig. 1. Join

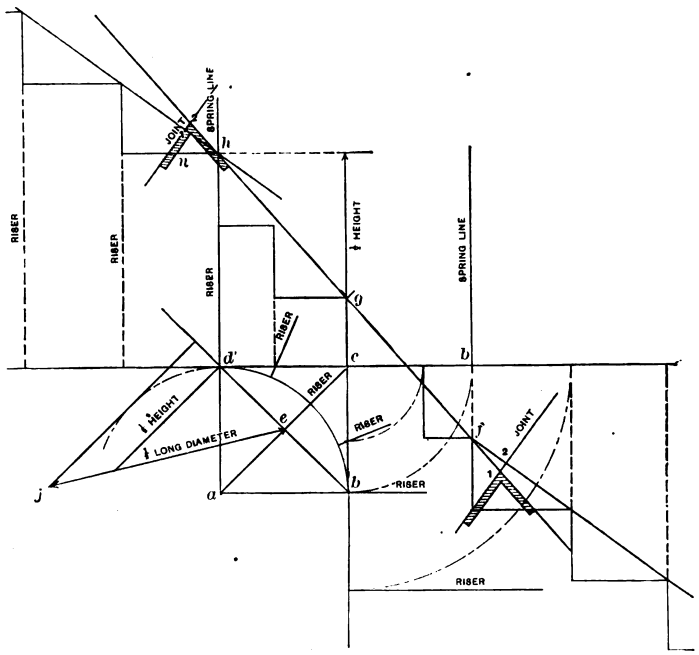


Fig. 1.—F. P. C's Method of Constructing Rail for Quarter-Circle of Winders, with Wreath in One Piece.

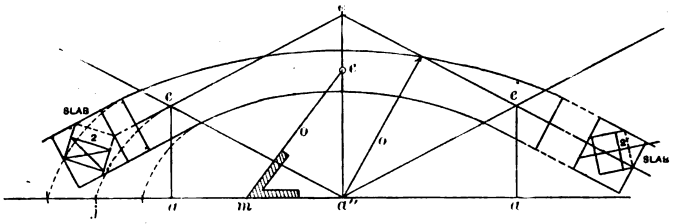


Fig. 2.—Method of Producing Wreath.

QUESTION IN HANDRAILING.

c e right and left and we have the angle of the tangents and arc equal to *g f* and *g h* Fig. 1. To find the plumb bevel for both ends of the wreath take *a''* as center, and distance tangent to *c e*. With the same distance and with *c* as center intersect the long diameter at *m*. Join *m* and *c*. The angle *m* gives the plumb bevel for both ends. Prepare joints in the usual manner. Work the plank to cylinder forms according to the bevel *m*. Remove the slab from the top of the upper end square with the joint far enough back to apply the stock of bevel *n*. Drop section of rail on end the distance 1 2, as shown in Fig. 1 and make the joint conform to the bevel *n*. Proceed in the same manner for the lower joint except remove the slab from bottom of rail and raise section 1 2, as shown. After this has been

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done work the ramp on the wreath top and bottom square to joint made by bevel *n*.

Methods in Hand-Railing.

From WM. B. GARVOCK, *Ottawa, Ont.*—Mr. Monckton's paper in defense of the tangent system of hand-railing in the January number of *Carpentry and Building* fails to convince that that system represents the art in its highest development, even though comfortable rooms be contrasted with those of 12 feet front, and the limited capacity of the penny whistle to the admirably constructed, sweet-toned old violin. Even the expert testimony of the metal-worker who never found fault with the curve of an unfolded miter of a stove-pipe elbow fails to convince that the system so ably advocated by Mr. Monckton and others is beyond improvement. With reference to ramps connecting straight rail with that over winders, we suggested that they be made in the wreath-piece, thus saving a joint and adding to the stability as well as to the general appearance of the work. In ordinary cases this can be accomplished without any sacrifice of wreath material—indeed, sometimes less than is now considered necessary for wreath-pieces without the ramp connection. I am aware that ramps can be dispensed with when the stairs are planned with that end in view, but it is not always possible to plan them so; or is it necessary, when you have passed beyond the limitations of the inflexible tangent system, when called upon to construct the rail? We hold that where rails are constructed on the tangent system the easings can in a very limited sense be wrought in the wreath-piece, while in what is known as the falling line system the easings are wrought with the greatest facility, and without any previous arrangement of the stairs to meet that end.

In regard to the question of rail deviation resort must be found in spacing the winders so as to conform with the curve given by the plane formed by the tangents in elevation if parallelism between rail and winders is sought. But this is not the usual practice, as very little attention is paid to the falling line of rail around the winders, providing the landing and starting points are correct, so long as the center of the rail is made to conform with the center of the plank. In cases where it ought not, so long will there be deviations in the rail and consequently unequal lengths in the balusters. The stove-pipe elbow illustration of Mr. Monckton helps to make this clear, as the center of rail, according to the tangent system in circular plans, is always more or less a part of this curve, and although this condition of things may please the metal-worker, it does not follow that it will please the stairworker when called upon to make his rails parallel with even-spaced winders, which in development show a straight line, while the developed miter of a stove-pipe elbow is anything but straight.

With reference to tangents in the formation of joints I have no fault to find, providing they are in the right direction and give true butt joints—that is, a line at right angles to the center of the falling line. But when the everlasting tangent is made to control the falling line of the rail—nay, give it—I think it is about time we were set free from this species of Egyptian bondage. I have no desire to go back to the so-called "good old days" of Peter Nicholson and his son Michael in order to find methods of hand-railing. The tangent system is an advance in method compared with theirs. Economy in time and materials, with accuracy in making joints, are points which give this system the following it now receives. Yet, notwithstanding these points of commendation, it is far from being perfect and able to meet all requirements. I can assure Mr. Monckton that I will give the matter in hand careful study, and may in time go back to my first love and see in it the excellence I once saw and find in it what I have not as yet found—a means of meeting every reasonable condition that can be laid down.

The Slide Rule.

From A. W. K., *Stockton, Cal.*—I notice in a recent number of *Carpentry and Building* a communication relating to the slide rule which interests me very much. I would say that so far as the letters M E are concerned they do not amount to much, as I do not find them to be very accurate, especially on the rule which I have. The A B C and D, however, are the "dandies," so to speak. In fact, I would not be without the rule a great while unless I happened to be where I could not get another one. I certainly agree with "F. S. R." when he says "the slide rule is very useful in laying out work." Not only that, but it is a very ready companion. If you did not have it you would be obliged to sit down in some nice, shady place in order that you might do your figuring without being obliged to replace the different figures which would be partially blotted out with perspiration dripping from the end of the nose. In the case of two sides being given by which to find a third, proceed as follows: $5^2 = 25$, $12^2 = 144 + 25 = 169$. Now, set 1 on C to 10 on D, and against 169 on C will be found the third side or root on D, which in this case is 13, the answer required:

C	1	169	Squares
D	10	13	Roots.

Suppose it is required to find the number of square feet contained in a redwood board, 14 feet wide by 38 feet long. Set 1 on B to 14 on A; then against 38 on B is 532 on A, the answer required:

A	38	532	Contents in feet.
B	1	14	

For square yards set 9 on B to 38 on A. Then against 14 on B will be found the answer in square yards on A, 59.1:

A	38	59.1	Sq. yards.
B	9	14	

For a thorough explanation I would refer those who are anxious to learn the use of the slide rule to Hodgson's work on that subject, and suggest that they buy a rule. They will never regret it. The book is a good one to use, even without the slide, if one does not care to make use of that part of it.

Concrete Foundations for Brick Dwellings.

From M. A. M., *Oceana, W. Va.*—Referring to the inquiry of "M. & E." as to concrete foundations for brick dwellings, which appeared in the January number of *Carpentry and Building*, I would say that your correspondents can hardly expect to obtain in a short paragraph in a trade periodical an answer to a problem which took Gen. Q. A. Gilmore, United States Engineers, with the resources of the Government at his back, years of research and experimentation to solve. If "M. & E." will read General Gilmore's "Lime, Hydraulic Cements and Mortars," and also his "Coignet-Beton," they will find much information to the point. The latter is a most valuable book, but out of print and difficult to procure. In the absence of these I would suggest that they write for the little book published by the Buckeye Portland Cement Company, at Bellefontaine, Ohio, which will give them about what they want. I have no interest whatever, direct or remote, in this company, and do not even know the gentlemen connected with it, but I write this for the benefit of "M. & E." and others who may want similar information, and not for the purpose of advertising the company referred to.

From M. M. O'B., *New York City.*—In the January number of *Carpentry and Building* I notice an inquiry from M & E. in regard to Concrete Foundations for brick dwellings. In reply permit me to make a few comments for the benefit of the correspondents and other interested readers. The question as published is somewhat ambiguous as well as ridiculous. In the first place they ask what per cent. is to be used for concrete foundations, when the very fact remains by their statement. Since stone is not procurable they intend substituting concrete, thereby questioning and answering themselves unknowingly. Explicit statement is at all times desirable, more especially when submitting it to the public. However, since the correspondents appear to be ignorant of the composition and price of concrete I will offer the following record of experience: A cubic yard of concrete ranges in price all the way from $3 to $7 for the class of work mentioned, and its proportions are generally one of cement to two of stone. The stone is to be broken to pass through a 2 inch iron ring in any direction and thoroughly wetted before mixing with cement and mortar. This mortar is generally composed of one part cement to two parts of screened bank sand. These proportions, however, are liable to change for each authority and every mechanic has his own method which from time to time has proven effective, consequently indisputable.

Protecting Pipes From Frost.

From E. J. D., *Macon, Mo.*—Can you or some of your readers tell me the best means for preventing water pipes from freezing? I have a tank under the roof of the house, and in very extreme cold weather the pipes are frozen so that the water will not run. The tank is sometimes frozen about ½ inch on the top, but this does not seem to affect the running of the water.

Answer.—There are several ways for overcoming the difficulty our correspondent speaks of. In some places the thing to do would be to pack the pipes in a non-conducting substance, (asbestos or something of the sort, in the same way that one would protect pipes running underground. If our correspondent wishes to try experiments he could make a packing of old newspapers which is a very effective barrier against the transmission of heat. We do not know the location of the pipes in this house, but another possible arrangement would be to encase the pipes and leave the casing open in one of the lower rooms of the house so that it would act somewhat as a ventilating flue, and the constant stream of warm air rising around the pipes would keep them free from ice. He says that his tank freezes over, but that this does not seem to affect the flow of water. Our correspondent will understand that if he boarded over his tank, and made an air-tight job of it, the atmospheric pressure would prevent the water from flowing out through the faucets. We have heard it suggested that similar trouble might result from the sealing of a tank by ice, but we do not know that it has ever actually occurred.

Oil-Stone for Carpenters' Use.

From H. W. P., *Dundee, N. Y.*—I would like to know, through the columns of *Carpentry and Building*, what oil-stone is regarded by the readers of this journal as the best for carpenters' use. I would also be pleased to learn where the article is quarried.

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CARPENTRY AND BUILDING.

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A MONTHLY JOURNAL FOR THE BUILDING TRADES

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APRIL, 1890.

A New Departure.

No doubt every reader of this journal will have noticed the colored plate, which is a conspicuous feature of this number, before he has found time to read this paragraph. Nevertheless, we call attention to it. This innovation marks an important change in our illustrations and one, that we venture to believe, will be very generally liked. We have substituted a single colored plate for the several plates in ordinary ink which we have been sending out each month for several years past. The colored plate, however, does not supersede any useful features of *Carpentry and Building*. It is illustrative only, and is supplemented by elevations, plans and details of the house, shown in our usual complete and thorough style. The colored plate serves to add brightness and spirit to the paper, while the usual illustrations meet the wants of the practical man, in the way in which he so thoroughly appreciates. The study presented herewith, as well as others which will form conspicuous features of succeeding monthly issues, differs from much that we have shown in the past, in that it is taken from life, so to speak. That is, it represents a building actually erected, and shows the work completed as it is. The advantage of showing that which exists as opposed to presenting a conception which might be built, will be instantly appreciated by all practical men. As remarked in our last number, we are not yet done with making changes in *Carpentry and Building*. We have still other pleasant surprises in store for our readers which will be announced in due time.

Trade Schools.

In another part of this issue we present in full a letter recently received from J. R. Abarbanell, in reply to a paragraph which appeared in these columns last month, on the general subject of trade schools. We are free to acknowledge to our correspondent that we did base our comments upon reports published in the daily papers, which it seems in this, as in many other cases, were so garbled as to give us, in some particulars, a mistaken impression of the author's intentions. We are very glad to know that he is heartily in favor of trade schools, broadly, and that when he uses the term he means a school organized and conducted for the purpose of teaching free labor something better than it now possesses, and that he does not by any means restrict the term to schools in reformatory institutions. We commend the letter to the attention of our readers, notwithstanding the feeling we have that some of them will scarcely be willing to accept the cigarmaker as a mechanic. There certainly is a difference between a man who makes cigars and one who devotes himself to building construction, cabinet work or machine work, not only in education and qualification, but also in real usefulness in the world. Nevertheless, the question of learning how to do the work is important in one case as well as in the other. We have allowed what our correspondent has to say on the subject of the "Single Tax Theory" to remain in his letter just as he presented it, although we are of the impression that this is a subject which it is scarcely within the field of a technical journal like this to discuss. All the different questions in political economy that are arising at the present time are of interest, and the single tax theory, as well as others, deserves to be investigated to the end that the voter may have reason for the faith that is within him, either to favor it or to oppose it. We are thus careful in referring to this subject, because we do not want to be put to the trouble of refusing to print voluminous communications upon it. We shall be obliged to restrict discussions in our columns to mechanical topics and to those questions bearing directly upon the occupations of our readers, or the preparation for the same.

Industrial Schools.

While the question of industrial education is agitating the minds of those having at heart the welfare of the youth of this country, the subject does not appear to have gained great headway among some of the European nations. According to the observations of the chairman of the Committee on Mechanical Trade Schools of the Master Builders' Exchange of Philadelphia, there are practically no industrial schools abroad outside those of a reformatory character. From a careful investigation of the subject during a recent visit through Europe, he found nothing in the way of manual training schools such as exist in this country. They teach trades, he says, in the reform schools at Feltham and Red Hill, near London, but they interested him more as a manager of the House of Refuge than as a master builder. The Feltham system is like that at the House of Refuge now, but at Red Hill they have in operation "the cottage plan," such as it is proposed to have at the new institution at Glen Mills. By this plan the boys and girls are divided into "families" of about fifty, under the special care of "fathers" and "mothers." They live as a family, but go to work on the farm or the workshop together. He also visited schools in Berlin and Genoa, but found none such as we have here. In Berlin they have a college where the higher branches of industrial training are taught under the direction of the Government, but not for the common people. In many places he found the people interested in industrial training, but they have not yet reduced it to practice.

Manual Training.

The closing exercises of the male department of the school connected with the General Society of Mechanics and Tradesmen of the City of New York were held on the evening of Thursday, March 20, at Mechanics Hall, No. 18 East Sixteenth street. Addresses were made by A. G. Bogart, president of the society, Col. Richard T. Auchmuty, founder of the New York Trade Schools, and Charles Pratt, who established "Pratt's Industrial School" in Brooklyn. The speakers referred in an entertaining way to the advantages to young men of manual training and to the good work that was being accomplished by the trade schools already established. The efficiency which the pupils of the school connected with the Society of Mechanics and Tradesmen have attained in the several branches taught was strikingly illustrated by a display of drawings in the class-room. These covered a wide range of subjects, and were executed in a manner which reflects great credit not only upon the scholars, but upon their instructors as well. The exhibition of the work of the class in modeling was very creditable, as was also that of the classes in architectural and mechanical drawing. Some very pretty work was that showing the results of the first lesson in decorative oil painting by the scholars, in a private class instructed by D. Baehre. Considered as a whole, the showing made by the classes was one of which the school committee of the society may justly be proud.

Danger from Steam-Pipes.

In discussing the causes of fire it is but proper to call attention to the possible danger of conflagrations arising from exposed steam-pipes. This caution is particularly pertinent at a time when the use of steam for heating, not to mention its increasing distribution for power purposes, is multiplying the number of steam mains in buildings and increasing enormously the possible points of contact between dry wood and hot iron pipes. Formerly it was argued that no fire could arise from this cause, and whether the heat from a low-pressure steam heating apparatus is sufficient to alter the structure of wood and ignite it, or even convert it to a form of tinder, we do not pretend to say. That steam under pressure is high enough in temperature to char wood is a statement made without any qualifications by our contemporary *Fire and Water*, which ought to speak with authority on this subject. Referring to the discussion of the possible danger of charring wood and setting it on fire by steam-pipes, our contemporary says that but a short time since one of their staff secured, as it was cut away from an underground main pipe of

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a steam heating company in New York, a large piece of the wooden casing in which the pipe was originally laid, and which had been in direct contact with the iron. The wood as it was thrown up from the trench in the street was moist from leaking steam, but had been completely charred to the depth of about ¼ inch. This being so our contemporary intimates that dry woodwork subjected to an equal degree of heat from a steam-pipe and exposed to a dry atmosphere and drafts would prove a very serious source of danger.

Fractional Paper Currency.

The suggestion of the House Committee on Banking and Currency to issue fractional paper currency for the purpose of affording the people a convenient method of sending parts of a dollar through the mails is timely and commendable. As the committee says, the postal notes now in use do not satisfactorily meet this requirement, as their cost and the inconvenience of obtaining them hampers their use. Publishers and others are overburdened with postage stamps received through the mails, which a currency of the kind described would no doubt replace.

Matters and Things.

There are always a number of building operations in progress in New York which command the attention of visitors. Just now the one conspicuous example of this kind is the structure of the *World* newspaper, near the entrance to the Brooklyn Bridge. It is one of the first things noticed in crossing the North River and it is also conspicuous from Brooklyn and down the bay. This building is notable not only on account of its great hight, but also by reason of many special features in construction, planning and appointments. Its roof line is far above the tops of the other high newspaper buildings in the neighborhood—in fact, it is three stories above the clock faces in the tall tower of the *Tribune* building, while its dome soars many feet above. The dome itself is a structure of no mean dimensions. It is large enough to contain the editorial rooms of the newspaper with space to spare. The editorial rooms are to be reached by a special fast-running elevator which will make the trip from the ground floor without any intermediate stops. Going up the sensation will be like that of being shot out of a gun, while the return trip will suggest to the timid person that the bottom has dropped out of things and that he is falling through space. Other elevators are to be provided for other stories and in this feature of its equipment the building will be second to none.

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—The construction of the building carries an extreme certain ideas that of late have become very popular among architects for edifices of its class. First, there is a skeleton building of iron, strong enough to withstand any strain likely to be brought upon it, and second, there is massive brick work, including both exterior and division walls, completely bedding and encasing the iron work. The columns, girders, floor beams and other parts are bolted and riveted together in the most thorough manner. Everything is made as strong and secure in this iron framing as though there was to be no brick work at all. Then the brick work has been done as carefully and as thoroughly as though there was no iron work The resultant strength of the building the reader can perhaps guess, I have no means of stating it. The walls are unusually thick, the brick have been selected with the greatest care, and in many respects the workmanship of the masons excels anything heretofore seen in the metropolis. The spaces between floor beams are filled with hollow tile, and the supporting columns in the interior are heavily encased in brick, terra cotta and plaster. Every pound of iron in the framing of the building will be thoroughly protected against variations in temperature.

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—The danger to iron buildings has always been the liability of collapse by expansion of the metal under heat and sudden cooling. Unequal contraction and expansion will sometimes rack a building, even though no very severe or unusual conditions prevail. With the iron so thoroughly covered by incombustible non-conducting material as in this case, it is believed that all these dangers will be fully overcome. All the advantages of both iron and brick construction will be secured with the smallest amount of the disadvantages of either. The building, on account of its great height, in proportion to the space it covers, looks light—even from a short distance—but inspection of its different parts shows that it is really very massive, and strong beyond buildings of its class.

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—One object of the *World* building is to advertise the newspaper, the home of which it is to be. Accordingly much is made of the progress of the building and of the different parts as they are undertaken or completed. The subcontractors also vie with the proprietor in making the work tell in the way of reputation and prestige. An instance in point was the test of the plumbing pipes which occurred a short time since. The President of the Board of Health, the Inspector of Buildings and other public officials, prominent members of the Association of Master Plumbers, editors of the building and other trade and technical papers, and reporters of the daily press were invited to be present. Details of the test would scarcely interest the readers of *Carpentry and Building*. Suffice it to say, therefore, that they were of the most thorough character and developed results highly satisfactory to all concerned. The hydraulic head in stacks of pipes so high as are necessary in this building develops a pressure that requires more than ordinary strength to withstand, but even a greater pressure than this was applied.

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—It is a pleasing thought that the habit of building long rows of city houses all exactly alike in outward appearance, as well as in interior arrangement, is fast going out of fashion. The marble trimmed rows of Philadelphia, the brown stone rows of New York, the brick rows of Baltimore, St. Louis and other cities, so monotonous in their lines and so opposed to all ideas of distinctive individuality, are fast becoming things of the past. They are being rapidly replaced by dwellings, artistic in all their details, each having its own particular charm and no two of which are exactly alike. The advantage to the neighborhood in which these new styles predominate is very great, while the satisfaction of the individual tenants must be even greater. It costs no more money, or at most a very little more, to build with pleasing variety in this manner than to put up the unattractive rows of buildings which have heretofore been the rule. Shrewd builders have been quick to note the change in public taste in this regard, and those who have been ready to supply the want have made handsome profits. On the other hand, those who are persisting in building houses of the old style are finding them in many cases unsalable at any price.

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—My attention has recently been called to several unique applications of the art of photography, one of which, in particular, relates to building matters, and must be of interest to all engaged in the building trades. A graphic history of the new Library Building at Washington, is being prepared. When it is completed, it is safe to say, it will be one of the most unique narratives of a building that has ever been prepared. The pencils used are the rays of the sun, and the paper is the sensitive plate of a photographic camera. At regular intervals from the top of the building, occupied by the superintending architect and his force of draftsmen, a camera is turned upon the work, which at present consists only of a great hole dug out in the square just east of the Capitol grounds. The resulting picture shows every detail of the condition of the work, the hight of the foundation wall, the piles of material on hand, &c. It is proposed to file these photographs away, properly labelled in such form, that they can be produced if any question arises as to what was done or was not done at any stage of the work.

OLIVER.

BUILDERS' EXCHANGE COMPETITION.

The general development of the Builders' Exchange movement throughout the country, is the remarkable feature of the building business at the present time. Everybody is interested in it, and information concerning the purposes, plan of organization and practical working of exchanges is demanded on every hand.

In order to give our readers and others the opportunity to contribute to the practical literature of the subject, and further, in order to secure suitable essays for publication in these columns, we propose a competition, with prizes and general conditions, as stated below.

The general subject of the competition is "A Builders' Exchange." The precise treatment is left to the contestants, with the suggestions that each essay should define the purposes of a Builders' Exchange, the advantages that follow upon its organization, the persons who are eligible to membership in it, the general scheme of its government, and the ways in which individuals may profit by association with it.

The essays are not to exceed 2000 words each in length. Each essay is to be submitted under a suitable *nom de plume* or emblem, with the name and address of the author in a sealed envelope, bearing the same *nom de plume* or emblem.

Two prizes are offered. To the essay which shall be deemed the best of all those submitted, and which conforms to the conditions of this advertisement, the first prize of $100 will be awarded. To the essay considered the next in rank of merit, the second prize of $50 will be awarded. The committee of judges to pass upon the essays will include, among others, some of those who have had the most to do with Builders' Exchanges to date, and who are thoroughly posted on every phase of the work

Essays submitted in this contest must reach us not later than the hour of closing business, May 10, 1890. We propose to print the prize essays in the issue of this paper for June.

The right to publish all the efforts submitted in this contest, whether taking a prize or not, is expressly stipulated. The question of accompanying the essays by diagrams or other illustrations is left to the discretion of the contestants.

Address the essays, marked "Builders' Exchange Competition," to

A. O. KITTREDGE, Editor *Carpentry and Building*,
66–68 Duane street, New York.

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DRY ROT IN TIMBER.

THE GROWTH, development and decay of timber is a subject of interest to every woodworker. A disease, whether of the human frame or of a plant, can only be understood by an intelligent conception of the growth and development of the structure and its conditions when in perfect health. Dry rot is a disease which attacks timbers under many different circumstances and which in a very large number of cases occurs in a way to be a profound surprise to those to whose attention it is called. The general subject was discussed not long since by Mr. W. H. Bidlake, who read a paper before the Architectural Association. The gentleman prefaced his remarks by stating that dry rot is frequently induced in different woods by different species of fungi. He stated that even the timber of the coniferæ may be attacked by different species, although their effect on the wood is practically the same. He confined his remarks to the best known of the dry rot fungi and the most destructive, as is the *Merulius lachrymans*. He presented its life history and its effect on pine wood. As likely to interest our readers more especially as much that the speaker presented relates to the growth and structure of the wood, we propose presenting a portion of his paper, together with illustrations. The speaker said:

Whereas most fungi are to be found in the damp surroundings of the forest, merulius, being of a more genteel nature, prefers the wrought timber work of a house, and has rarely, if ever, been found in a wild state.

We cannot study the diseased state of an organ intelligently without knowing its healthy state, and it will be necessary therefore to consider the structure of sound pine wood, and to some extent the physiological functions of its parts, before discussing the diseased state induced by merulius.

Let us suppose we have the opportunity of examining a piece of pine trunk. We shall observe: 1. The central axis of pith composed of loosely-packed thin-walled cells, and surrounded by groups of tubular vessels having spirally thickened walls, forming more or less of a cylinder, called the medullary sheath. 2. Outside this comes the great mass of the wood, which is marked on the transverse section by two systems of lines, the concentric lines showing the annual rings and the radial lines the medullary rays. Both produce lines of weakness and frequently give rise to cracks—"cup shakes" resulting from the

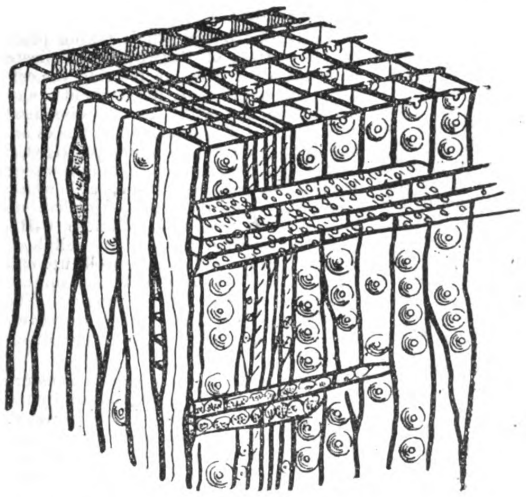


Fig. 1.—*Section of Pine Wood Showing Long Tubular Cells.*



Fig. 5.—*Section of Root Hair.*

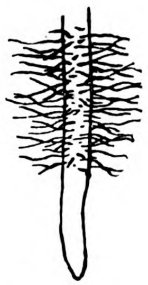


Fig. 4.—*End of a Rootlet.*



Fig. 2.—*Front Elevation of What is Termed "Bordered Pit."*

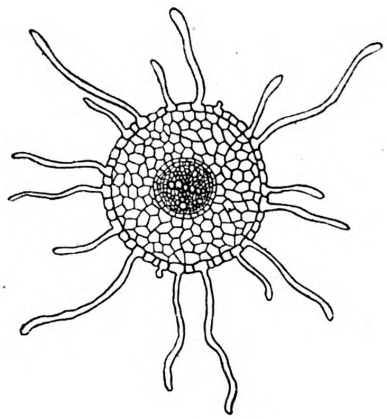


Fig. 3.—*Section through a Rootlet.*



Fig. 6.—*Section of Wood Showing Outgrowth on the Surface and the Peculiarities of the Hyphae.*

ILLUSTRATIONS OF DRY ROT IN TIMBER.

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former, "star shakes" from the latter. All the medullary rays appear to start from the periphery of the wood, some extending right through to the pith and others to various distances. Among the wood it will also be noticed that here and there the cells have separated so as to form resin passages. 3. Outside the wood and separated from it by the series of wet succulent cells of the cambium comes the bark. This in its inner portion is traversed by medullary rays, and includes the sieve-tubes, which are long tubular cells, the one separated from that below by a perforated plate or sieve. The outer portion includes more spherical-shaped cells containing nutrient substances. Here and there is to be seen a large resin passage.

The whole is invested with layers of impervious cork, which keeps the tree from the weather.

If then we examine from the pith outward, we shall pass ring after ring of annual growth, and while we shall not lose the old, we shall continually find new medullary rays starting. As we get near the margin of the wood its cells will become more delicate, until we arrive at that line of succulent cells which separates the wood from the bark, the line of weakness through which the bark tears off. These cells form the cambium or growing issue of the tree; they are delicate thin-walled, filled with granular protoplasm, bathed with fluid, and divided tangentially, giving rise to new wood cells on the one hand, and to a much less extent, new bark cells on the other.

The protoplasm employs itself with thickening the cell wall by adding layers of cellulose, in which process not only are the nutrient substances used up, but the protoplasm itself eventually absorbed.

The thickening does not take place regularly over the whole of the cell, chiefly on its radial walls, rows of circular areas remain thin, and the cell wall is prolonged inward from their margins so as to surround the depression thus formed. As an exactly similar operation is in process at the same spot in the next cell, a structure results which one may compare to two thick watch-glasses, each pierced by a hole in the center, placed face to face, and the thin persistent membrane between adhering to the inner surface of one of the glasses. The whole structure is called a "bordered pit," and when seen in front elevation it presents the appearance of two concentric circles. (See Figs. 1 and 2.) It plays an important part in the diffusion of water.

When the operation of thickening the cell wall is complete and the cell contents are used up an important change takes place; the cellulose becomes converted into lignin. This is not a definite chemical compound, but includes several substances, of which lignose is an important one. The cell walls are now said to be lignified; they now form true wood. This change renders them harder, more elastic, less absorbent, but at the same time easily traversed by water. The entire line between one thickened cell wall and another undergoes a still further change, and is called the "middle lamella."

We must think of pine wood, then, as made up of long tubular cells (see Fig. 1), nearly square on plan, with bluntly tapering ends, whose radial walls are studded with bordered pits. Such cells are called "tracheïdes."

It will now be necessary to glance at the structure of the root, or rather one of the rootlets. Fig. 3 is a section through a rootlet, and Fig. 5 shows a root hair in contact with particles of soil. Here the central axis is formed by the woody vessels, and is surrounded by tissue somewhat resembling pith in its structure, whose cells are lined with protoplasm and have cellulose walls. The whole is invested by a membrane, one cell thick—the eperdermis. Many of these eperdermis cells grow out into long closed tubes, called root hairs, so that the end of a rootlet, Fig. 4, resembles in appearance a diminutive brush, such as is used for cleaning glass tubes. These root hairs are in most intimate contact with the particles of soil, and absorb water which fills the interstices of the soil. This absorption of water through the cell wall is induced by the presence of organic acids within the cell and is so great that not only does the cell become distended, but it often takes up more than it can hold, so that the water exudes again. This is called the osmotic property of cells, and is of immense importance to plant life; in fact, plant life may be said to be dependent upon it. The cells contiguous to the root hairs do not absorb the water from them in the same way as and from the same cause that they had absorbed it from the soil. Water is thus passed on from cell to cell until all the cells become distended with it, and at length the hydrostatic pressure becomes so great that the water is filtered through the walls into the woody vessels in the center of the rootlet. The total sum of the pressures exerted by all the rootlets is called "root pressure," and may be so great that water is forced up the trunk of the tree to a considerable hight.

I have said that the wood vessels were empty except in spring. Now, in spring the ground soon gets warmed as the sun gains power, and, in consequence, the roots get stirred to activity, and water is filtered into and forced up the vessels. The water is forced up by root pressure alone and fills the cavities of the vessels. The sap is now said to be rising, and if the tree be cut water exudes from the lower portion in connection with the roots, and it is said to "bleed." Spring is in consequence the worst time for felling trees.

Let us now suppose the timber felled, shipped, stacked, sawn up and built into a floor, being quite sound and having escaped the attacks of various fungi and other mischances. We may, perhaps, now consider it secure. No! A fungus, not of wild forest life, but of domesticated habits, attacks it. Merulius lachrymans steals upon it in the dark, stagnant air and dooms it to rottenness and decay.

Let us suppose that a single spore of about $\frac{1}{1000}$ inch in diameter has found its way to the under surface of one of the joists, either by this having previously been placed near infected wood or from being cut by a saw which had been used upon infected wood, or, perhaps, the spore had floated thither in the air. What will happen? That depends largely upon the architect and builder. Every organism, to live and thrive, must have a congenial environment, and the merulius spore requires darkness and a warm, stagnant air.

This is not, however, sufficient. For a long time the spores could not be induced to germinate artificially until it was discovered a few years ago by Professor Hartig (to whom much of our knowledge of Merulius is due) that the presence of an alkali, such as ammonia, is a necessary condition. This frequently rises from the soil when it has not been properly prepared and from bad mortar or defective drains.

The spore lodged on the damp timber now begins to germinate. One or more protuberances appear on its surface, and these elongate into minute closed tubes or *hyphæ*, the spore meantime becoming exhausted of its contents. From the tips of the hyphæ a solvent is secreted which attacks the lignin and enables the filaments to pierce the cell wall and enter the wood, which soon exhibits a greenish-gray soft patch. The hyphæ now divide and ramify, attacking first the nutrient substances stored in the cells of the medullary rays, whence they obtain the nitrogen, potassium and phosphorus necessary for their more vigorous growth. Here and there a white mold breaks out from the joist in rounded patches, looking like white swan's down or cotton wool, but whose filaments seem to radiate from a number of centers on the surface of the wood. This outgrowth becomes more compact till it forms a dense felt of interwoven hyphæ of a slate or brown color, which creeps along the surface of the joists and completely incases them, while thick strands of it run in the angles between the boarding and the joist, or hang in festoons from one joist to another

Where this outgrowth is taking place on the surface of the wood the delicate filaments, or hyphæ, are piercing the cell walls, extending along the tracheïdes, and permeating the wood in all directions (see Fig. 6). The mineral substances are appropriated, and the lignose ($C_{18}H_{28}O_{11}$) of the cell walls, which is more complex in its chemical constitution, and which contains a larger amount of carbon relatively to oxygen than cellulose ($C_6H_{10}O_5$), is converted again into cellulose, which absorbs water and swells up, and then is itself absorbed or broken up into simpler substances by the fungus. The middle lamella of the cells is, moreover, dissolved, and the cells become dissociated.

It will be seen how necessary moisture is to the well-being of the fungus, by the fact that half its weight consists of water. Indeed, so susceptible is it to drought that it soon withers in dry air, and the delicate growth on an infected chip withered after an exposure of a few minutes. The mycelium condenses moisture from the air, and the wood when in a decayed state readily condenses and absorbs it. The mycelium may extend over brickwork and absorb moisture from it, it may even penetrate the soil and transport moisture to parts growing in dry situations.

I said that nitrogenous substances formed a necessary part of the food of the fungus (for nitrogen is one of the constituent elements of protoplasm), and that the only important source of such was the medullary rays. Now, it has been observed that the fungus economizes these by passing the protoplasmic contents of the older hyphæ on to the younger growing ones.

We saw, when considering the structure of pine, that the newer wood cells contained some protoplasm and nutrient matter, and also that the outer rings of wood or alburnum formed the vehicle of the ascending sap. It is evident, therefore, that if a builder has used this green wood or unseasoned sap wood he has provided the very substance to encourage the most rapid and vigorous growth of merulius.

Under favorable conditions the dense felted mycelium which extends along the underside of the timber assumes a more definite outline and along its margins, which often curve slightly downward, the surface becomes pitted and corrugated, resembling that of spongy india-rubber, but with the walls of the depressions zigzag and serrated. It now assumes a warm brown color, and from it are distilled, in consequence of the osmotic activity of its cells, clear drops of water, so that it glistens as if covered with dew.

This is the fructification of the fungus and the pendant tears have given it its specific name. Merulius lachrymans is allied to the mushroom (as shown in the table, which gives several orders of fungi, with their best known representatives) the mycelium corresponds with the mushroom "spawn" and the fructification with the mushroom itself, the zigzag corrugated ridges being the analogues of the mushroom "gills."

(To be continued.)

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MASONRY AND STONE CUTTING.*

THE ITALIAN VAULT is built of stone *voussoirs*, and the surface of the vaults is selected in such a way that their intersections lie in vertical planes, according to the precedent of Gothic groining. This is done by settling the section of either the wider or the narrower vault, and deducing therefrom the section of the other vault. Given (Fig. 76) the section A′M′N′Z′B′ of the smaller vault, it is easy to deduce therefrom the section of the other so that the groin be in a vertical plane, or, what is identically the same thing, that the plane of the groin be a straight line. After drawing several generators M′M, N′N, &c., of the first vault, we stop them on the line of the groin on plan and turn them round parallel to the sides of the second vault. If the section of the first vault be either a circle or an ellipse, the section of the second vault will be an ellipse; but if the section of the first vault be only formed of a combination of segments of circles, such as an oval or a pointed arch, then the section of the second vault will be formed of a combination of segments of ellipses.

The intersection of these two vaults of same hight but different spans is an example of an important general law which finds various applications in masonry. Surfaces which give conic sections (ellipse, hyperbola, parabola, line pair) in every direction are called quadratic surfaces, because their co-ordinates are obtained by quadratic equations (as in Fig. 78). Now, whenever two quadratic surfaces have one diameter in common, then their intersections lie in planes, a property which is the key to many interesting vault groinings. 79A shows plan of two elliptical domes which rise to the same level at the crown; 79B shows plan of intersection of elliptical dome and barrel-vault; 79C shows plan of intersection of cupola by barrel-vault of elliptical section. Cylinders are quadratic surfaces, for their section by any plane will give either an ellipse, a circle or a line pair, all of which are conic sections. It follows, therefore, that when any two vaults of elliptical section (the circle is but a special ellipse) springing from the same level and rising to the same hight at the crown intersect one another, the groins formed by their intersections lie in vertical planes. This is true, whatever may be the angle at which the vaults meet, when they meet at an oblique angle, as in Fig. 80, as well as when they meet at right angles.

The intersection of two vaults can present two totally different appearances. If the vaults cross one another, as in Fig. 76, so that the generators of each vault are interrupted at one groin and appear again at the other groin, the groins form a projecting arris between the two vaulting surfaces. If the vaults do not cross one another, but that their generators lie within the groins, as in Fig. 77, then the groins form valleys between the two vaulting surfaces. In the former case we have cross vaults, in the latter a rectangular dome or a coved ceiling.

We now consider two vaulted passages, which (Fig. 81) form a return angle such as occurs at the angle of a cloister. One of the passages is narrower than the other, and is of semi-circular section, A′ Z′ B′; the square section of the other passage is the eclipse A″ Z″ B″, the axis O″ Z″ of which is equal to radius O′ Z′ of the first vault. The groin formed by the intersection of the vaults lies in a vertical plane, and it is projected in plan on the line C E. We draw the section of the first vault as any ordinary arch. We remind the reader that the radius of the extrados = thickness of the vault at the crown + ⅛ of the diameter A′ B′ of the arch. The bed-joints of that vault pass through the centre line of the vault. On the wider vault of elliptical section the joint lines will be at the same level as on the smaller vault; this determines

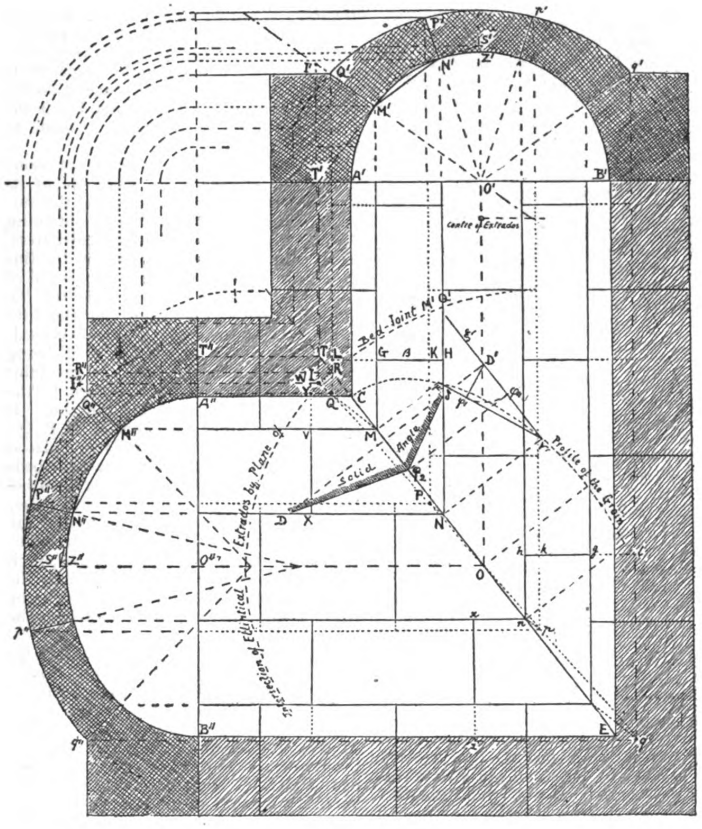
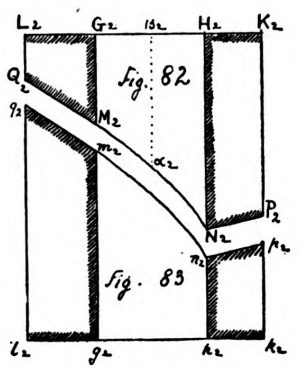


Fig. 81.—*Return Angle of a Cloister.*



Figs. 82 *and* 83.—*Molds for Groin Stone.*

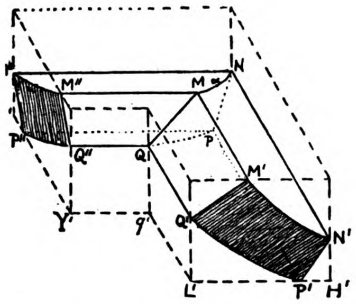


Fig. 84.—*Cutting the Stone by Aid of the Square.*

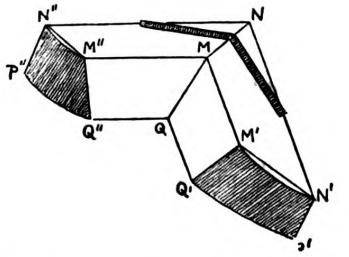


Fig. 85.—*Working the Stone with Bevels.*

MASONRY AND STONE CUTTING.

** Continued from page 246, December, 1889.*

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M″ N″, &c., on the square section. The surface of the joint will be a plane normal to the soffit of the vault, that is perpendicular to the plane tangent to the soffit along the joint-line. The joints M″ Q″, N″ P″ will be perpendicular to the tangent to the ellipse in the points M″ and N″. These tangents can easily be found by means of the tangents in M′ and N′ of the semi-circular vault; for as the intersection of the vaults lies in a plane, the tangents to that intersection must lie in that plane. On the other hand, we know that a tangent to the intersection of two surfaces is the intersection of the planes tangent to those surfaces. The line T′ T is the trace of the plane tangent to the first vault along the joint-line M′ M. T is therefore the trace of the tangent to the groin in the point M. The trace of the plane tangent to the second vault along the joint-line M M″ naturally passes through the point T, the trace is therefore the line T T″. Joining T″ and M″, we get the tangent TM″, to which M″ Q″ has to be at right angles. When two ellipses have an equal axis, as is the case here, O″ Z″ = O′ Z′, the tangents, to point at the same level, cut that axis at the same level. For the tangent to the point N″ we need only take S″ Z″ =S′ Z′ and join N′ S″.

Now, the bed-joints of the second vault will be planes drawn through the joint lines, such as M Q″, and the normals, such as M″Q″. As the stones which form the groin have to take in a piece of each vault, it is desirable that the joint lines of the extrados should be on the same level in each vault. This determines the points U″, P″, &c., which form the outline of the extrados of the second vault. Now, the two joint lines on the extrados at the level of Q″ and Q′ meet on plan in the point Q, and therefore, M Q is the projection of the intersection of the bed joints of both vaults at that level. If the points Q P O *p q* be connected by a continuous curve, it will be the projection of the intersection of the two extrados surfaces.

The extrados of the second vault might be calculated so that its intersection with the extrados of the first vault be a curve in a vertical plane projected in C E. To do this the generator Q′ of the extrados of the first vault would have to be stopped in the point R on the line C E, then through this point we produce the horizontal line R R′, which will be a generator of the extrados of the elliptical arch; its elevation R″ is a point of the section of the extrados, which in this case will be an ellipse shown by dotted line. The joint M″ Q″ would have in that case to be prolonged to I″. Take I′ on joint M′ Q′ of first vault at the same level as I′ and we shall find I the point on the plan where the bed joint of the first vault meets joint line on the extrados of the second vault. We see thereby that the joint line on the extrados of the first vault will have to ascend the extrados of the second vault from the point R to I, so as to get to the joint line of the second extrados. R I is a portion of the ellipse produced by the section of the elliptical extrados by the plane of the bed joint M′ Q′. On this extrados the joint line of the stone would therefore form the broken line W I R L. This second mode of delineating the extrados is therefore rather more complicated than our former arrangement, but it presents the advantage of thickening the larger vault in its lower part and should always be adopted when there is a great difference in the span of the two vaults. To continue our first construction, we draw the vertical joints, which are simply vertical planes, projected in L G K H and Y V X. The polygon L Q Y X N H L will then be the plan of one of the groin stones. Now, if we consider a stone on the opposite side of the groin, such as the one of plan *l g z x n h*, we shall observe that the intersection of the vaults forms a valley, as in the miter of coved ceilings; whereas, on the stone L Q Y X H L the intersection forms a projecting groin, as in the case of cross vaults. The angle of a cloister offers, therefore, a combination of both cases of intersection of vaults.

Molds.—By unrolling the soffit of the first vault we get, Fig. 82, the mold for the soffit of that half of the groin stone. The joint line G β H, Fig. 81, becomes the straight line $G_2\beta_2H_2$, Fig. 82, and the groin M and N, Fig. 81, develops into the curve $M_2a_2N_2$, Fig. 82. Then, making G_2L_2 = M′ Q′ and H_2K_2 = N′ P′, we can draw easily the quadrilaterals $G_2L_2Q_2M_2$ and $H_2K_2P_2N_2$, which are the molds of the bed joints of that half of the stone. Similar molds might be drawn for that part of the stone which belongs to the elliptical vault; but they are not required for working the stone.

As to the stone *x n l h g z* on the opposite side of the groin, its molds are given in Fig. 83, and the reader will observe that their outline coincides exactly with that of the first stone, but reversed, the concave lines of the first becoming convex in the second.

Cutting of the Stone with the Help of the Square Only. Begin by working an operation prism (Fig. 84), the base X′ Y′ *q′* L′ H′ of which is equal to the outline X Y Q L H N of the stone on the plan (Fig 81), and the hight of which is equal to the difference of level between M′ and P′ on the section of the first vault. Then, on the one end the outline M′ N′ P′ Q′ of the head of the groin stone will be delineated. (In Fig 84 the groin stone is turned upside down, with its further end towards us, so as to show its soffit.) On the other end the head M″ N″ P″ Q″ of the stone will be delineated. Then all the horizontal arizes M′ M, M″ M, Q′ Q, Q″ Q, P′ P, P″ P, N′ N, N″ N, will be delineated on the faces of the operation prism.

Guided by these lines, the soffit, starting from the head curve M′ N′, can be worked either by means of a templet cut to the curve of the arch, and made to rest on the lines M′ M and N′ N, or by repeating the head curve M′ N′ on the opposite face of the prism and working the stone with a straight-edge. Then the mold G_2 M_2 N_2 H_2 (Fig. 82) of the soffit of the semi-circular vault will be squeezed in, and the groin line M N (Fig. 84) will be delineated. It is evident that the soffit of the second vault can now be cut with the help of a straight-edge guided by the head curve M″ N″ and the groin curve M N. In drawing the soffit mold several points, such as *a*, should be marked to guide the straight-edge.

The upper bed N′ P′ P is, in Fig. 84, placed below on account of the stone being turned upside down. It is a plane easy to work by means of the arrisses already delineated. The bed mold can then be placed on that plane and its extremity N P marked, which gives us all the lines required for working the return of the bed in N″ P″. As for the lower beds, M′ M Q Q′ and M″ M Q Q″, they comprise a valley. The first bed will have to be worked progressively from the edges M′ M and Q′ Q until the bed mold can be placed thereon, taking care to leave the line M Q quite clear; then the other bed will be easily worked.

The extrados surfaces can be worked with the help of a templet and an extrados mold; but often the back of the stone is not worked at all and the groin stone is simply finished by the horizontal plane of the operation prism.

The above method of working the groin stone is very accurate; but, as it implies a waste of labor in working many operation planes, master masons prefer the next method, where the work is done with the help of bevels.

Method of Working the Stone with Bevels.—In this method the soffits of the stone are first replaced by two operation planes which connect the arrisses M G and N H, M V and N X, Fig. 81. If these planes be prolonged, the one would have the vertical trace N′ N′, the other M″ N″ on the planes of the cross sections. The intersection of these two soffit planes is a straight line projected in plan on M N; this line is the chord of the ellipse profile of the groin. To get the bevel required for working this stone, the solid angle comprised between the two operation planes must be measured. To do this we turn down the groin round the line C E (that is exactly equivalent to making an elevation of the groin, taking the line C E as ground line), and we get the chord $\mu' \nu'$, and the horizontal joint lines projected on horizontal lines as $\iota' \xi'$. Now, if we take through a point ϕ' on the chord a plane at right angles with the chord, it will cut the joint lines in points projected on the groin elevation in D′ and on plan in D and δ. The lines connecting the point ϕ with the points D and δ measure the solid angle comprised between the soffit operation planes. When we turn up the plane with which we cut the solid angle the point φ' comes to ϕ''. That plane is then horizontal and we get the solid angle in its real size in D ϕ_2 δ. In this operation the line which connects the points D δ is the hinge round which the plane is made to turn.

Now, having chosen a block of stone dotted on elevation, we work one of its sides to a plane, and mark thereon the outline of the soffit operation plane containing M M′, N N′ (Fig. 85), a quadrilateral easily drawn. Then, guided by the line M N, the operation plane of the soffit of the other vault will be produced. To work it, a bevel (Fig. 85) giving the solid angle between the operation planes is used. The length of the lines N N″, M M″ being measured off from the plan, the end joint M″ N″ P″ Q″ is worked square to the soffit operation plane, and the same is done for the other end joint M′ N′ P′ Q′; then the section of the vaults are placed on the respective head-joints, and the beds and soffits can be worked as described before. In this method, the only labor wasted on operation planes is that for the soffits, all other worked surfaces remain.

The groin stones on the valley side, such as *x n h l g z* can be easily worked by the first method, but some care will be requisite to stop the soffits neatly at the groin line.

The keystone of the return angle (Fig 81) is worked like the other groin stones. In the keystone of a crossing (Fig. 76) the soffit belonging to the semicircular arch is first worked right through its length. Then with a templet giving the elliptical profile of the groin, the two groin lines can be marked, and the soffit of the other vault can be worked therefrom. The keystone of a rectangular dome is rather difficult to work on account of its soffit presenting four valleys. With templets giving the profile of the groins, chisel-chases must be worked down on the diagonals of the keystone. These will then serve as guiding lines for working the cylindrical surface of the soffix between them. The most practical way of sinking curved chisel-chases is to sink several holes along the line of the depth requisite to reach the curve, then connect these holes together by removing the stone between them.

(To be continued.)

The changed condition of the country in respect of its timber supplies appears from the fact that several large vessels are loading with timber at ports on Puget

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RESIDENCE OF CAPT. J. W. WESCOTT, DETROIT, MICH.

A. C. VARNEY & CO., ARCHITECTS.

FOR ELEVATIONS AND PLANS SEE PAGES 71 AND 73.

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Sound to supply shipyards in Maine, the "pine-tree State."

Peach Bottom Slate.

The finest roofing slate in the world, says the Bel Air *Democrat*, is that known in commerce as Peach Bottom slate, and which is taken from a ridge extending about 7 miles from Peach Bottom, on the Susquehanna River, in York County, Pa., southwardly into Hartford County, Md., about 2 miles of the ridge being in the latter State. The first quarries were opened at Peach Bottom, which gave the name to the slate. Since that time the industry has worked back along the ridge, until now three-fourths of the so-called Peach Bottom slate is taken from quarries in Hartford County.

Stretched for over a mile along the base of the ridge, and hemmed in between it and Scott's Run, is the thriving borough of Delta, which sprang up with the slate industry, and is dependent on it for existence. As the quarries moved toward the southwest the town followed them until it, too, has crossed Mason and Dixon's line and has extended into Hartford, where, under the name of South Delta, it is now booming, if that progress may be called a boom which is the result of natural causes.

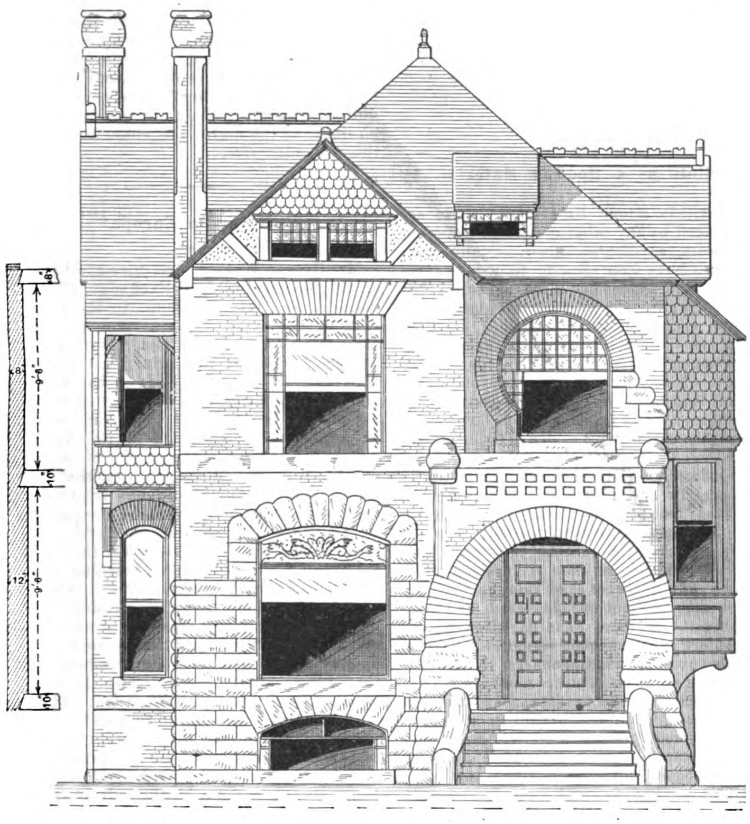
There are now in operation on the Hartford side six quarries, giving employment to over 200 men. The demand for Peach Bottom slate was never so great as now. The quarries in operation are being worked to their full capacity, new quarries are being opened and old ones reopened, and as the supply of slate is practically inexhaustible there is every reason to believe that with proper management on the part of the manager the business of the quarries will continue to increase.

Manual Training Schools.

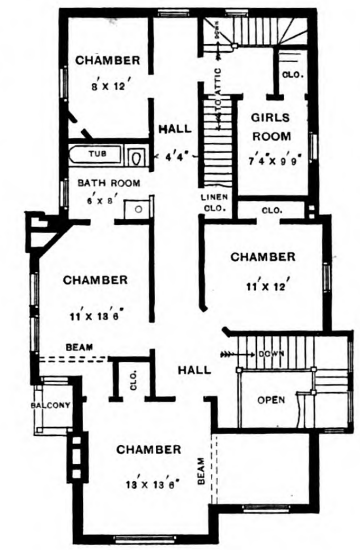
We are in receipt of the following letter, called out by the remarks under the above title which appeared in our issue for February:

Editor Carpentry and Building: Please permit the so-called "Economist" to briefly reply to the comment in the February number of your esteemed journal on his address on the subject of manual training. It is unfortunate that the daily press, from which you evidently took the short excerpt from my lecture, should be under such pressure of news relating to baseball, prize-fights, horse-racing, &c., as to find hardly any room for reports of doings and sayings affecting such minor topics as the social condition of the masses. It therefore almost invariably happens that one who thinks he has some suggestion to offer which might aid in solving the tremendous problem which confronts society is made to assume a position diametrically opposite to that he actually holds. So far from not approving manual training schools, I stated very emphatically that in the bright Utopia which we are striving to realize manual training will be a compulsory part of every system of education, and that every factory will have its trade school as a necessary annex, for the more skilled workingmen trained the more work there will be for them to do.

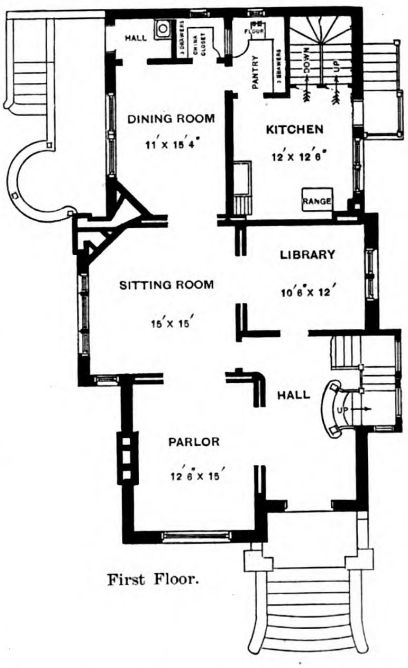
What I did state and what I repeat was that those who have charge of the technical education of the young should not consider that they are completing a task; that it is their duty not only to turn out skilled mechanics but to furnish them with work, and that because they are derelict to this phase of their obligations they are simply complicating the labor problem, instead of solving it. Nor does it make any economic difference whether this added competition among the already overcrowded ranks of labor is caused by criminals working for the State, paupers and objects of charity working for the asylums which protect them or the "sons of honest mechanics"



Section and Front Elevation.



Second Floor.



First Floor.

RESIDENCE OF CAPT. J. W. WESCOTT, DETROIT, MICH.

A. C. VARNEY & CO., ARCHITECTS.

Scale—Elevation, ⅛ Inch.—Floor Plans, 1-16 Inch to the Foot. *(See Colored Supplement and Article on page 73.)*

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underbidding their own parents in the eager quest for work, so much so that in the end father and son together only earn as much wages as the father himself formerly did.

A simple illustration of this latter fact is afforded by our cigarmakers. In former years a cigarmaker could earn from $15 to $20 a week working alone. In an evil hour he taught his wife how to make cigars and his children to "strip," &c. Now it is a common sight to see the whole family working in the living-room of the tenement-house in which they reside, and their total wages amount to the same $15 to $20 a week. Any cigarmaker you may ask will verify this statement. Of what benefit was it that this wife and these children of an honest mechanic should have been taught the elements of their trade.

We demand that all taxation on industry and the products of industry shall be abolished, and that every one holding out of use God's given earth shall pay to the community for the benefit of all the annual rental value of that portion of the earth as monopolized by him. This will at once set free thousands of natural opportunities, and the demand for labor will be so great and the consequent wages so high that manual training schools will have to be established on almost every block to supply the demand for skilled workingmen. In no trade will this demand make itself so quickly felt as in the carpenters' and building trades, of which your journal is so able an exponent. It behooves you more than any other editor to advocate the single tax. It is practical, it is just, it will produce the result that is expected of it. What I ask of those in charge of manual training schools is not that they shall close them up, but that they shall assist with all their might in bringing about the general adoption of the single tax. Then, indeed, will they have efficiently aided in solving the labor problem. Yours respectfully,

J. R. ABARBANELL.

Glue and Gluing.

The following notes on the use of glue will interest many of our readers:

To glue two surfaces together seems to be a very simple operation, and so it is if the surfaces of the wood and the glue be properly prepared. Good glue may be known by having rather a "fishy" smell when hot—it by no means follows that the glue should be composed either of fishy or part fishy matter, but if glue be prepared from properly selected materials it always has a distinct smell as stated. Adulteration by means of resin is a very common means of recommending a good (?) clear glue to a buyer, and, as a further bait, it can be sold at a marvellously low price. This description, being composed of rosin, takes longer to melt than pure glue, and is deceptive in appearance, so that if we wish to thin it for a joint, we shall weaken the adhesive power of the little real glue that was in it, and simply make a sloppy mess of powdered rosin and water, and not having any adhesion in its composition, we probably spoil our work. The many blisters we find on veneered surfaces may be very often attributed to such inferior material.

Well prepared glue should be free from "lime." This may be tested by jointing two pieces of very soft "bay-wood" together, and freely glueing them. If on paring off the superfluous glue, prior to planing the joint level, we find the wood "pinky" in color, we may conclude that the lime has stained the wood. It should then be well boiled and strained, and it will come to a clear, harmless fluid. If in gluing two surfaces together we need to heat them, the surfaces must not be glued while the heat is too much for the hand to bear, because the glue gets a "skin" on its surface and will not penetrate the opposite surface, so that a layer of glue remains in the joint that can be easily separated. If one surface be glued at the bench, and another piece be warmed and applied to it, and well cramped up, the heated side will melt the glue and absorb it into itself, and the gluing thus becomes a success. Chilled or cold glue will not hold the least grip.

The best consistency for glue for a joint to be "rubbed," or for veneer to be "laid" with, is to thin it until it runs in a stream from a "glue-stick" or a small brush; it must not be so thin as to "drop." As "hand-screws" form a common means for cramping pieces of jointed stuff together, men should look more after them and keep them in order. By the constant pressure of the back screws the "jaws" become bent, and consequently don't close on the wood as they ought. They should have the "jaws" planed or "shot" on the inside, and it would repay the time tenfold. Again, iron cramps are oftentimes rendered abortive by the "bar" being strained and bent, so that to cramp up a table-frame or a dowelled joint is a difficult job. The screw of the cramp is often out of order and troublesome. In such cases the foreman's attention should be directed to this, in order to have it put right.

Slate as a Roofing Material.

It will be a long time before slates are displaced by any other material for roofing purposes, says *Stonemason*. Many substitutes have from time to time been proposed, and sometimes it has appeared that their rivalry would become formidable. They were lighter, it was said, or more durable, or more impervious to the weather, or cheaper, or more attractive in appearance. Yet, with all these recommendations they have not yet superseded the old-fashioned slates or, so far as we are aware, sensibly reduced the demand for them. And we do not wonder. We might get a roofing material which would be lighter in weight and possibly considerably less in cost; but as to its being more durable on the one hand or more attractive on the other we are by no means persuaded that such would be the case. Amidst certain surroundings there is no doubt something picturesque about red tiles, and still more so about the more primitive thatch, but both are excelled, even in point of color, under ordinary circumstances, by the blue or gray of slates, and in neatness of appearance, in their resistance of weather and practical indestructibility slates are unsurpassed. Other materials may have some desirable attributes which slates do not possess, but none combine, so far as we know, so many excellencies, and for all-round utility they hold undisputed possession of the field.

London Building Laws.

A late issue of the *Engineering and Building Record* contains the following relative to proposed changes in the London building laws:

The London County Council will ask Parliament to pass a new bill defining and extending its power, some parts of which will change the metropolitan building law on points of general interest. Thus one section gives the council authority to permit the erection of a building without party walls, used for trade or manufacture, including more than 216,000 cubic feet, but the space cannot exceed 450,000 cubic feet. Another section gives the council power to make by-laws at discretion regarding the kind and quality of the substances used in making plaster and the materials used and manner of filling any excavation within 3 feet of any building.

It is provided that no structure not erected for the purpose shall be used or converted into a public building without the consent of the council in writing, and that the council may give such consent subject to such regulations and conditions as it may think fit. The provisions in regard to the rights of the public when buildings are being put up or taken down are especially noteworthy. Any person who intends to build or take down any building or wall within 30 feet of a public thoroughfare must give notice to the authorities, and before beginning work put up a boarding or fence, with convenient platform and handrail to serve as a footway outside of the fence, if there is room for it, all to the satisfaction of the authorities, and maintain both fence and footway while the work continues, and keep the latter well lighted at night. This section is provided with considerable penalties in the way of fines, as indeed are all of similar character in the bill. The fine for erecting a building too high, for instance, is £100, with £10 added for every day that the offense continues. The prescribed hight is 70 feet above the ground, unless the consent in writing of the council is gotten to go above that; but there appears no limit to the hight the council can in this way authorize.

Building in Europe.

Mr. George Watson, first vice-president of the Master Builders' Exchange, Philadelphia, Pa., returned home in the early part of the year from a nine months sojourn in foreign countries. During his absence he visited the principal cities of interest upon the other side of the water and made investigations which are of value not only to builders but to all interested in the industrial education of the American youth. In speaking of the pleasures of the trip, Mr. Watson states that he never received more courteous treatment than was accorded the party by the people of England, Ireland and Scotland. In London the builders have what they call a 'Builders' Institute,' and, learning that the visitors were representatives of American organizations, they gave a dinner. I told them, says Mr. Watson, what we were trying to do in the way of trade schools, but they could not understand how schools of that kind could succeed. The London builders work differently from us. They make general contracts and furnish the mechanics and material themselves, employing skilled workmen in all the branches, and having their own yards and stores. Here, all this is done by the sub-contract system. There, when a strike occurs, it means a strike in all its branches. The purpose of the institute is chiefly to protect the members against strikes and by their system, when a strike occurs in Liverpool, for instance, men are sent from London to do the work. The builders use their influence in other ways, however, and are now urging Parliament to take action on an appeal against excessive freight rates.

* * * * * *

The mechanic of Europe is a laborer; he looks like a laborer, and I certainly felt proud of being an American mechanic when I understood his condition. The methods of European workmen are sometimes different from those of workmen here. In many trades they are artists. The stone masons and plasterers, in particular, are artists, but in Salzburg I saw them trudging along, wheeling their tools

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in handcarts. In San Remo I saw them handle stone in a curious way. Four men would lift a stone of great weight and set it on the head of a fifth man, who would carry it to the point on a level, or to the floor of a building where it was to be laid, and then four other men would remove it from the head of the carrier and set it in its place. All through Germany and Austria I saw women mixing and carrying the mortar for the masons and bricklayers. They do not use hods, but a kind of a tray which they carry on their heads. In Zurich I saw a peculiar style of pile driving. The weight was hauled up by a rope drawn hand over hand by a gang of men, who would let go the rope when they wanted the weight to drop. This method did not work as well as ours. In Munich I visited one of the beer gardens frequented by workmen and talked with an intelligent stone cutter. He said the workmen rarely had meat to eat more than once a week. Their dinner consisted of their beer, a little brown bread and sausage. The beer cost them 2 cents a gallon, and they drank it quietly at work or at dinner. I saw no disorder whatever among them, and, in fact, saw but three drunken men during the whole time I was in Europe.

One thing deeply impressed me while abroad, said Mr. Watson, and that was that the continental tourist of ten years hence will not know what historic Europe was. Everywhere they are tearing down the old landmarks and substituting buildings of modern design. Cologne, for instance, has three times increased its original size, and ground never occupied before is now filled with dwellings. I was struck by the activity in the building trades, and inquired of more than one man whence they get their money. I don't know how true it was, but I was told that travelers had brought over $30,000,000 last year. I have no doubt that foreign money has stimulated European building enterprises. Even old Nuremburg, with its gates, its walls and its castles is giving way to the builders, and in old Ghetto, 'the Jew's quarter' of Rome, the tumble-down structures, which were sometimes overflowed by the Tiber, have been replaced by elegant houses on raised ground. They build their houses well on the inside in Europe, and the outside they build substantially rather than ornamentally.

Residence of Capt. J. W. Wescott.

On this page and on pages 71 and 74 we present the elevations, floor plans and details of a brick residence on Trumbull avenue, Detroit, erected a short time since for Capt. J. W. Wescott, from plans prepared by A. C. Varney & Co., architects, of that city. The house is a two-story structure of attractive exterior and cost about $5500. The perspective view will be found on the colored plate which forms a supplement to this issue of *Carpentry and Building*. The house is well arranged, affording space for five rooms and a large hall upon the first floor and five sleeping rooms and a bathroom upon the second floor. Three of the rooms upon the first floor are readily accessible from the hall, while the dining-room, which is placed in the rear, is entered from the sitting-room. The house is heated by means of a furnace supplemented by grates in the parlor and dining-room. With the exception of the kitchen, all the rooms upon the first floor are finished in ash and red oak, while the hall has a parquetry floor. The rooms on the second floor are finished in white pine, natural wood. The basement extends under the entire house. The engravings, including details, show the work so minutely that extended description is unnecessary.



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

RESIDENCE OF CAPT. J. W. WESCOTT, DETROIT, MICH.

NEW PUBLICATIONS.

COURT HOUSES, CITY HALLS, JAILS, &C. By Palliser, Palliser & Co., Architects. Size 10¾ x 13½ inches; 96 pages, profusely illustrated. Published by Palliser, Palliser & Co. Price, in paper cover, $2; bound in cloth, $3.

This is a volume which is published quarterly and contains a great variety of plans, details, elevations, &c., of court houses, city halls, jails, &c. A number of plans show work already executed thus adding materially to its value. The authors announce that in presenting these designs and plans to public officials, building committees and corporations, it has been their endeavor to give a selection of practical plans, which with a few additions and changes, can be adapted to the requirements of all grades and sizes of villages, towns, cities and counties. While it is not expected that the plans will meet all the requirements of communities other than those for which they were designed, they can be used as a basis of study from which suitable buildings may be developed to meet peculiar conditions.

A TEXT BOOK ON ROOFS AND BRIDGES. PART II. GRAPHIC STATICS. By Mansfield Merriman and Henry S. Jacoby. New York: John Wiley & Sons. 8vo., 124 pp., 4 Plates. $2.50.

This volume contains the second part of the course of instruction in roofs and bridges at Lehigh University. It gives the analysis of stresses by graphic methods.

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It will be followed by a third part, giving the design of a bridge, and a fourth containing a discussion of the four principal kinds of bridges. The new features of this text-book are found in its abbreviated processes in some of the diagrams for wind stresses, the determination of those due to initial tension, and the analysis of maximum moments and shears under locomotive wheel loads.

Zinc Ceilings.

The large use of zinc and sheet metal for architectural ornamentation in America and Australia, says an English exchange, is one of the notable facts which the records of contemporary buildings in those countries brings to our notice. Cornices, window dressings, mansard and other roofs, dormers and ornaments are largely formed of sheet metal, fixed upon brackets to the walls, or otherwise secured to the structure. Unfortunately, we have no definite information as to the durability of this sort of architectural decoration, though, judging from English experience of metal work and zinc applied externally, there is little promise of the permanence of these appliances. In Sydney zinc appears to be used for ornamental ceilings, and a ceiling of this kind on a rather large scale has been recently fixed in an hotel dining-hall at Sydney, which for richness of ornamentation and "beauty of design" is said to be unrivaled. The ceiling is divided into 15 deep and rich panels, "handsomely decorated and gilded." The chief advantages of a zinc ceiling are that it can be soon fixed without dirt, and is a comparatively light material. Certainly, its internal employment is more likely to be a success than its external application. The metal can be molded into panels or coffers, and fixed up in large pieces, and the material can be decorated or gilded. Molded zinc cornices can be fixed *in situ*. The acoustical properties of the material is a point that has to be tested. One thing in its favor is its durability. We are not aware that metal ceilings have been employed in this country to any extent, though there are many substitutes for plaster. One question is the fixing of the sheets, and the allowance to be made for expansion and contraction. To cover old ceilings, or to prevent the appearance of cracks, the metal ceiling is well adapted, as the sheets can be easily fixed, care being taken to prevent the unpleasant rattling of the sheets from vibration or shaking of the floor.

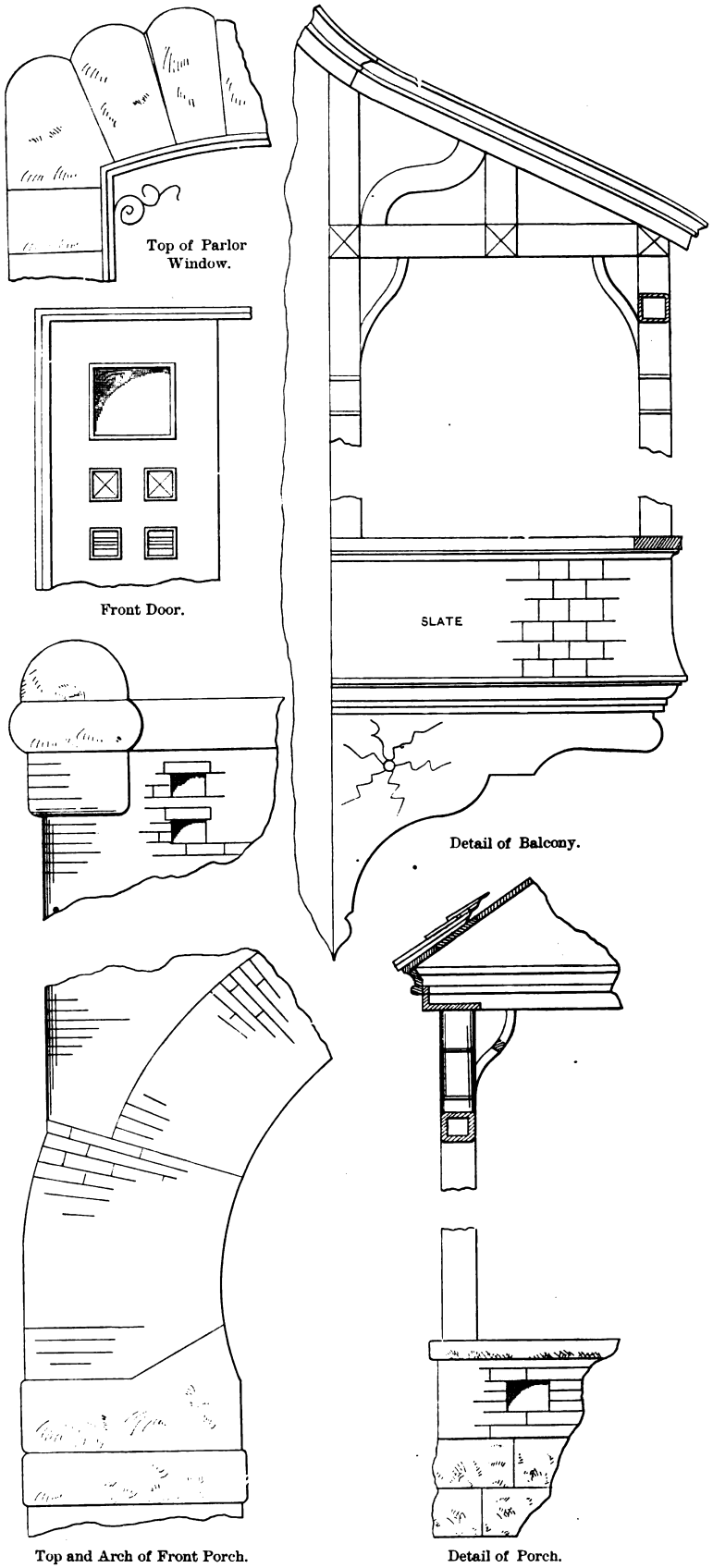
Architects to Specify Sizes of Window Panes.

At the recent convention in Detroit of the Master House Painters' and Decorators' Association of the United States of America, the following resolution was unanimously adopted:

Whereas, The fact that architects do not usually specify the sizes of glass, is a source of much inconvenience and loss to master painters.

Resolved, That the Master House Painters' and Decorators' Association of the United States of America, in convention assembled, do earnestly and respectfully request architects in future to specify the sizes of all glass, and that the secretary be requested to forward a copy of this resolution under the seal of the association to the American Institute of Architects.

The Franklin Institute, of Philadelphia, are proposing to erect a handsome fireproof building, to cost $300,000 to $400,000, including the site. A committee of 100 are obtaining subscriptions.



RESIDENCE OF CAPT. J. W. WESCOTT.—DETAILS.

Scale, ½ Inch to the Foot.—(See Colored Supplement and Article on page 73.)

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SOME MODERN BATH ROOMS.

FROM a copyrighted catalogue lately issued by Leonard D. Hosford, 43 Beekman street, New York City, we are permitted to take the engravings of bathroom interiors shown in pages 76 and 77, illustrating work that Mr. Hosford has executed in this city and Brooklyn. In addition to the brief descriptive particulars given in the catalogue, Mr. Hosford furnishes us with some interesting figures concerning the cost of the work.

Fig. 1 shows the arrangement of bathroom piping and fixtures in a house, 453 Fifth avenue, New York. This room, it will be noticed, is very compactly arranged, and it will also be seen that the pipes are all exposed and that the fixtures stand free from the wall on all sides, so that they can be readily cleaned.

In Fig. 2 is shown a bathroom as plumbed for a New York City dwelling now in process of erection, the room 10 x 14 in size, being situated in an extension opening off the second story chamber. At the left of the cut is shown the nickel-plated needle-bath, with rubber curtain, while behind it is a solid white porcelain sitz bath with bidet attachment. In the corner is a syphon water-closet with oval bracket-seat. A lavatory, supported on nickel-plated standards, with oval bowl, is in the middle of the room at the end, and in the right hand corner is a solid white earthen slop sink resting on plated brass legs. On the right side of the room is the porcelain-lined bath with heavy marble rim and which, it will be noticed, is set level with the floor. The particular feature of the arrangement in this bathroom is the absence of all woodwork in connection with the plumbing, so that all the piping is exposed to view. Whatever pipes are not shown in the bathroom itself are exposed on the ceiling of the butler's pantry which is situated immediately below. The walls of the bathroom to the hight of 6 feet are covered with glazed cream tile, while the floor is laid in a special unglazed tile ⅞ inch thick. The plumbing in this room, we are informed, done in connection with the other work of the house, will cost from $900 to $1000, the cost of the tiling being about $375 in addition.

The line drawing, Fig. 3, shows the arrangement of piping in a bathroom at 43 West Fifty-first street, New York. No pipes are carried beneath the floor, and all are accessible. The vertical lines of soil and vent pipes which pass through the room uncased are finished in silver bronze. This system of placing all the horizontal pipes above the floor is specially alluded to by Mr. Hosford, who refers to the advantage of this system over the old method of placing the pipes beneath the flooring, which necessitates the notching of beams to receive them. The horizontal pipes are arranged on a bracket hanger and stand about 3 feet from the wall at the back, so that they can be readily cleaned. The branch pipe to receive the waste from the closet is taken off the main line below the ceiling, and shows in the dish closet at the side of the alcove in back parlor. The soil and vent pipes are cast iron, and stand about 5 inches away from the wall at the back and side, and are supported by special bracket hangers. The cast-iron pipes are finished in a white china glazed paint. The vertical line of water supply-pipes are of tin-lined brass pipe. The cost of a bathroom plumbed in this way, according to Mr. Hosford's estimate, is about $175, when it is done in connection with the other work. This price does not include the carpenter work or tiling, but it will be readily seen that there is very little carpenter work to be done.

In Fig. 4 another bathroom interior is shown, the room being in a residence in Lefferts place, Brooklyn. On the left is the porcelain-lined bathtub with sitz bath having bidet attachment, while in the corner is the porcelain-lined bath with shampoo cock over it, the open lavatory, resting on nickel plated legs coming between the bathtub and the closet, the latter being of the syphon kind with paneled cistern. The wainscoting of the room is blue tinted and figured English tile, the floor under the fixtures around the edge of the room being of glazed white tile, while the center of the room is covered with parquet floor. The exteriors of the bath and sitz bath are finished in a white enameled paint. All the supply, vent and waste pipes are nickel-plated brass, while the soil-pipe is finished in white enameled paint. As in Fig. 2 the pipes are all exposed, rendering them easily kept clean. The cost of this room, as near as can be figured, Mr. Hosford informs us, done in connection with the other work of the house, was about $450, not including the tiling, which amounted to about $200. The whole forms a very handsome piece of work.

GREENHOUSE-HEATING BY HOT WATER.

THE GENERAL SUBJECT of greenhouse-heating is one we know many of our readers are interested in because they often send us inquiries of all sorts relating to this branch of heating. The use of hot water for this purpose is, to all practical purposes, the oldest application, in this country at least, of water as a heating medium. Long after it was popular for greenhouses it first came into general use for residences. We take pleasure in presenting this month cuts showing the arrangement of pipes in two greenhouses, engraved from drawings, for which we are indebted to Hitchings & Co., 233 Mercer street, New York.

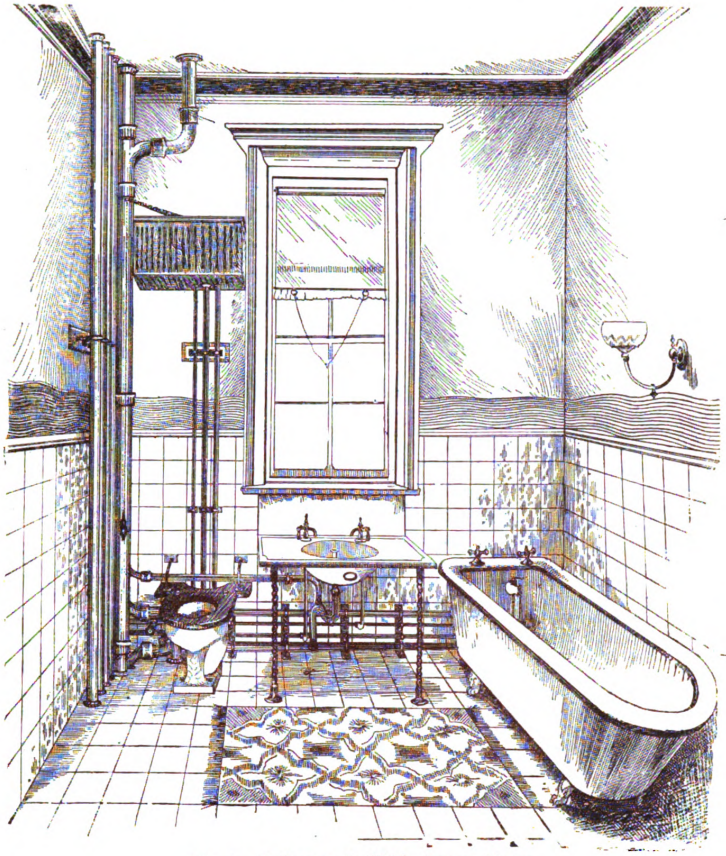
In Fig. 1, page 78 a greenhouse 100 x 18 feet, having a partition midway of its length, is represented. The portion of the house further from the boiler is intended for plants requiring but moderate heat, and the valves at the partition provide a perfect control of the heat in this cooler section. The arrangement of valves is such that when the angle-valve beyond the partition is closed and the T-valve opened, the circulation will be through the first or warmer section of the house only, flowing through the tank and T-valve and returning to the boiler by way of the return pipes. When heating the second section the angle-valve is opened and the T-valve closed, thus causing the circulation to be through the full length of the house and returning through the "run" of the T-valve, thence to the boiler. By the adjustment of these valves the circulation through either or both sections of the house may be regulated at will. The heat to be maintained in the first section of the house is 55° to 60° F. during coldest weather. To attain this there is provided 390 linear feet of 4-inch pipe, being a proportion of a little more than 1 foot of pipe or 1 foot of heating-surface to about 3 square feet of sash-surface. The second section is intended to be heated to a night temperature of 50° F., and the heating pipes are proportioned in the ratio of 1 foot of 4-inch pipe or 1 foot of heating-surface to every 3½ square feet of sash-surface.

Fig. 4 represents a standard form of rose-house, such houses as are designed for the forcing of bloom through the winter months. The dimensions are 100 x 18 feet, and it is heated by the No. 16 Standard Greenhouse Boiler, with eight lines of 4-inch pipe distributed through the width of the house, as shown by the diagram. The side pipes terminate at the far end of the house in expansion-tanks and those under the center bench in a standing pipe of the same hight as the tanks. The two tanks used have a sufficient hight and diameter to hold the expansion of the water in all the pipes, the standing pipe on the center runs serving only as an air-vent for these pipes. In these houses valves are placed on the lines of pipes at the front and the back of the house, to be closed during the fall and spring months, when but little heat is required. A small fire will quickly and easily warm the line of pipes through the center of the house. The heat required in these houses is about 60° F. during coldest nights, and the proportion of heating-surface in the pipes is in the ratio of 1 foot of 4-inch pipe, or 1 foot of heating-surface, to about 3 or 2½ square feet of sash-surface. The boiler or water-heater used has a grate-surface of 528 square inches and heats 1000 feet of 4-inch pipe or 1000 square feet of surface.

As of general interest to our readers, we give below several quotations from the catalogue of Hitchings & Co. on the subject of warming greenhouses by hot water:

In order to replace the losses and equalize the heat as much as possible the heating-pipes must be placed near the floor, with the greater portion under the low parts of the roof, near the side and end walls. The pipes are laid in lines of two or more side by side, or in two tiers one above the other; the end of one (the upper one, in the case of two tiers), termed the flow-pipe, connects with the upper part of the boiler, and the other, termed the return-pipe, connects near the bottom part of the boiler, while the further end of both pipes connects with an expansion-tank, which completes the circuit for the circulation of the water. When more heat is required than can be obtained from two pipes additional pipes are laid, parallel to and connected with them at both ends. The pipes rise vertically from the boiler to the hight of 6 to 12 inches above the floor of the house and then continue through the house, either level or with an ascent toward the expansion-tank. The latter is preferable in long lines of pipe. When benches are used in span-roof houses of moderate width the pipes may be placed under the side benches, the bench being built with a space of 2 or 3 inches between it and the wall, and the front left open to allow the air to circulate freely around the pipes and the heated air to

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SOME MODERN BATH ROOMS.

(SEE ARTICLE, PAGE 75.)

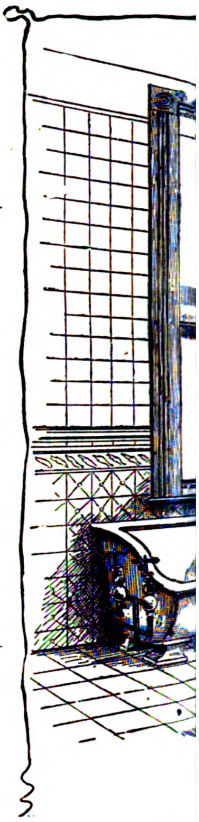


Fig.

Fig. 1.—Bathroom in Fifth Avenue House.

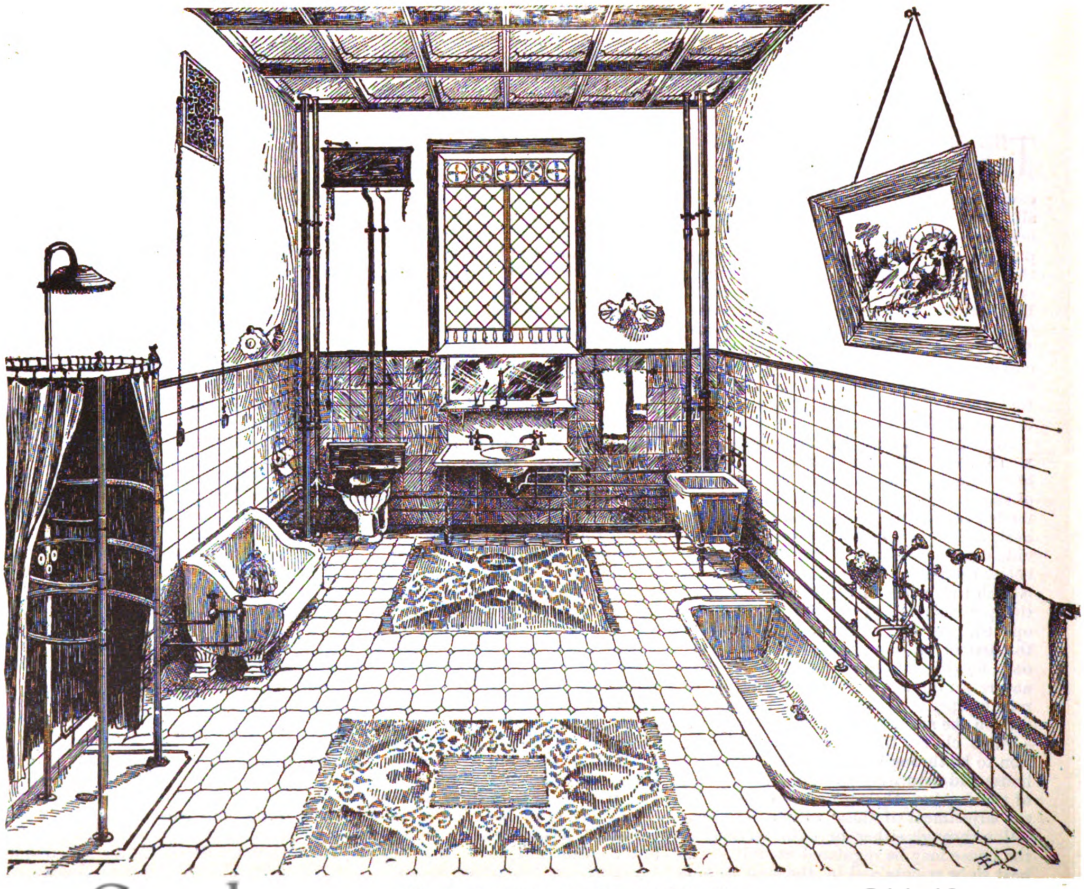
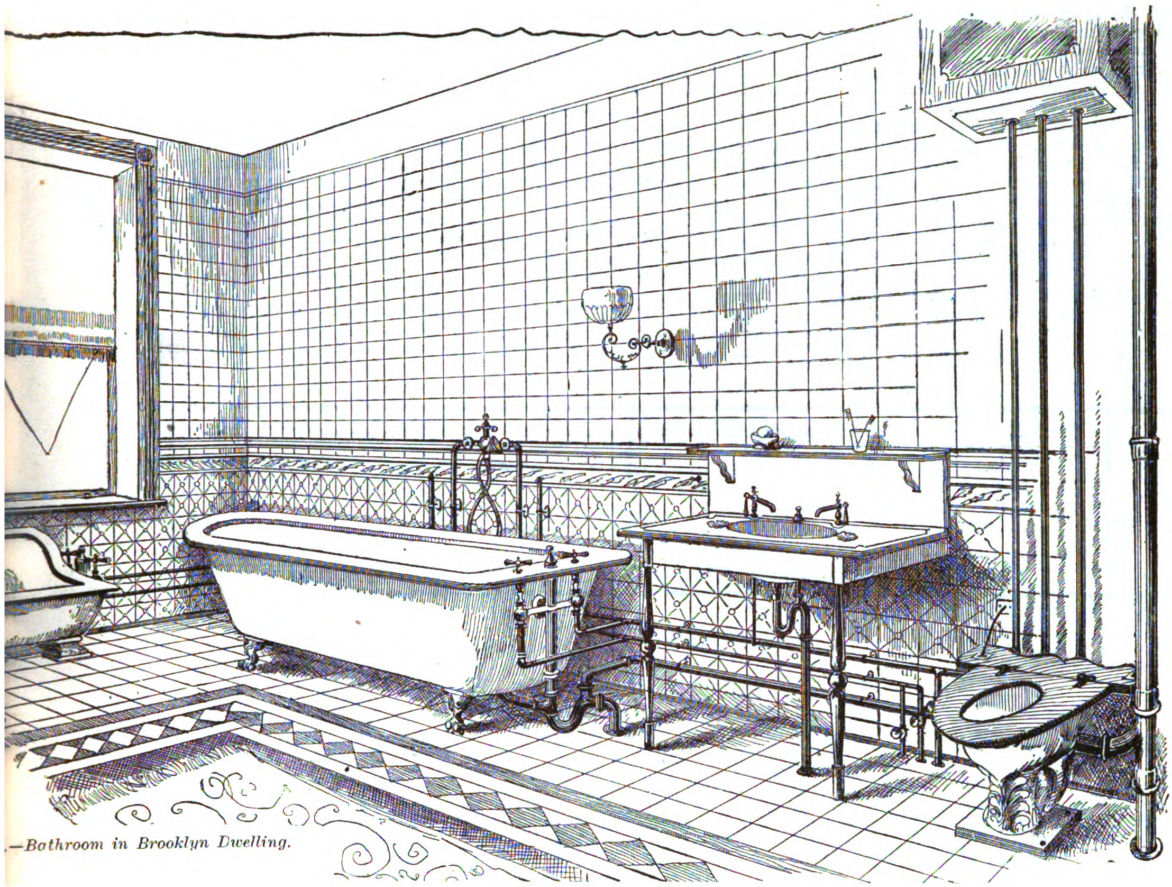


Fig. 2.—Bathroom for New York Dwelling.

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—Bathroom in Brooklyn Dwelling.

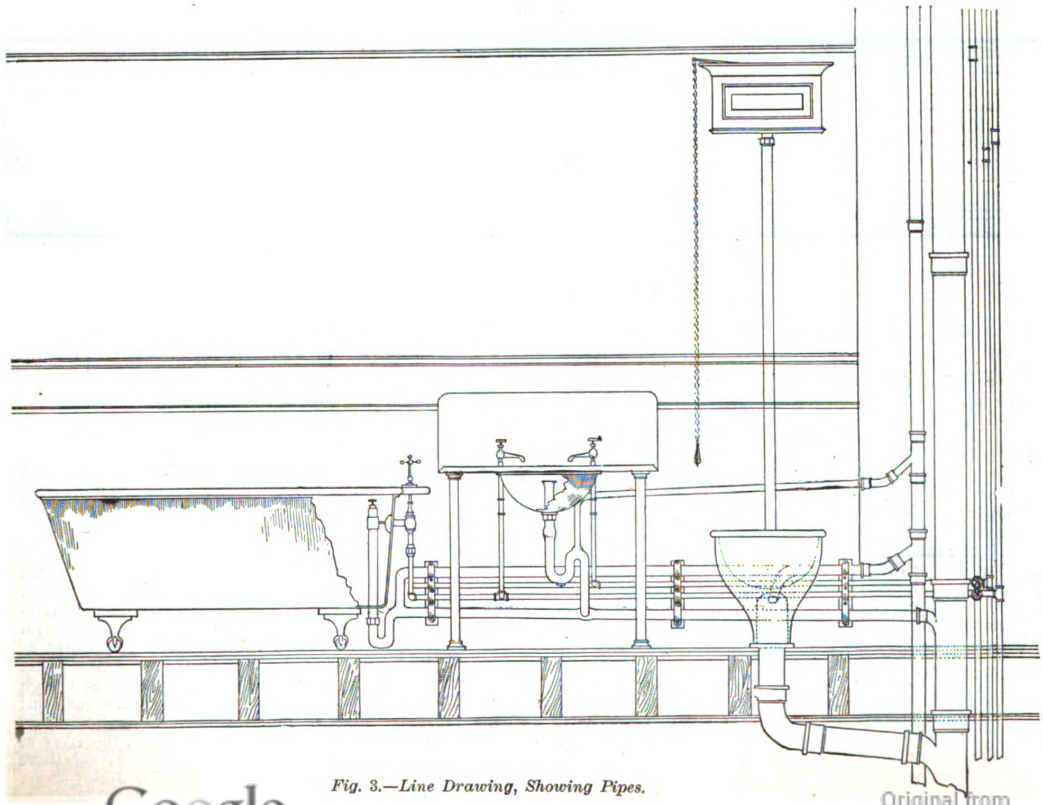


Fig. 3.—Line Drawing, Showing Pipes.

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rise through the spaces and protect the plants resting on the bench. In houses of greater width parts of the pipes may with advantage be placed under the center staging. In houses 12 to 15 feet wide, with "lean-to" roof against a warm back wall, the pipes should be laid near the front and end walls. If the width exceeds 15 feet it will be found advisable to have a part of the pipe placed through or near the center of its width.

There should be a tank at the terminus of each line of pipe, and in large houses near the boiler, open to the flow-pipe. The sizes of the tanks vary from 4 to 14 inches in diameter and from 33 to 54 inches in hight. They are furnished with a loose cover and have two or more sockets near the bottom to receive the heating-pipes.

ation to an appreciable degree. When in operation the boiler and pipes are kept full of water, and also the tanks to the hight of 3 to 6 inches above the pipes; and the loss of water is merely that which is evaporated from the surface of the water in the tanks.

In estimating the number of feet or quantity of piping that will be necessary to maintain a given temperature in a house of the ordinary size and shape, warmly built, with hollow brick walls or with double boarding filled in with brick or lined with felting or tarred paper, it will be bound sufficient to reckon only the amount of sash exposed to the weather on the roof, sides and ends of the house and provide a proportional amount of piping, irrespective of the shape of the roof. In house with "lean-to" roof does not require additional pipe on account of the back wall, as the protection from wind and air currents afforded by the wall is sufficient offset to the increased hight of back wall; but in case a house has stone walls or walls one brick thick or single boarding, or if a high temperature is required in a house with roof of unusual hight, or in case the house is in a location much exposed to cold winds, due allowance must be made for these circumstances and a greater proportion of pipe provided.

A important decision has been rendered by the Supreme Court of Michigan with regard to mechanics' liens. It holds that a

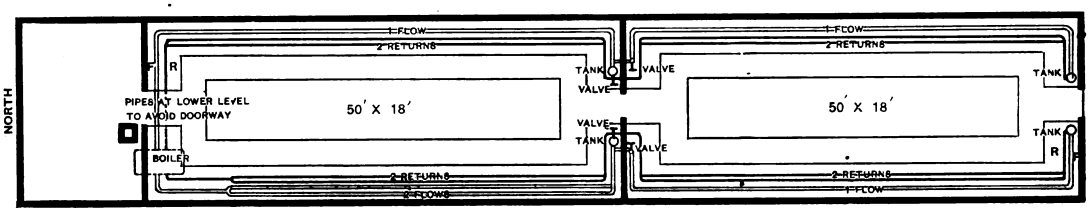


Fig. 1.—Plan of Greenhouse.

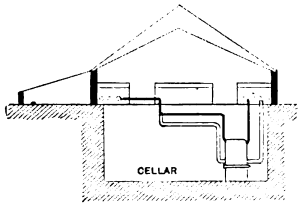


Fig. 2.—Sectional Elevation of Greenhouse Looking South.

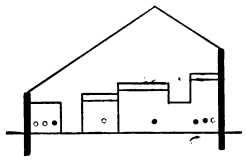


Fig. 3.—Sectional Elevation of Rose-House Looking West.

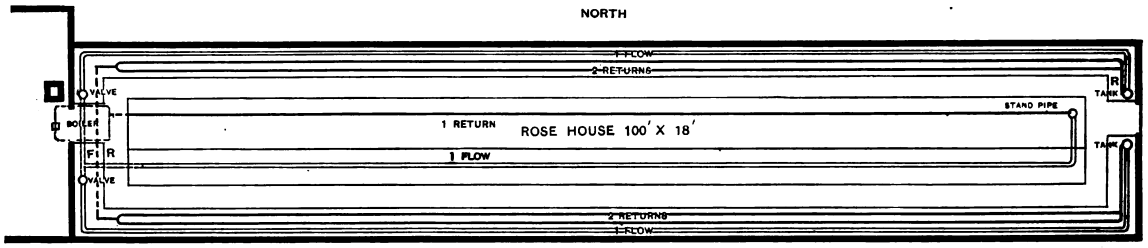


Fig. 4.—Plan of Rose-House.

GREENHOUSE-HEATING BY HOT WATER.

The aggregate capacity of the tanks above the level of the pipes should be fully equal to one twenty-third part of the contents of the boiler and all the pipes. Pipes that measure 4 inches in diameter and weigh 10 to 12 pounds to the foot are the size and weight in general use, and are the best suited for the purpose, affording the best proportion between the volume of water contained and the radiating-surface they expose. Pipes of greater diameter contain too much water and cannot be heated quickly in case a sudden change in the weather requires it. Those of less diameter do not maintain the steady heat desired. The weight of pipe named above is necessary to give it sufficient strength, and any material reduction in weight detracts from the permanence of the work. As regards the heating power of the pipe, the conducting power of iron is so high that the thickness does not affect the radi-

order to maintain a night heat of 55° to 65° in the house while the thermometer outside ranges at 15° to 20° below zero, it will be necessary to provide 1 square foot of heating-surface, or in other words 1 linear f oot of 4-inch pipe, to every 3 square feet of ssash on the roof, sides and ends of the houe, and for a temperature of 40° to 45° 1 foot of pipe for every 4 square feet of sash. This will serve as a general rule, to be modified somewhat to suit the exigencies of the case. This same rule will apply in sections of the country where the thermometer does not reach the low figure named, but where a temperature of 10° to 15° above zero is accompained by high winds. With zero or cold weather the condensation on the roof freezes and closes the laps and crevices of the glass, preventing the escape of heat, and renders it as easy to maintain the heat of the house as with less severe cold and strong winds. A

lien law under which a property-owner was compelled to make double payment for part of the work on his house is unconstitutional. "One man cannot be made to pay the debts of another," the Court says, "and a lien can properly attach only to the amount which remains unpaid to the contractor"

The precise location of the proposed bridge between Philadelphia and Camden excites a warm discussion among merchants and others interested. General Casey, chief of the Engineering Corps of the United States Army, recommends that the bridge shall be constructed as a high bridge with unbroken and continuous span; shall be 150 feet above mean low water, and only one pier shall be in the river at least 1000 feet from the Pennsylvania shore and 800 feet from the New Jersey shore.

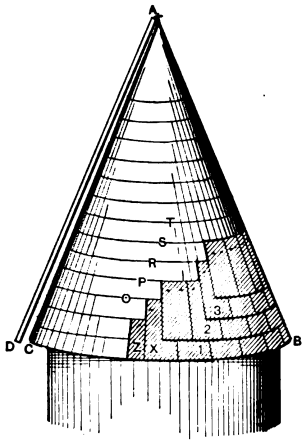
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CORRESPONDENCE.

Slating a Conical Roof.

From ROOFER.—When a conical roof is to be covered with slate one of the first steps would be to space off the lower edge of the roof B C so a certain number of slate can be laid in the first row without a half piece being put in the last. The width of slate in the bottom row may depend on the size of the cone, for if the cone is very small full width slate may be too wide to be laid, yet the wider the slate in the bottom row are, the wider the pieces can be near the apex. Having decided what is the proper width of slate for the bottom row, which should be the full width of the slate if it can be so used, the next step is to obtain the pattern for this and the other rows. This can be conveniently done on a board of sufficient size, as shown in Fig. 2 by G H J K, which represents the board upon which the patterns are to be drawn. We first draw the line E F, which is the same in length as the slate X in Fig. 1 is in width. Above the line E F, Fig. 2, is located the point A so that A E F represents the slant hight of the roof A B, Fig. 1. Lines *a b*, *c d*, &c., are to be drawn, showing how much of each slate is to be exposed to the weather. There are two reasons for making the slate in each row above the bottom narrower. One is to allow of the slate being applied so as to break joints, for if the slate for each row were of the same width it would be impossible to so lay them that one joint would not come over another, thus causing a leak. As the cone tapers from the base to the apex, it is necessary that the slate should decrease in width toward the apex, as it would be impossible to lay wide slate near the top. Having completed the diagram A′ F E, we will proceed to get out the patterns for the various rows. A slate is laid with its lower edge on the line E F, when by means of a straight-edge as much of the lines F A and E A are drawn as is necessary; the slate being cut on these lines, it presents the shape shawn by 1′. The pattern for the second row is obtained by laying a slate on the diagram with its lower edge resting on the line *a b*, and the lines F A and E A being drawn after the slate is cut on these lines it represents the shape shown by 2′. The patterns for the other rows, as 3′, 4′, &c., are obtained in a similar manner, each pattern being of the right taper to be laid about the conical roof as shown in Fig. 1. After a number of patterns have been cut the piece to be removed may be wide enough to be used at some row near the top of the roof, and in order to save this piece the slate is laid over the edge of the roofing-stake and a number of holes punched through by means of the point of the roofing-hammer, as shown by M N, when the slate can be broken in two pieces by striking on the stake, the rough edge being trimmed to the pattern-line, as shown by dotted lines, the holes being indicated by round dots. The dressing of the slate can be done in any convenient place about the building, the roofing-stake being driven into a plank or block of wood to hold it solid. The slate to be cut is taken in the left hand and held with the mark even with the edge of the stake, the cutting being done by means of the slaters' hammer, which is held in the right hand. The long point of the hammer serves as a guide to keep the hammer in position so the cutting edge of the hammer will come down past the stake with a shearing motion. The necessary nail-holes are punched by holding the slate over the edge of the stake and driving-holes through with the sharp point of the hammer. The cutting and punching of slate are operations requiring considerable practice to enable one to perform them without breaking the slate.

The distance from the apex the slating is to be laid is a matter to be determined by the architect. As the slate for each row becomes narrower toward the top, it would be impossible to finish to the apex, so for a covering for the top, and also for an ornament, some kind of a finish is made from sheet-metal and placed as a cover over the apex. This ornament can be secured to a piece of timber run through the roof at the point A. Before proceeding to lay the slate the roof should be covered with tarred paper, which has a tendency to prevent the condensation of moisture on the under side of the slate, and prevent any leakage in case a slate should become broken. In order to lay the slate evenly it is convenient to have a mark of some kind to go by. The marking can be done by the stick *a d*, which can have a strip of tin nailed at one end and then bent over the timber in apex of roof, a nail driven in, when it can be revolved about the roof. It is easy by means of this stick and a pencil to mark lines about the roof, as shown by *o*, *p*, *r*, &c., the lines being as far apart as the slates are to be exposed to the weather. The location of the line *o* can be determined by laying on one of the bottom row of slate, as *x*. The first row of slate being laid, which should be double so as to break joints, as shown by *z*, the second row is started, as shown by slate 2, which is placed over the joints in the first row as shown, the top of the slate being placed on the line *p*. The slate in the third row are laid over the joints in the second row, the tops being placed on the line *r*. By proceeding in this manner the various rows of slate are laid until as near the apex as desired.



Slating a Conical Roof.—Fig. 1.—Showing Manner of Laying the Slate.

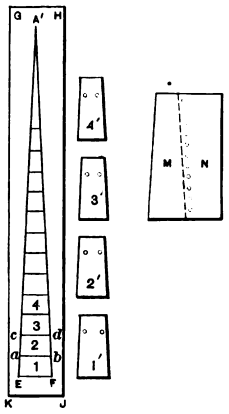


Fig. 2.—Method of Obtaining Patterns for the Rows of Slate.

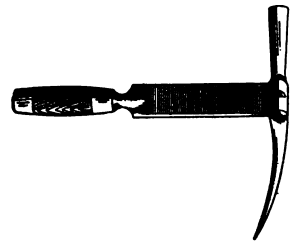


Fig. 3.—Slaters' Hammer.

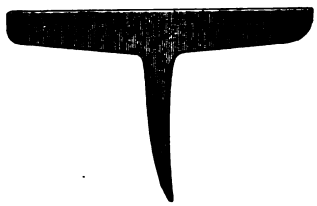


Fig. 4.—Slaters' Roofing-Stake.

SLATING A CONICAL ROOF.

Right and Left Hand Doors.

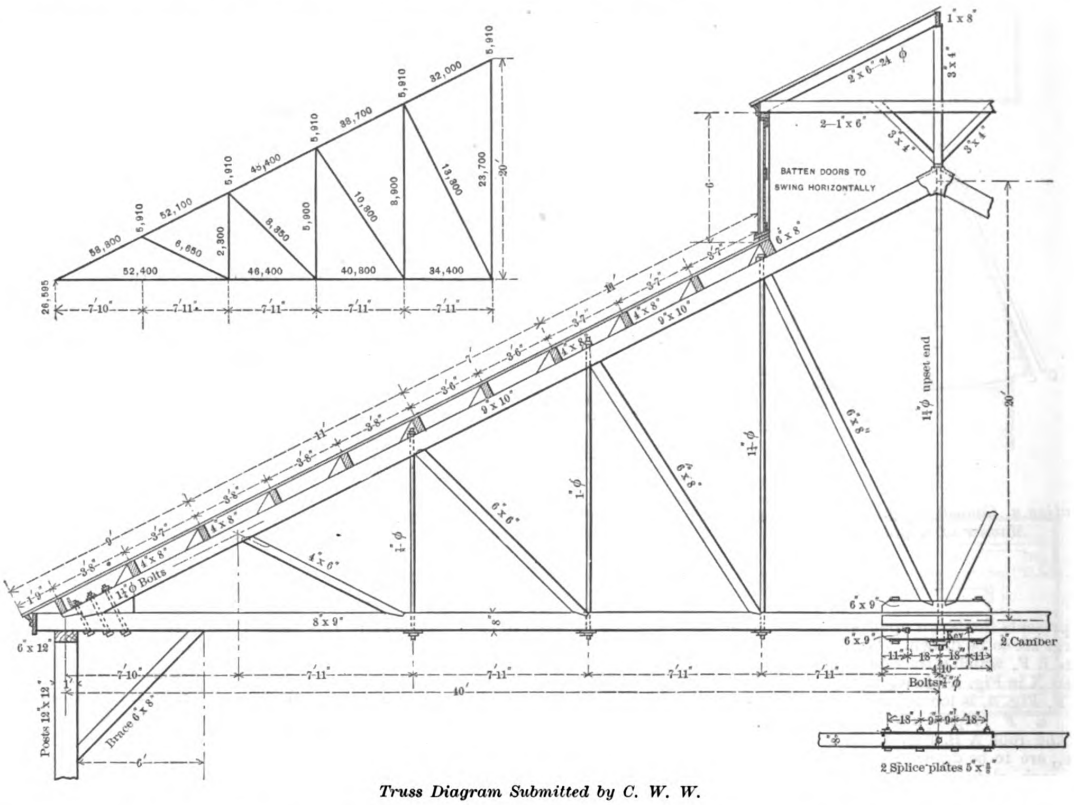
From B. S. H., *Evansville, Wis.*—In reply to "G. F. M.," Penn Yan, N. Y., I would say that I had always supposed the question concerning which he asks was settled years ago. My impression was that there was only one opinion as to which was a right and which was a left hand door. Approaching the street you grasp the knob with the right, swing the door to the right from the side of approach and you have a right-hand door. In confirmation of this allow me to say that 25 or 30 years ago all of our loose-hinge butts were made for right and left hand doors, not reversible as now, and all butts to swing the door as I have described were marked on the package "right-hand" or "left-hand," as the case might be. In ordering our door trimmings it was necessary to note how many pairs of each kind of butts were wanted. This was also true of locks, and I remember when we first began to use the Janus-faced lock. It was considered quite an improvement and it is comparatively but a short time since the reversible lock was introduced with the perfection we now have it. The face of the door is the street side. "Put the best side out" has become a proverb. In hanging inside doors I make it a rule, if there is any "best side" to a

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door, to put that side facing the principal rooms, regardless of the fact of which way it swings.

Self-Supporting Roofs.

From C. W. W., *Allentown, Pa.*—Some months ago a correspondent asked for drawings of a self-supporting roof truss, and as I have just finished sketches for a mill building 80 feet wide, I send them in the hope that they may be of service to him. The trusses are 17 feet distant from centers. The roof is intended to be slated on boards, the extra load on the trusses consisting only of light shaftings placed near the posts. In consideration of this fact I took for the load of the truss—that is, its own weight, roofing, snow, force of wind and the weight of shafting referred to—44 pounds as the uniformly distributed load per square foot of roof area measured horizontally, and found the stresses in the different members as given in the strain sheet. The iron rods are provided with cast-iron washers according to the pitch of the roof, and wrought-iron washers at the other end. A cast-iron shoe receives the top ends of the principal rafters. The splice in the bottom chord is made by butting the two timbers of the tie beam together and two flat iron bars 5 x ⅝ inches are bolted to the sides. The ends are bent at right angles so as to cut ½ inch into the timber. On the top and bottom are placed blocks 6 x 8 inches. From an inspection of the drawing which I send it will be noticed that I have not shown a vertical bolt in the first panel joint. as it is not absolutely necessary. It may be placed there, however, if the shafting should be put about midway between the head of the brace from post to tie beam and the rod in the second panel joint.



Truss Diagram Submitted by C. W. W.

Hot-Air Engines.

From H. N. H., *Unionville, Conn.*—Can you give a reader of your paper any information regarding hot-air engines of small power. I see gas engines advertised, but not any hot-air engines. Also, please let me know the name of the maker of the Davy Safety Engine.

Answer.—There are a number of combined hot-air engines and pumps on the market, but the only hot-air engine expressly for power purposes that we know of is made by H. H. Roper, 36 Pearl street, New York. The Davy Safety Engine is, we think, manufactured by Chas. P. Willard & Co., Chicago, Ill.

Length of Jack Rafters.

From H. W., *Lebanon, Pa.*—I am a reader of *Carpentry and Building*, and find it very useful for young chaps like myself, for it shows me how little I know. There is always a great deal of hip roofing to be done, and enough concerning this topic cannot be published. What I would like to know is how to obtain the length of jack rafters on different pitches of hip roofs. What I mean is, how much longer must the one be than the other if they are spaced 2 feet apart? I have a book which is called "Hodgson's Steel Square Problems." It says that for one-third pitch 2 feet apart each must be 2 feet longer. That may work for one-third pitch, but won't work for one-half or one-fourth pitch. I trust some reader of *Carpentry and Building* will give me a plan or method of solving this problem.

Note.—This question has been discussed in some of our back volumes, but it is one that has perennial interest—one that can never be entirely exhausted. Therefore we again allow it to come up.

Water Mains for Fire Purposes in Large Buildings.

From E. J. D., *San Jose, Cal.*—About the middle of November I read in the papers of the difficulty experienced by the New York firemen in getting water to the fire in the top story of the Western Union Telegraph Building, in New York City. Concerning this matter permit me to state that the trouble may be overcome in the following manner: In all buildings over three stories in hight place in the front wall near the middle a water-main of 4 or 5 inches diameter. Extend this water-main from the ground floor to the top of the building. At each story run a short branch and place one or more fire-plugs of the size used by the fire department. It would be well to put one or more on the roof. On the outside of the wall, near the sidewalk, place a plug with suitable screw to connect with the discharge-pipe of the fire engine. Now, in case of fire the steam fire engine is brought to the sidewalk in front of the plug. Connection is made with it and also with the hydrant for water. The firemen take the empty hose to the fourth, sixth or eighth story, wherever needed, secure on to the fire-plug, call for water and obtain it in a second without hauling and pulling a hose two or three hundred feet long full of water up the walls or through the building. This avoids a great deal of hard labor, extra pressure on the hose, and also is a saving in the quantity of hose required. When not in use the pipe should be kept empty, so that there would be no danger of its bursting from freezing. The fire-wardens should see that all new buildings wherever erected over three stories in hight should have water-mains of a considerable size placed in the building where most convenient, as I am sure it would be a great saving of time, labor and also in the wear of the hose. A water-main could be placed in buildings already erected, and in case of fire would more than save its cost.

Note.—As being of possible interest to our readers we would remark that at the present day most of the important buildings erected for business purposes in the large cities are provided with water-mains something after the plan suggested by our correspondent. At each floor is attached to the upright water-main a line of hose which when not required is coiled upon a support convenient at any and all times

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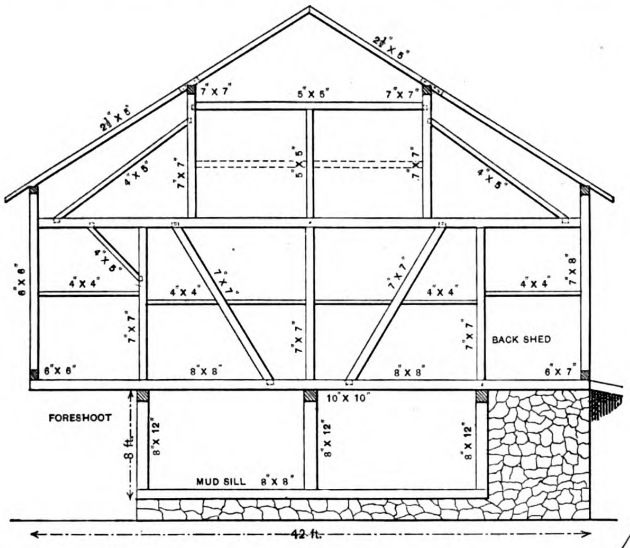
for immediate use, it being only necessary to turn on the water. This may be done by means of a small hand-wheel, one of which is located at each story.

Barn Framing.

From J. C. W., *Pine Hill, Pa.*—I noticed a letter in a recent number of *Carpentry and Building* from "J. R. T," Minnesota, in which he gives a plan of his work and asks the Eastern farmers to express their opinion concerning the methods of framing employed. I have been reading the paper for some time, and have always been under the impression that it was published in the interest of carpenters, masons, bricklayers, &c., and not for farmers. How farmers are to form an opinion concerning the barn plan of the correspondent mentioned I am unable to discover. As I am no farmer I am in doubt whether it would be fitting for me to give an opinion or not. I was, however, raised on a farm and do about all the carpenter work on barns for farmers in this immediate vicinity; I think, therefore, I will risk giving an opinion about the method of framing employed by "J. R. T."

In the first place, it does not look to me like a frame. To my mind it very much resembles what we call a balloon frame, mostly spiked. I may be wrong in this, but that is the impression I get from an inspection of the sketches. Again, the plates are 2 x 6, which double would be, if I understand the matter correctly, 4 x 6 inches. From themanner in which it is placed I infer it must be spiked, and what would a 4 x 6 inch stick be for a rafter plate in a barn 36 x 72 feet, even if solid?

I inclose a sketch of a plan for a barn which I have built. It is known as a bank barn. From an inspection it will be noticed that the cattle are so located that there is no question about their being warm. The barn cannot be nicely constructed without the presence of a little side hill. In the sketch I give only the gable end. This would be one wing or section and there can be made as many sections as may be necessary for a large barn. I have put eight in a barn 46 x 110 feet. The sketch inclosed is for a barn 42 x 34 feet with 8 feet foreshoot and the same back shed. In order to carry hay through the barn it is necessary to bring the upper piece collar beam down to the dotted lines, or else not put it in at all—that is, in some of the middle sections. This style of frame is usually boarded up and down. If otherwise, it would be necessary to use some extra studding. If tny reader desires further explanation of ahe sketch and will state his wants I will try and accommodate him. The rafters are in two lengths. This plan, I claim, is a good one in order to use short timber, with the exception of the ties or stringers, which should be in one length, the width of the barn.



Plan of Barn Framing Employed by J. C. W.

Rule for Setting Newels.

From D. L. S., *Emporia, Kas.*—I think the seven-room house published in *Carpentry and Building* was very good, for the reason that an inspection of the details showed me something I did not know before, and that was, which end up to place the balusters. I should have put them the other end up. It seems to me that the newel and baluster are too close together. I should think the space between them should be about the same as between the balusters. Will some of the old stair-builders give me the rule for setting newels? I desire to learn how far the newel should come on to the first step.

Answer to Stair Problem.

From A. L., *Stockton, Cal.*—In reply to the inquiry of "C. G. H.," which appeared in the May number of *Carpentry and Building* for 1889, I suggest the following: Referring to the accompanying sketch, let D E *e h* of Fig. 2 equal D E *e h* of Fig. 1. Draw perpendicular lines from E *e h* and set off the floor line and level rail, which will be understood by comparing Fig. 1 with Fig. 2. Draw the center line of straight rail. Draw the lower tangent D B as judgment may direct. Draw the upper tangent A B and continue to *c*. To obtain the bevels for squaring the wreath make E F equal E H, H being a point on the line E B tangent to the cen-

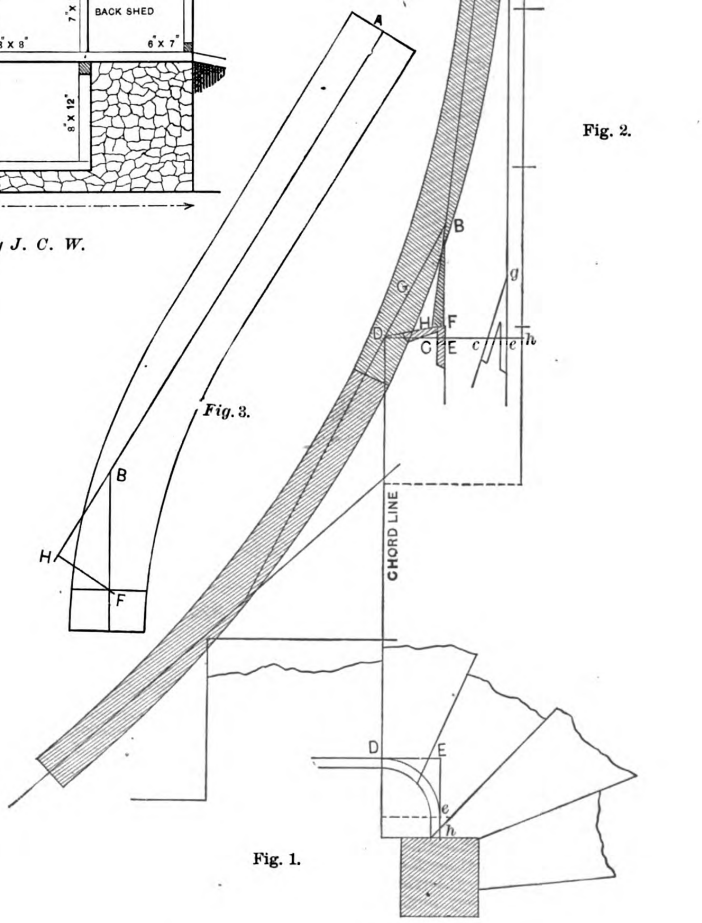


Fig. 2.

Fig. 1.

Sketches Accompanying Letter of A. L.

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ter E. Connect F D. To avoid confusion of lines make *e g* equal to E G. Make *e c* equal E C. Connect *g c*. To draw the face mold make A B H of Fig 3 equal A B H of Fig. 2. Make H F on Fig. 3 equal D F of Fig. 2. Connect B F. Set off a little over half the width of rail each side of F and A. Add the required straight wood at F. Complete the mold by bending flexible strip. The bevel at F is applied at joint A and *g* at joint F. The bevel at J is applied at A to obtain bevel to fit to angle newel. Plumb the wreath. Then mark the knee to suit the fancy, as shown at A. The wreath piece should have a little extra thickness, say 4 inches. Leave out the upper baluster.

Baseboard for Circular Bay.

From W. C. T., *Inglewood, Ont.*—In reply to "F. S. S.," Charlestown, I offer the following solution to the problem presented by him in a recent issue of *Carpentry and Building*. Referring to the accompanying sketch draw the straight line A D upon which describe the circle required. It is understood, of course, that this must be drawn to a scale. At G D mark off the bevel or fall of the floor. Divide the distance from D to E into any number of equal parts. Then from C to F continue with the dividers twice the number of spaces. A more correct way, perhaps, would be to figure out the exact length of the board and then divide it into twice the number of equal parts. Draw the vertical lines from dividing points on the circle and the straight line; then parallel lines from the points where the vertical lines intersect the bevel. Draw the curve through the intersecting lines C to F, which will give the shape of the bottom of the board to be used.

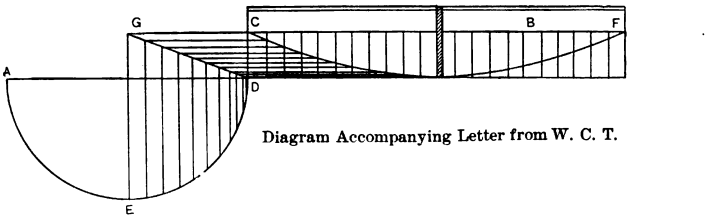
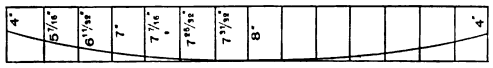
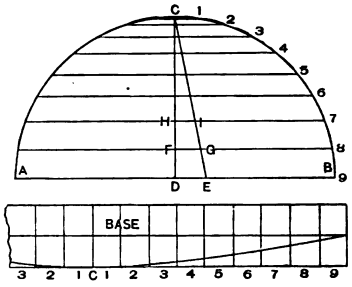


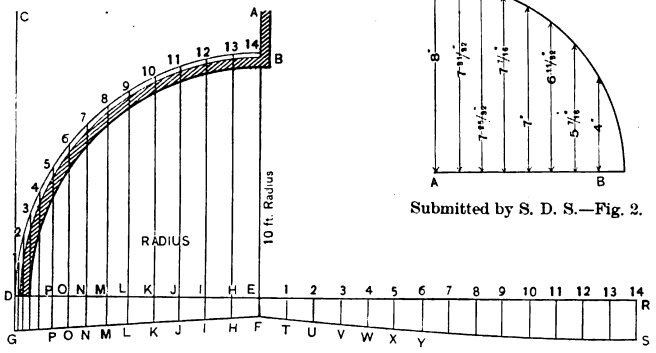
Diagram Accompanying Letter from W. C. T.



Plan Submitted by S. D. S.—Fig. 1.

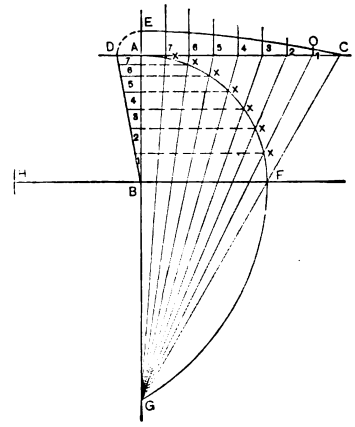


Sketch Contributed by S. S.



Plan Suggested by J. F.

Submitted by S. D. S.—Fig. 2.



H. C. B.'s Method.

ILLUSTRATIONS OF BASE BOARD FOR CIRCULAR BAY.

FROM VARIOUS CORRESPONDENTS.

From J. F., *Delightful, Ohio.*—In reply to the correspondent, who asks concerning a base-board for a circular bay, I offer the following answer: Referring to the accompanying sketch, let A B C D be the plan of the roof of piazza, D E the radius of the bay-window, D G the wide end of the base and E F the narrow end, or the rise of the roof narrower than D G. Draw the length F straight. Now, divide the quarter-circle into any number of equal parts, and from the divisions produce lines through D E at right angles to D E until they intersect the line G F in H I J K, &c. Produce the line D E to R and transfer the divisions in the quarter circle to the line E R, as 1, 2, 3, &c., on the quarter circle to 1, 2, 3, &c., on the line E R. Then take the distance H H, I I, J J, &c., and transfer to 1 T, 2 U, 3 V, &c., until all the divisions are transferred. Then E R F S will be the shape of the base around the quarter circle of the roof. The more divisions there are in the quarter circle the better will be the fit.

From S. S., *Lincoln, Neb.*—In answer to "F. S. S.," Charleston, S. C., whose communication appeared in the February issue of *Carpentry and Building*, I send a rough sketch showing the way I would obtain the lines to cut a level baseboard around a circular bay window. Referring to the accompanying sketch, divide half of the circumference into any number of equal parts. Draw lines through these parts parallel to the diameter. Make the distance D to E equal to the fall of the floor. The difference between D E and F G will be the cut for the base in space No. 9, and the difference between F G and H I will be the cut for the space in No. 8. The succeeding spaces will be the cuts for the corresponding numbers. I think the reader will understand my plan without further explanation.

From H. C. B., *Lisbon, N. D.*—In reply to the inquiry of "F. S. S.," Charleston, S. C., I send the following sketch, which shows how to obtain the pattern for the lower edge of the base board where it

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comes in contact with the piazza floor. Referring to the sketch, the distance between the lines A C and B F represent the width of the piazza floor, and A F the outside line of one-half of the bay window. To find the length of the board to go half way around, obtain the stretchout for A F by taking A F as radius and marking the point G on A B. From G draw a straight line through F and continue the same until it strikes the line of the front of the piazza at C. The distance between A and C will be the distance required. Divide this length into any number of parts, say eight, establishing seven intermediate points, and number them for convenience as shown in the sketch. From A set up D E equal to the slant of the floor, in this case 4 inches. Connect D and E, which will represent the line of the slant. From the line of A C erect short perpendicular lines from the points just numbered, and from each of these points on A C draw a line to G, which will cut the line A F in the points X X X, &c. From the points X X X, &c., draw lines parallel to H F intersecting the line of slant B D. Number these lines where they come between A B and B D, the same as those on A C. Then take the distance of line 1 between A B and B D and set it off on the first perpendicular erected at 1 on A C as at 0. Proceed in the same manner with remainder of the lines and set them up on the perpendiculars of corresponding numbers on A C. Connect the points thus established, which will give the line E C, which will be the correct line for the bottom edge of the base board.

Note—With reference to the diagram of our correspondent we desire to say that the method of obtaining the stretchout of the quarter or half circle made use of in his diagram will be found by trigonometrical calculation to be slightly inaccurate. The distance of A C is 0.0066 of a radius too much, and the distance A4 is 0.0068 of a radius too much, or 0.0068 of a radius more than the stretchout of one-eighth of a circle, which it is intended to be. It thus shows that the variation from right is greater in the middle than at the termination of the stretchout. However, these variations are so slight as to be of no importance whatever in practical work of ordinary dimensions.

From F. E. G., *Leroy, Minn.*—In answer to "F. S. S.," Charleston, S. C., whose communication appeared in the February issue of *Carpentry and Building*, I would say that the reason why a straight line will not answer his purpose is because a foot of the baseboard near the place marked A in his Fig. 1 reaches nearly a foot on the length of the porch from A to B. It must, therefore, have nearly the same pitch as the porch floor, but a foot at the other end of the board covers only an inch or two of the length or width of the porch from A to B. Hence his line on the board must have only as much pitch in that one foot as the porch has in an inch or two. A careful study of Fig. 15 on page 254 of the issue of *Carpentry and Building* for December, 1889, will teach the correspondent how to lay out his board.

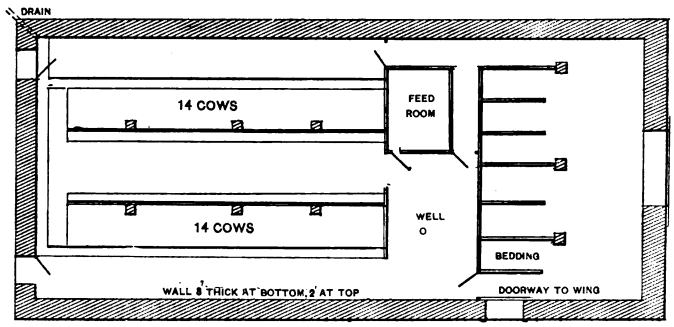


Fig. 1.—Plan of Main Portion.

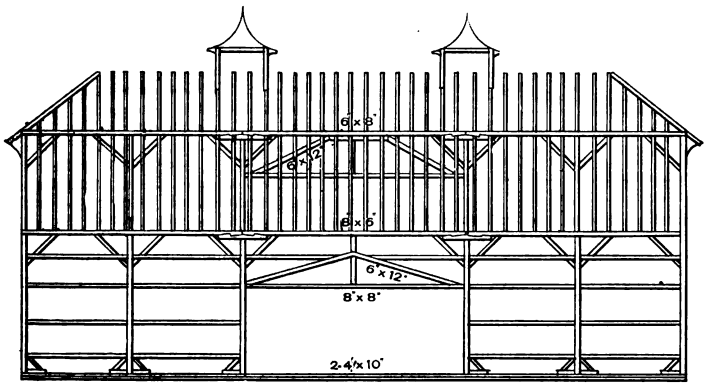


Fig. 2.—Framing of One Side.

Framing a Barn.

From E. A. R., *West Alden, N. Y.*—I inclose herewith drawings showing a barn which I built in the fall of 1888 and the spring of 1889. Fig. 1 shows a plan of the main portion of the barn; Fig. 2 represents the framing of one side; Fig. 3 is a cross section while Fig. 4 shows the framing employed at the end. I submit the drawings for the benefit of the readers of *Carpentry and Building* and also to afford a subject for criticism if any of the practical mechanics are inclined to find fault with the method I have employed.

Roll-Top Desk.

From R. H., *Seattle, Wash.*—Will some of the readers of *Carpentry and Building* kindly give me a method for constructing a roll-top desk. All that I desire to know is how to make the roller top; the rest I can construct to suit myself.

Coffins.

From T. B., *Headingly, Man.*—Will you kindly permit a reader of *Carpentry and Building* space to ask some of those interested if they have ever been called upon to make a coffin. If so, perhaps some of them would be kind enough to explain the proper shape of one so as to have it in proportion. I was asked the other day to make a small coffin, and the length was all I had to go by. The proper width and depth I had to judge for myself. What I desire to know is this: Given the dimension 3 feet long, how wide should the coffin be at the shoulders, and where should the wide place for the shoulders be; that is, how far from each end should the wide portion be placed, and should the head and foot be the same width? This is a job that a carpenter in a back county settlement is sometimes called upon to do.

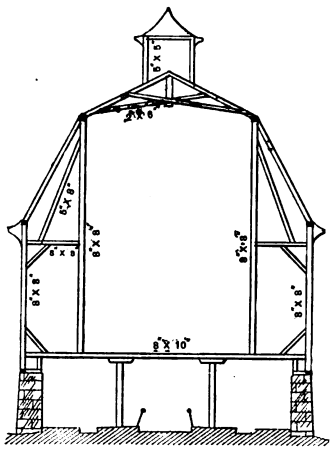


Fig. 3.—Section Through Barn.

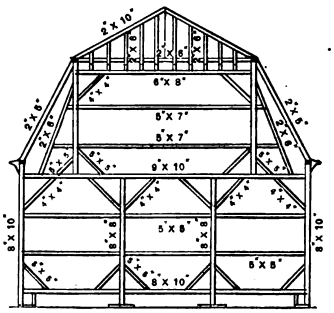


Fig. 4.—Framing of End.

FRAMING A BARN, AS DESCRIBED BY E. A. R.

The Slide Rule.

From A. J. McI., *Waverly, N. Y.*—I have in my possession a two-foot rule with M and E octagon scale described in a recent issue of *Carpentry and Building*. It also has a brass sliding-rule marked B and C alongside it, on the wood, a corresponding scale marked A. None of my fellow craftsmen are able to decipher it, and I write to ask is some of the practical

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readers of *Carpentry and Building* will tender an explanation.

Note.—The character of the question propounded by our correspondent above is such that we much doubt if a satisfactory explanation can be given within the limits of our correspondence department. The subject is rather a complex one, and we think our correspondent cannot do better than to procure a copy of some work treating of the slide-rule and studying it in connection with the rule in his possession. One of the best treatises on the subject is Hodgson's Slide Rule and How to Use It, which can be obtained through this office on receipt of the price, 25 cents.

A Correction.

From A. D., *Beloit, Wis.*—I notice an error in the drawing accompanying my article on handrailing which appeared in the March number. It was caused by the confused state of my mind growing out of a severe attack of neuralgia at the time the sketch was made. The true tangent for straight wood is the pitch line C D and not I P which is used in the drawing. I formerly employed the line I P for the tangent D G, but to be more correct I discontinued it. Please make the correction in the next issue.

Question in Barn Framing.

From S. J. McN., *Ambrose, Pa.*—I would like to ask the readers of *Carpentry and Building* a question in barn framing. I am only a young chip and would, therefore, be thankful for their help and advice. I have a barn 56 x 70 feet in size with double threshing floor 32 x 56 feet to construct. The bay overhead is to be carried by a truss with a span of 56 feet. What I desire is a plan of a truss that will be sufficent for the purpose. It would have to carry the roof and whatever grain might be placed above the floor. An answer in an early number of *Carpentry and Building* would be greatly appreciated.

Framing a Circular Bay Window.

From O. N. G., *Lake Mills, Iowa.*—Will some of the readers of *Carpentry and Building* give me a plan for framing a circular bay window?

Bills of Lumber.

From J. C. W., *Pine Hill, Pa.*—I notice in various issues of *Carpentry and Building* reference to bills of lumber for buildings, &c., which run something in this style: 5 x 7, 7 x 9, 3 x 5, &c. Why not 6 x 6, 8 x 8 and 4 x 4? I would, where possible, make the lumber bills call for square pieces. For this reason, where I am, we use a great deal of oak, and oak is a timber which is inclined to warp. Now, if the piece is square, there is more chance to use the stick so it may not interfere than if it were not square. I admit some pieces must be other than square, but then I would so select a kind of wood that is not apt to warp. I would like very much to have some one else talk up the subject of timber bills and express their opinion.

Circle on Circle Arch.

From W. E., *Napanee, Ont.*—Will some of the readers of *Carpentry and Building* kindly show me the way to strike out an arch over a circular-headed window in a circular wall? It is commonly called "circle on circle arch." The arch is to be cut-stone the full thickness of the wall.

Right or Left Hand Doors.

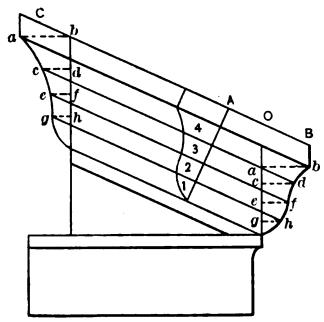
From S. H. W., *Bridgeport, Conn.*—In reply to G. F. M., Penn Yan, N. Y., I would say that mechanics in this section of the country call a right-hand door one that swings from you to the right as the house or room is entered, and a left-hand door one that swings to the left. Some 15 or 20 years ago, when loose joint butts were used they were marked L and R to distinguish them and when applied invariably worked that way.

Construction of Hay Racks.

From G. W. F., *Fisherman's Bay, Sonoma County, Cal.*—Will some one kindly tell me through the columns of *Carpentry and Building* the best way to construct hay racks in barns for feeding horses and cattle? The racks must be so arranged that the stock can get all the hay they want with a minimum of waste.

The Development of a Raking Molding.

From J. H. P., *Grinnell, Iowa.*—In the sketch inclosed I show the manner of striking or working a raking molding to fit a miter with the same on a horizontal line or flank. The method of procedure is as follows: First, divide the width of the molding into 1, 2, 3 and 4 parts, as shown at A. Raise a perpendiular line in B at O. Trace the curve of the molding from the intersection of *a b c d e f h h*, at right angles with the perpendicular line O to the points *h f d b* in the curve or face of the molding. Transfer to A, *a b c d e f g h*. In like manner the curve at C may



Method of Developing a Raking Molding, Suggested by J. H. P.

be found, all to miter in their several parts with each other. I submit the above in answer to the inquiry of "J. N. B., Jr.," of Burlington, Iowa. Of course the profile of the raking molding will be different from the horizontal molding. I desire to say with "J. S. B.," of Philadelphia, Pa., that it is impossible to miter and member a level and pitched molding of the same curve and size.

Oil Stones.

From F. K. H., *Goffstown, N. H.*—In reply to "H. W. P.," who desires to know what is considered the best oil stone for carpenters' use, I would say without hesitation Pike's Rosy Red Wichita and the Lily White Wichita. The latter is a finer grained stone that the former. The Arkansas are the finest stones in the world and cost the most money, but the Wichitas serve an excellent purpose and are much more economical.

Flour Boxes.

From R. G. M., *Atchison, Kan.*—I would like to have some of the readers of *Carpentry and Building* give one or more sketches of flour boxes with dough board attached. The device might also contain a few small drawers for sundry articles. Houses are sometimes too small in this part of the country to allow space for a pantry, and people have to content themselves with flour boxes. Of course it is not much of a trick to make one, but I desire to get hold of something new, and I should be very much obliged to the readers if they would favor me with a few designs.

The Study of Vitruvius.

The work of Vitruvius, says M. Guenepin, has not been more free from the vicissitudes of opinion than his person—for books as well as men have their fate. At the revival of literature it was welcomed with the blindest enthusiasm, its precepts were recognized as infallible, and its author was for a long time regarded as the supreme law-giver in architecture, but when a vigorous investigation of the text had exposed a number of unintelligible passages, the obscurity of which, no doubt, arose from the absence of explanatory plates not to be found with the manuscripts, and still more when the assiduous researches on the monumental antiquities everywhere coming to light had shown that in many instances the doctrine of Vitruvius did not tally with those beautiful models bequeathed to us by the ancients, the implicit faith our author had inspired was replaced by a more considerate and qualified admiration. And it was understood how a profound and attentive study of this work, united with that of the monumental remains, might illumine, and perhaps establish the theory of architecture. These studies, continued with perseverance up to the present time, far from being barren, have borne abundant fruits; a great number of obscure passages have been explained, and everything inclines us to the belief that notwithstanding the success that has hitherto crowned the labors of art and erudition, of which Vitruvius is the object, much may yet be done. The study of the Grecian monuments, disentangled and simplified, may lead us to hope that the lost drawings of Vitruvius' work may be recovered from the ruins of the monuments he has cited. Already some valuable remains of edifices mentioned by him have been recognized, and though the much desired time for interpreting the text of Vitruvius does not appear to me to be yet arrived, it cannot be far distant. It is not at all certain whether Vitruvius had ever traveled out of Italy, though the monuments of Asia Minor are those he cites most willingly; he does not seem to have attached much importance to, or perhaps he was but imperfectly acquainted with, those of Attica and Greece. He even goes so far as to advance, in the third chapter of his second book, a remarkable opinion that I shall quote from the translation of Perrault: "There have been certain ancient architects who did not conceive the Doric order to be fit for temples, as there was something inconvenient and embarrassing in its proportions. Farschesius and Pytheus were of this opinon, and it is also said that Hermogenes having a great quantity of marble for constructing a Doric temple to Bacchus changed his plan and made it Ionic. (Nonnulli antiqui architecti negaverunt Dorico generi ædes sacras oportere fieri, &c.)" It is probable that these Doric temples of Greece, of Sicily, and even those of great Greece, although situated in Italy, were almost entirely unknown to him. It is also probable that to the study of ancient monuments of Attica and the other parts of Greece, at this moment followed up with so much activity, will succeed that of the antiquities of Asia Minor. Then the comparison which may be made between the edifices cited by Vitruvius and his own work will, perhaps, explain the difficult passages of the text in the same way that those parts of the monuments which may need interpretation will be explained by him.

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MEASUREMENT OF ROOFS.*

BY TRIANGLE.

BEFORE PROCEEDING further with the subject of roof calculations it might be well to define the meaning of the words "plan" and "elevation," as these words are of such frequent occurrence when speaking of the construction or measurement of buildings, and there may be many apprentices and beginners who are not conversant with their definitions. In Fig. 36 are shown the roof-plan, side and end elevation of a building. The word plan is roof-plan. The difference between the two would be that our view would be in perspective, or as the roof would appear when viewed from one point, with the lines appearing otherwise than parallel and at right angles to each other, as the case might be. The plan is drawn on a flat surface, and is a reduced outline of the building all of the angles and lines drawn to reduced scale being shown, and on this account is of more service to the mechanics, as each part can be measured. some of the more important measurements in figures, not only to avoid mistakes, but as a matter of convenience. It will be seen that the various plans and elevations of a building are such views as can never be exactly obtained after the building is erected, being imaginary in character, but so drawn that measurements of any part shown can be obtained. In order that a building may be constructed as desired there are other plans than the one just described, as foundation plans, cellar plans,

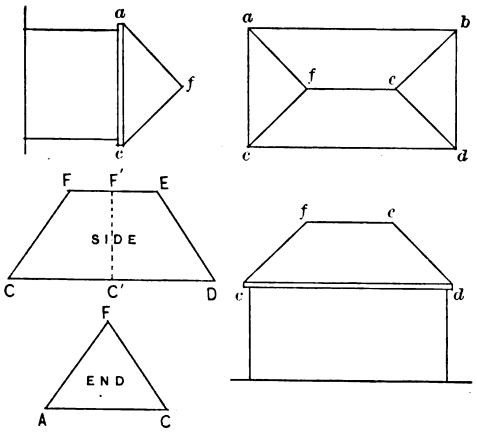


Fig. 36.—Rectangular Building with Hipped Roof.

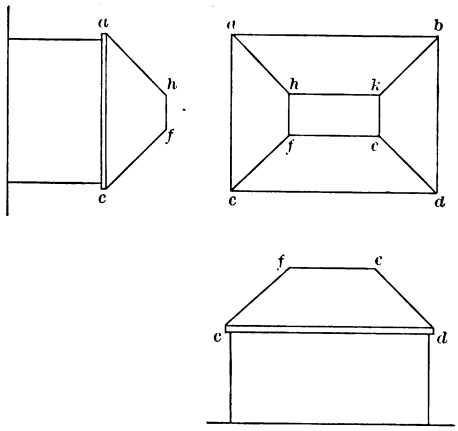


Fig. 37.—Hipped Roof with Flat Deck.

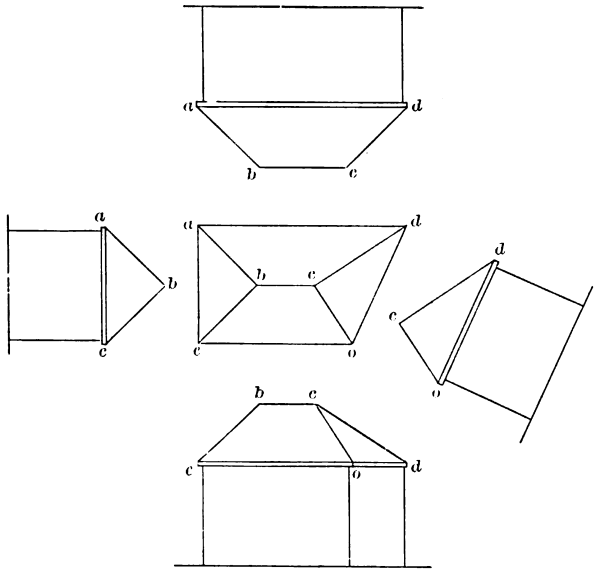


Fig. 38.—Hipped Roof with Irregular Plan.

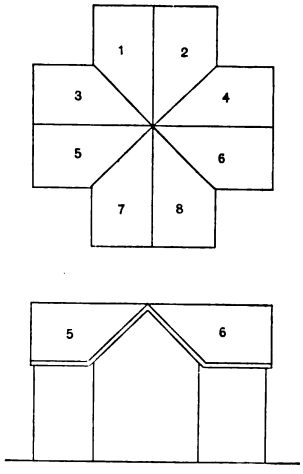


Fig. 39.—Roof with Four Gables.

MEASUREMENT OF ROOFS.

frequently applied to all kinds of architectural drawings, as if the words plan and drawing had the same meaning. The word plan should only be applied to those drawings which represent the horizontal sections of the various floors or parts of a building, or as it would appear when viewed from above. If we could be poised directly above a building and look down upon it we would have a view somewhat similar to that presented by the

The elevation is a similar drawing, only it represents the flat side or end of a building, not exactly as it would appear if we stood in front and looked at it, but as if we stood in front of each individual portion. It, like the roof plan, is drawn to some scale, and, being a reduced representation of the building, it can be measursed just the same as though we were to apply a rule to the building. When the drawings are drawn to a reduced scale it is customary for the architect to put down floor plans, &c., which are horizontal sections of the various floors of the building from which they are named, showing the disposition of the walls and apartments, with the situation of the various fireplaces, cupboards, doors, &c. They, in fact, represent the different stories as they appear when seen from above or when the walls are built 2 or 3 feet above the level of each floor.

An examination of Fig. 37 will show the mutual relationship between the elevation

* Continued from page 48, March, 1890.

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and plan, which is one of the points to which attention should be called. It will be noticed that the elevation of the side of the building is drawn directly under the plan of roof, and the elevation of end at one side of roof-plan, the two elevations being so placed as to correspond with the portion of the plan to which they belong. Certain parts in the two elevations should agree with the plans, as *c d* in the side elevation should be the same as *c d* in the roof-plan, and *a c* in the end elevation should be the same as *a c* in the plan. The ridge *e f* also should be the same length in roof-plan and elevation. It is the usual custom for architects to draw the plans and elevations to one scale, so by comparing one with the other we are enabled to obtain the dimensions necessary for calculating any one of the several parts. If a mechanic were required to measure an actual building, in order to obtain the measurements of the various parts, he would have to walk around it so as to obtain a view of the several sides, and perhaps get on the roof to obtain a view and measurements of that part of the structure. When making estimates of work the mechanic can greatly facilitate his operations by grouping the various

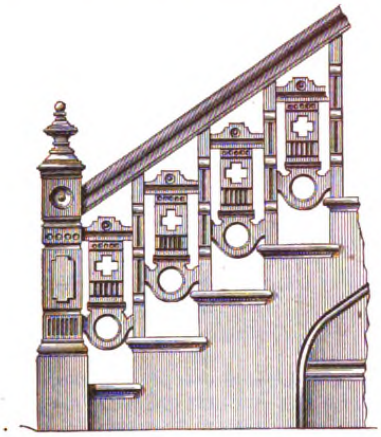


Fig. 1.

elevations about the plan as has been done in Figs. 36, 37 and 38, thus presenting the several views of the building that would be obtained by walking around it. By locating the various elevations in this manner there is less chance for mistakes, and time is saved, as the location of the elevations to a certain extent explains them.

An inspection of Fig. 36 will show that there are no shapes presented for which rules have not been given already for calculating the surfaces. The ends of the roof, as *c f a* and *d e b*, are triangles, the surfaces of which were calculated in the last article. The side of the roof, as *c f e d*, is a trapezoid in shape, the surface of which is calculated in a similar manner to that of Fig. 32. In order that this building should be fully shown two elevations are given. To obtain the surface of one of the side roofs the mistake should not be made of taking *c d e f* of the elevation for the *surface* of one side. To obtain this surface we take the length of eaves *c d*, as shown by C D, the hight C′ F′ being derived from *c f* of end elevation. The length of ridge F E is the same as *f e* of roof-plan or side elevation. The surface of the end is obtained in a similar manner, A C being derived from *a c* of plan or end elevation, the hight being the same as C′ F′. It will be noticed that C F of end is the same in length as D E of side.

Another form of roof is shown in Fig. 37, the same side elevation being used as in Fig. 36. In order to allow for the top of the roof being flat, as shown in plan by *f e k h*, the end elevation is made wider. The surface of side is the same as in Fig. 36, the end being a trapezoid of the same height as the side, and its surface is obtained in a similar manner. In this instance there are two methods for obtaining the surface on the flat part of the roof; it can be found from *f e k h* of roof-plan, or the length of side from *f e* of side elevation and the end from *f h* of end elevation.

In Fig. 38 is shown an irregular building, the eaves of roof at *e o* being shorter than *a d*, as *a e* are shorter than *o d*. Each of the four parts of this roof are different in shape and have to be figured separately, yet this can be done by the rules previously given. Fig. 39 shows a form of building

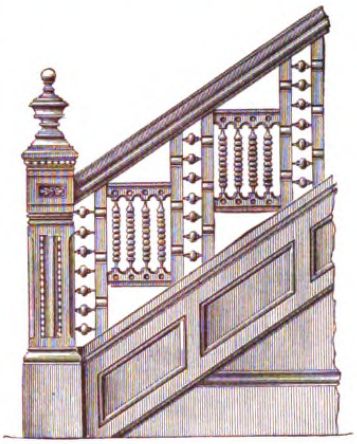


Fig. 2.

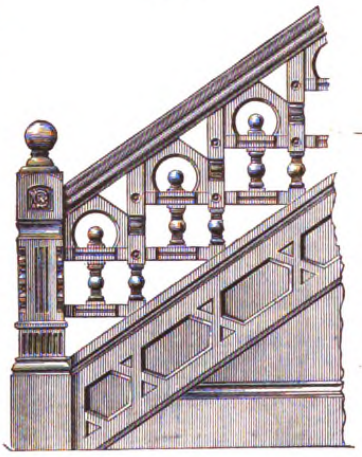


Fig. 3.

DESIGNS FOR STAIRS.

the plan of which is two equal parallelograms crossing at right angles. The roof or surface of this building could be calculated from the elevation, the plan being depended on to show that the various parts of the roof, as 3 and 7, are the same size, or that the ridge and eaves are of the same length for each part of the whole roof. If we were required to estimate the surface of this roof we could obtain the length of ridge from the portion marked 5 on elevation, the hight being obtained from the gable shown in the front. Having obtained the area of this portion, it is an easy matter to determine that the other portions of the roof are duplicates, so, having calculated the area of No. 5, all that is necessary to do is to multiply it by the number of parts of which the roof is composed—in this case eight. The reader who has looked at the elevation a sufficient number of times to form in his mind the shape of one of the parts of the roof must have glanced at the roof-plan and been aided by it in forming a picture of the whole. This shows the utility of the roof-plan in connection with the elevation, even though it may not be absolutely essential.

Designs for Stairs.

Among the features of house construction, and especially of interior work, to which more and more attention is being given at the present day, is the stairway and its ornamental value to the hall in which it is placed. While a flight of stairs is not, under ordinary circumstances, an object of great interest, from an artistic standpoint, the decorative effect may be greatly enhanced by the use of appropriate designs for the balusters. Those who are engaged in the business of making stairwork are giving unusual attention to this feature and are turning out some very pretty designs. In the illustrations upon

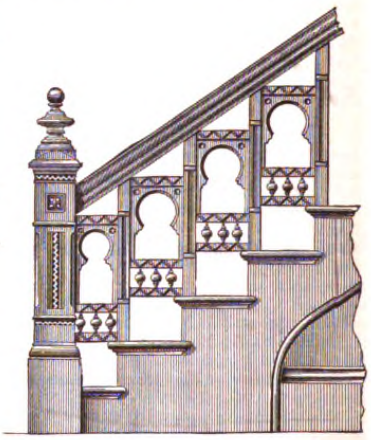


Fig. 4.

this page we show four designs for stairs which represent some of the work being brought out by S. E. Smith & Bro., of 199 West Seventh street, St. Paul, Minn. The factory of this firm is fitted with tools and machinery designed especially for the production of this class of work and they turn out attractive designs in oak, ash and other woods. The illustrations presented herewith indicate very clearly what may be accomplished in this direction and show designs which would add materially to the decorative effect of the halls in which they were used.

The Massachusetts Institute of Technology, in Boston, has upward of 900 students. Additional apparatus and machinery have been supplied to a large extent within the last six months. The new six-story structure 52 x 148 feet erected for the mechanical and civil engineering departments was constructed at a cost for land, building and equipment of $186,000. A triple expansion engine of 150 horse-power for experimental purposes, will enable the laboratory to take a leading position in experimental investigations and research in steam engineering. Among other equipment, apparatus for experimental work upon the flow of water through orifices, mouth pieces and pipes and for testing the effect of recent bending upon the elasticity of iron and steel, is provided.

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SOME PECULIAR PLUMBING WORK.

THE GREAT NECESSITY of making a careful examination of the plumbing of a residence is well exemplified in a recent case where James Muir, of the firm of James Muir, Sons & Co., 27 East Twentieth street, was called on to change a few of the fixtures in a dwelling-house situated on one of the principal uptown avenues in this city. The building is on a corner lot and covers a space about 80 by 80 feet wide. There are five stories, with a back extension on the first floor. It was built some seven or eight years ago and has not been occupied. Recently it was sold, and the purchaser desired to change some of the fixtures in order to have those with the most recent improvements and some of the modern appliances. The existing valve pan closets without cistern connected direct to water peppermint test to all systems of plumbing previous to attaching new fixtures. On the day of the test Mr. Charles F. Wingate, the sanitary engineer, was present on behalf of the owner. When the test was applied not only did the residence in which the changes were being made become filled with the smell of peppermint, but the house next to it was similarly affected. It was then decided that a thorough examination should be begun and, if necessary, a complete change in the piping be made. The soil-pipe, Fig. 1, was found built in the wall, no channel having been made for it. The pipes at B B, Fig. 1, were 2-inch cast-iron pipes, connected by saddles to vertical pipe. These pipes were left open at the ends, the cement or mortar being laid up loosely against them. It was evident that the sewer gas could fitted with a trap, but neither of the traps had ventilating-pipes. If the slightest stoppage took place in the leader, and a stoppage was likely to occur through the accumulation of grease from the pantry sinks, an overflow during a heavy fall of rain might back up through the sinks and soon flood the butler's pantry and dining-room floor. Fig. 6 shows the waste-pipe from laundry washtubs and kitchen sink. It was placed nearly level without any useful inclination. It is of cast iron, hub and socket joints; pipe 3 inches in diameter. To still further demonstrate the carelessness with which the work was carried out, a lead-cup made of a piece of 2-inch lead pipe fitted with a string and partially filled with red and white lead was found, as shown in Fig. 6, in the 3-inch pipe just beneath the opening

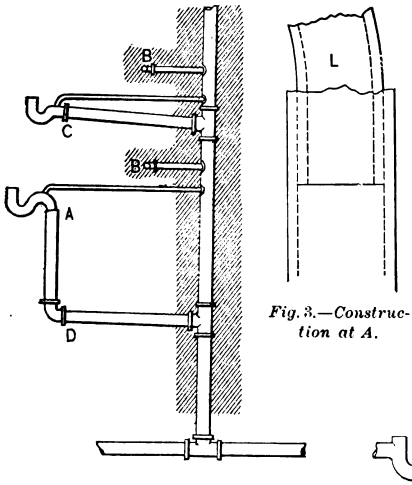


Fig. 1.—Arrangement of Pipes as Found.

Fig. 3.—Construction at A.

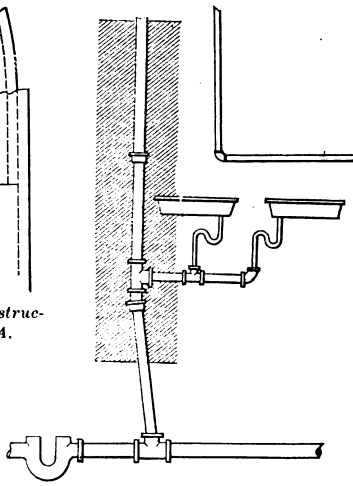


Fig. 5.—Leader from Roof of Extension One Story High.

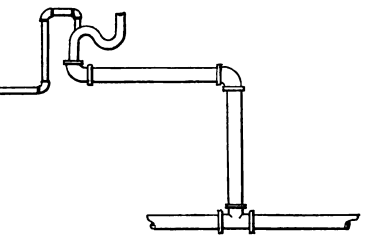


Fig. 4.—Ventilating Pipe with a Trap.

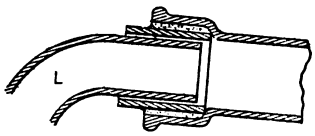


Fig. 2.—Connection at C.

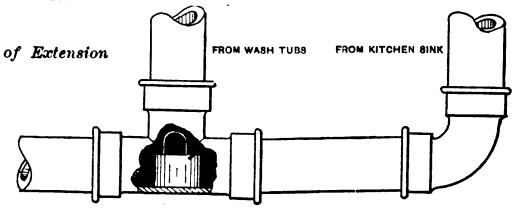


Fig. 6.—Obstruction in Waste Pipe.

SOME PECULIAR PLUMBING-WORK.

main were to be removed, the bathtubs were to be changed and one or two other small alterations made. It was supposed that these alterations would only require the labor necessary to disconnect the old fixtures and connect the new to the existing pipe arrangement. The old fixtures were first removed, and when this was done all openings were stopped, as Mr. Muir decided to apply a peppermint test before proceeding any further. From an external examination it was apparent that the work might have been better done, and in removing the old fixtures some very peculiar pieces of workmanship were exposed. For instance, Fig. 2 shows how a brass ferrule was used, the end of lead trap was pushed into the ferrule without being soldered or turned over; Fig. 3 is another example where the end of lead trap was passed into a piece of cast-iron pipe the end of which was broken off. But without encountering such visible defects Mr. Muir always makes it his practice to take the precaution of applying a pass into the houses from them, as they were near the base or wash-boards on the different floors, and gas could readily pass under the boards. Fig. 4 shows the manner of ventilating one of the closets. Condensation would soon fill up this trap in the vent-pipe and the usefulness of the pipe for ventilating purposes would be destroyed. Fig. 5 shows the leader-pipe and its connection. From the main roof a 4-inch leader is conducted to the roof of the extension, and from the latter roof a 3-inch leader, as shown in Fig. 5, is used to take all the water from a roof of a building 80 feet wide by about 80 feet long and upward of 75 per cent. of the water from the roof of the next house. This 3-inch leader is connected to drain-pipe without a trap, and, being open just beneath the windows of the second floor, permits the gases to escape from drain-pipe, and when the windows are open these gases may enter the rooms. To this leader was also connected the waste-pipe from pantry sinks. Each of the sinks was tee which received the waste from washtubs. This might have moved in the course of time into the drain-pipe and stopped the whole system, or it certainly would have stopped the waste from the kitchen sink if it had remained where it was found. The pipes from the closet traps are nearly level in most instances and in one case one of these pipes was already found partially stopped. The house trap on drain-pipe had no fresh-air inlet. The fittings were square tees, Y fittings not being used. It is but fair to state that such a case of comparatively modern plumbing carried out in such a careless and it may be said dangerous manner is seldom if ever met with in the city of New York. It is a matter of congratulation that the house had not been occupied until such a thorough examination as had been made was carried out. New soil, drain, ventilating and leader pipes are being put in, and when the alterations are completed this residence will have a most perfect system of sanitary plumbing.

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TRADE NOTES.

THE SIDNEY PLANING MILL COMPANY, Sidney, Ohio, favor us with a copy of what they are pleased to call the architects and builders' edition of their catalogue, showing Hill's Patent Inside Sliding Blinds. The catalogue is of large size, oblong in shape and is profusely illustrated. The blinds manufactured by the company are fully described and their construction and application shown by means of sectional and perspective views. We also have from the same company what is known as Catalogue No. 2, devoted to a presentation of the goods referred to above. Numerous testimonials are presented from those who have used these blinds and full directions are given, and a list of agents is presented showing where the goods can be obtained.

THE QUESTION IS OFTEN ASKED by those interested, "Does creosote preserve the color as well as the wood when used as an exterior stain?" A manufacturer of creosote wood preserving stains claims that it does and gives as a reason therefor that the low forms of organism and fungi, which so often cause the blackening in oil paints and stains, are prevented by the addition of creosote, which is a strong germicide.

WARREN-EHRET ROOFING COMPANY, of Philadelphia, have removed their offices and city warehouse to the new and more commodious premises No. 432 Market street, two doors west of their present location. They also occupy a warehouse covering about half a square at Thirteenth and Cumberland streets. Their mills are at Wissahickon from which station most of their goods are shipped.

THOMAS CARLIN'S SONS, Pittsburgh, Pa., have just issued from the press a somewhat voluminous catalogue of their specialties. The work is profusely illustrated and sufficient descriptive text is presented to enable the reader to fully understand the features of the goods referred to. Numerous tables are scattered through the volume which will be found of interest and value. The firm manufacture stationary steam engines, hoisting and winding engines, portable hoisting engines, pile-driving engines, horizontal and tubular boilers, reversible table engines, friction hoist, rolling mill and machine castings, steam pumps, valves, elevator buckets, wire and hemp rope, feed boxes, bell traps, window gratings, hitching posts, pile-driving machinery, and make a specialty of ore and clay mining machinery.

THE DAILY PRESS, of Dayton, Ohio, have recently been devoting more or less space to a description of the various industries located in that city, and have taken occasion to call attention to the productions of F. A. Requarth & Co., who have inaugurated a perfected system of "square-turned" work for builders' use. The statement is made that the output of this company is being shipped to all parts of the United States, and that one of the more recent and probably the finest examples of their work was a stairway which was shipped to Houston, Tex., for the new Government building now in process of erection in that city.

IRVING BROS., of Elwood, N. J., are distributing samples of their Water-Proof Manilla Building Paper, which is claimed to be clean and colorless and to unroll as well in cold as in warm weather. The manufacturers state that it is saturated with chemicals which make it vermin-proof. It is designed for use in the construction of buildings and is said to be water-proof and that it will not stick. The firm is also sending out samples of Irving's Japanese Paper Carpeting, which is employed as a substitute for oil-cloth. These goods, it is stated, are meeting with a good demand and are constantly growing in favor.

CHENEY & HEWLETT announce elsewhere in this issue that they have removed their works to Newton Creek, Paidge avenue, Setauket and Brant streets, Brooklyn, N. Y., where they have erected new shops specially arranged to meet the requirements of their business. They have been fitted with the most approved tools and machinery and are in shape for rapidly turning out all kinds of architectural and ornamental iron work for building purposes. Their New York office is 207 Broadway.

MR. RAFAEL GUASTAVINO, of the Guastavino Fire-Proof Construction Company, Boston, New York and Denver, delivered a lecture before the members of the "Thursday Club," of Boston, a short time since, taking for a topic "Cohesive Construction." In discussing the subject the application of the cohesive system to mills, institutions and dwellings was described in a very interesting manner, and the various phases of the subject touched upon in a way to command the close attention of the audience.

THE PRESCOTT HARDWARE MFG. COMPANY, of Chicago, illustrate in their advertisement this month two applications of the Prescott Door Hanger, one view showing the hanger applied to parlor doors and the other the method of using it in connection with barn doors. These goods have been described in our columns at some length and our readers are no doubt familiar with their merits.

P. PRYIBIL, 518 to 524 West Forty-first street, New York, reports a gratifying demand for his wood-working machinery and especially for his new resawing band sawing machine. Among the recent shipments which he has made of this machine may be mentioned one to Corson & Rand, Keokuk, Iowa, and one to Hall & Brown, St. Louis, Mo. Mr. Pryibil is also meeting with a good inquiry for his twist machine designed for producing all kinds of spiral and rope moldings, either straight, tapered or oval. This machine is constructed in a very workmanlike manner and has been upon the market only a comparatively short time.

GOODELL & WATERS, of Philadelphia, direct the attention of the trade this month to the "Mohawk Dutchman" Band Saw Guide, a view of which they show elsewhere in this issue. They claim for this device that it prevents cramping or twisting of the blade, reduces friction and will not crystallize the saw. Testimonials from those who have used the guide show in a very striking manner the estimation in which it is held by the trade.

IN THEIR ADVERTISEMENT this month L. Schwartz & Co., with factory at Buffalo, N. Y., and New York office at 18 East Fifteenth street, direct attention to their extensive line of hard wood and slate mantels. These are offered in a variety of designs and the firm solicits correspondence concerning them.

WILLIAM J. WALTERS' SONS, of Philadelphia, Pa., announce elsewhere in this issue that the last edition of their wood-workers' catalogue having become exhausted they are now getting out a new one. This will show their complete line of wood-workers' tools and contain information which cannot fail to be of interest to carpenters and builders generally.

THE PENRHYN SLATE COMPANY, with quarries and factory at Middle Granville, N. Y., and office and salesrooms at 103 East Seventeeth street, New York, direct attention elsewhere in this issue to their line of Mantels, Roofing Slate, &c., which they are prepared to furnish.

THE E. D. ALBRO COMPANY, Cincinnati, Ohio, invite attention on another page to their line of Hardwoods and Veneers for interior finish. They report an especially good demand for their built-up woodwork of which they make a specialty.

THE H. W. JOHNS MFG. COMPANY, 87 Maiden Lane, New York, call attention in their advertisement this month to the advantages of Asbestos Roofing. They state that this roofing is now in use upon factories, chemical works, foundries, cotton gins, steamboat decks, railroad bridges, cars, &c., and that it can be supplied ready for use in rolls of 200 square feet.

C. E. JENNINGS & CO., of Nos. 79 and 81 Reade and No. 97 Chambers streets, New York City, call the attention of the trade in their advertising space, this month, to the very complete line of Augers and Bits, which they are able to supply upon short notice. The assortment includes all sizes, ranging from ship augers dow to nthe smallest bits.

THE STOCKHOLDERS of the S. A. Woods Machine Company held their annual meeting and banquet at Young's Hotel, Boston, Mass., on February 10, 1890. The usual dividend was declared, and the report of the company's business showed that the past year was the most prosperous in their history. The output was largely in excess of that of any previous year, and the orders for future delivery already booked were stated to be greater at the present time than ever before. The Board of Directors elected consisted of S. A. Woods, F. F. Woods, Elroy N. Heath, Harword Watson and Henry Faxon. The officers elected were as follows: President, S. A. Woods; vice-president, F. F. Woods; treasurer and clerk, Elroy N. Heath; superintendent of works, H. R. Tillison

THE CANTON STEEL ROOFING COMPANY, of Canton, Ohio, have just issued their thirteenth annual catalogue and Reference Book, in the preparation of which they state they have spared neither labor nor expense. The pamphlet is made up of over 40 pages of text, profusely illustrated. The goods of the company are carefully described and the methods of application clearly shown, while their merits as regards other forms of roofing are compared. Full directions are given for ordinary goods and the manner of shipment explained. Attention is given to paint, cement, waterproof paper, roofing tools, size of sheets kept in stock, while a great deal of information of interest to those engaged in the erection of buildings is embodied within the paper covers in which the pamphlet is bound. The company state that they have lately obtained patents on and put in machinery for making long eave trough, conductors, boots, shoes and angles, also wire and steel hangers, strainers, &c., for which they will soon publish a complete catalogue.

THE GAGE TOOL COMPANY, Vineland, N.J., announce that their planes are fully up to representations and that they can be relied upon in all cases. Their financial position is also fully established as is evidenced by the references which they are permitted to use. Correspondence upon the part of mechanics concerning these tools is solicited by the company whose advertisement appears elsewhere in this issue.

THE BUCKEYE PORTLAND CEMENT COMPANY, Bellefontaine, Ohio, are distributing a very attractive pamphlet devoted to a presentation of the merits of Buckeye Portland Cement, which is manufactured by them at Harper, Logan County, Ohio. This is the second edition of the pamphlet, and in the introduction to the trade the statement is made that the capacity of the factory has lately been increased and is now nearly 100,000 barrels per year. Special attention is called to the chapter upon the relative strength and cost of cements and mortars, in which the advantages of Buckeye Portland Ciment are shown in comparison with those of common, cheap cements. A telegrapic code which will be found of interest, is also incorporated, as well as numerous testimonials from those who have used the company's goods.

W. J. BURTON & CO., Detroit, Mich., report the demand for their Eastlake metallic shingle as highly gratifying, and state that the shipments for the month of February were more than double those for the corresponding month of 1889. The manufacturers claim that this increased demand grows out of the many features of merit possessed by their shingle and the general satisfaction it has given wherever employed. The firm have just issued a circular in which the merits of the shingle are set forth somewhat in detail. They are now giving, free of charge, with each order their improved starting strip, which is said to make a neat and perfect finish at the eaves of roofs without exposing the fastening to the weather. They are also offering a sufficient quantity of their Eastlake paint to recoat the shingle when laid.

EDWIN A. JACKSON & BRO., of 50 Beekman street, New York, are distributing among their customers a very tastefully-printed pamphlet bearing the suggestive title Heating and Ventilation. In shape it is nearly square and within its yellow-covered paper covers are 24 pages of matter relating to the "Jackson ventilating grate considered as a method of heating and ventilating hospitals, asylums, courthouses, schools and private dwellings." Numerous illustrations are presented showing different styles of the grate and its application, while considerable space is devoted to a list of names of persons in public and private life in whose homes the grate is used. The mechanical execution of the pamphlet is of a high order, and renders it an interesting addition to the recipient's library of trade literature.

IN THEIR ADVERTISING SPACE this month the Warren-Ehret Company, of Philadelphia, direct the attention of carpenters and those engaged in the building trades, to their building papers. The statement is made that they carry in stock all grades of these papers, as well as roofing materials and coal tar products.

IN THEIR ADVERTISING SPACE this month the Thorn Shingle and Ornament Company, Philadelphia, Pa., set forth some of the claims made for Thorn's Patent Metallic Roofing Tiles and Spring Lock Shingles, which they manufacture.

THE DETROIT HEATING AND LIGHTING COMPANY, Detroit, Mich., have issued a collection of advertising matter relating to their Bolton Hot-Water Heater which they manufacture. A circular letter which they distribute calls attention to their combination Gas Machine as well as their Hot-Water Heater and briefly notes their merits. Another slip presents several articles from the Detroit local papers in which the Heater is commended. The principal feature of the collection is a poster carrying in one corner a calendar and illustrated with small cuts showing the Bolton Hot-Water Heater and also the Combination Gas Machine.

AN ARTICLE in the roofing line known as Flax Felt is being introduced by the McTear Flax Felt Mfg. Company, 292 Pearl street, (second floor), New York City. It is a well-known fact that flax of all fibers is least subject to decay. Accordingly a roofing felt made with flax has many advantages to recommend it for use. The felt in question is made of flax fiber, finely carded together, and then formed into sheets so as to be in shape to absorb a sufficient quantity of bituminous liquid to make a solid web impervious to moisture. The result is a strong, compact, substantial body, well adapted to the purposes for which it is intented. The material may be used as a sheeting under other forms of roofs, or it is adapted for use as a roofing material, simply having applied over it a prepared roofing cement. The company are sending out by mail to all applicants samples which are very fair specimens of this material All our readers will be interested in inspecting them and testing the toughness. Two thicknesses are manufactured, one running 50 pounds to the square and the other 35 pounds to the square. In writing for samples request should also be made for circulars of directions, which differ very essentially from other roofing literature.

THE CORDESMAN MACHINE COMPANY, of Cincinnati, Ohio, have been giving a little attention to poetry recently and have brought out a number of verses in which an invitation is extended to the reader to call on them for wood-working machinery adapted to meet varying requirements. The last two lines of the jingle are as follows:

Ohio is the place where Presidents grow
And wood-working factories have a show.

WE ARE INDEBTED to S. Bowen's Sons, 150 North Fourth street, Philadelphia, Pa., for one of their memorandum calendars for the current year. The primary object of this device is to advertise the merits of the Pecora Mortar Stains, the advantages of which are mentioned in various ways on the 365 sheets that make up the tablet. The sheets are mounted in a cast-iron framework that supports them at a convenient angle for writing. The lower half of each sheet contains the record of the day, while the upper part is left blank for memorandum purposes. The cast-iron frame is neatly finished in black japan with gilt lettering referring to the Pecora Mortar Stains, while the forward part of the base is decorated with three little squares of colored mortar into the shape of small tiles, and giving practical illustration of the quality and value of the mortar stain above mentioned.

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CARPENTRY AND BUILDING.

A MONTHLY JOURNAL FOR THE BUILDING TRADES.
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DAVID WILLIAMS, - - PUBLISHER AND PROPRIETOR.
A. O. KITTREDGE, - - - - EDITOR.
JOHN S. KING, - - - BUSINESS MANAGER.
66 & 68 DUANE STREET, NEW YORK.

MAY, 1890.

New Art Features in "Carpentry and Building."

With the last issue of *Carpentry and Building*, we sent out a colored plate which was, in some respects, a radical departure from anything that had preceded it, in the way of architectural illustrations. It has been admired by thousands of our readers, and many have been so much pleased with it that they have taken the trouble to write us concerning it, expressing their satisfaction. What we present this month is still another new idea. Only black ink is used, but we have secured an effect that perhaps has never before been obtained in printing from relief plates. We are certain that this will please our readers quite as much as that to which we have already directed attention. The picture has all the excellence of a photograph, with much effect added thereto. Next month we promise our readers still another surprise. We shall not occupy space at the present time in telling just what it is going to be. We risk nothing in saying, however, that the June issue of this paper will be, in many respects, more attractive than anything that has ever preceded it. Not only will the art features be important, but the literary part, and the mechanical diagrams as well, will go far ahead of anything that we have ever yet attempted.

Building Trades Disturbances.

From present indications it seems probable that the 1st of May will witness an increase rather than a diminution of the trouble in the building trades at Chicago. Strikes seem likely to be inaugurated in various other centers as well. On that day the Executive Committee of the American Federation of Labor propose to introduce their eight-hour programme, for which they have long been preparing, with the carpenters and joiners in the lead. The expectation is that other trades will soon become involved in a practical agitation of the question, and that through the pressure of the situation employers will be constrained to meet their demands. If the plan as now mapped out is carried into force, the result cannot be other than a serious interference with building operations. Since the struggle is bound to come sooner or later, it is perhaps as well to have it now as at any other time. Employers have been notified in advance, and many of them are ready to arrange on the new basis. It is necessary, however, to secure uniformity of action. Hence the gravity of the situation. It is possible, of course, that a part of the disturbance now impending may be averted by prudent management and the adoption of conciliatory measures, but the attitude of some of the trades unions would seem to leave no ground for hope in this direction. Not only is the demand for a limitation of the working day to eight hours, with no corresponding decrease in pay, but in some instances higher wages are demanded for eight hours work than were formerly paid for ten hours. Another demand made by trades unions is uniformity in wages without regard to skill. They propose, however, to secure this uniformity by leveling wages up to the maximum prevailing in the trade and not by making any reductions. This is an unreasonable demand, and an insult to all workmen of superior skill and ability, and one which employers out of a mere sense of justice will be disposed to resist. If these disturbances in the building trades are not settled very speedily, much harm will be done to general business at a critical time. So many industries are dependent upon building operations that a partial cessation of work in that line during the regular season is widely felt. But more important yet is the fact that those intending to build costly structures may defer them until another year, by which time they hope these troubles will have been settled, if not permanently, at least for a few years.

The Strike Disease.

Another cause for anxiety concerning these building trades strikes is their contageous influence. The strike disease, once it is fairly started, spreads rapidly to other lines of trade. Even now unions are being formed among hitherto unorganized workingmen who propose to secure for themselves an eight-hour day and uniform wages. Those also who employ labor are not idle in this respect, as may be seen from the number of Master Builders' Exchanges in all sections of the country. The spirit of the times is organization for the protection of mutual interests, and the present labor situation growing out of this feeling is so serious as to call for the most delicate treatment, if great financial loss is to be avoided. Meanwhile the building trades of the country, as well as the general public, will await the 1st of May with no little concern.

The Eight-Hour Day.

In speaking of this subject it may be interesting to note the unions which have declared for a work day of eight hours in New York City. These are, the Plasterers, the Artificial Stone Masons, the American Stair-Builders, the Cabinetmakers, the United Brotherhood of Carpenters and Joiners, the Paper Hangers, the Millers and Millwrights, the Progressive Painters, the Housesmiths, the Eccentric Engineers, the Operative Cement Workers, the Mosaic and Encaustic Tile Layers, the Wood Machine Workers, the Derrickmen, the Granite Cutters, the Iron Molders, the Belgian Pavers, the Cement Asphalt Layers, the Amalgamated Carpenters, the German Painters, the German Pavers, the Slate and Metal Roofers and the Cigarmakers. Of these 23 unions it is not likely that more than half a dozen will make an emphatic demand for eight hours. The eight-hour work day has been accorded to the Plasterers' Union. The artificial stone masons, the cement asphalt layers and the operative cement layers are now engaged in a fight for it. It is said in Europe that the movement in favor of a simultaneous international labor demonstration on May 1 is assuming formidable proportions, and that as far as numbers are concerned is already an assured success in England, France, Germany, Italy, Hungary, Belgium, Holland and Spain. The organizers estimate the grand total to parade in England at nearly 500,000. Jules Guisde, who has charge of the movement in France, promises to have 200,000 workmen on parade. Belgium pledges to show 100,000; Holland, if the police will permit, 100,000; Germany, by the grace of Kaiser Wilhelm, 800,000; Italy, 100,000 and Spain, 50,000.

Fractional Paper Currency.

The suggestion of the House Committee on Banking and Currency to issue fractional paper currency for the purpose of affording the people a convenient method of sending parts of a dollar through the mails is timely and commendable. As the committee says, the postal notes now in use do not satisfactorily meet this requirement, as their cost and the inconvenience of obtaining them hampers their use. Publishers and others are overburdened with postage stamps received through the mails, which a currency of the kind described woud undoubtedly replace. The proposition is not to displace our token silver, and as the new currency sball be receivable by banks and post offices, who will not reissue it, but forward for redemption to the Post Office Department, it would be less likely to become soiled by use than that in circulation 25 years ago. Carpenters, builders and members of kindred trades would be greatly accommodated by such an issue as well as those in many other branches of industry.

Matters and Things.

Something that has surprised me ever since I have been old enough to use my observation about buildings is the unfinished spots that are to be found in country structures of all kinds. I use the term "country structures" not meaning necessarily a farmhouse, but any building that is erected by mechanics who have not the discipline, and the skill that follows the discipline, of those mechanics who work in and about the large cities. There are skillful men to be found in the country and in the country towns, —men who can do things which their city brothers and cousins find it impossible to do, men who are able to get out of mechanical difficulties, great to their own credit, and in a way that would astonish men who are accustomed to have the thinking done for them by foremen and superintendents; and yet with all their skill and special experience there are marks upon their work which, to say the least, are peculiar. For example, a beam will protrude itself through a ceiling; or some hard spot to plaster will be left without a finish; or some corner will reveal a similar lack of finish;

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or the upper or lower tread of a staircase will vary a trifle in hight from the others in the same flight. I dare say many another man has noticed the same thing, and has often wondered why it is that country mechanics, with all the special skill which they possess, have not the courage to do a thing over a second time and correct the little mistakes they make at first; for it is only mistakes in calculation that account for such things as I have mentioned.

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—Another thing that I have encountered among mechanics, and this does not necessarily apply to country mechanics any more than to city mechanics, is an unwillingness to undertake anything a little different from the customary way of performance. For example, a given piece of work is of such a character as to make possible two or three methods of execution, and the architect, or some one else in charge, will say: "Now, I would like to have this done so and so." The mechanic will look at the work, consider the plan, and then say: "Well, I never learned to do it that way." I have encountered this remark so often in so many different places that I begin to think that it is the symptom of a disease that is well-nigh epidemic throughout the land. A case in point: I was altering over a country house some years ago, and had in charge of the work a bright, young carpenter who certainly was able to comprehend any direction that I might give. I desired to have the work done in various particulars differently from what was current in the community in which the house was located. I could not be present all the time while the work was in progress, but I would call my man to me and explain, before leaving, how I wanted a certain thing done. I would make sure that he comprehended me, and then go off. On several occasions, when I returned, I found the work done differently from what I had ordered. I would say: "Charlie, did you not understand me to direct the work to be done so and so?" "Yes." "You comprehended exactly what I meant when I said I wished it done so and so?" "Yes." "Well, why have you done differently?" "Well, I will tell you. After you had gone I got to thinking it over, and inasmuch as I had 'never learned to do it that way,' and as every one does differently around here, I thought best to do it by the usual plan, and here it is."

***

—I wonder if the mechanics in the building trades realize the rapid advancement that is being made in all directions about them, not only in the facilities for doing work, but in various changes that affect style, character of work, &c. I never go across the country on a trip that I do not encounter a hundred things that bear directly upon this fact. Features of construction, styles of decoration, methods of doing work, machinery, tools and appliances in general are changing and advancing in quality so rapidly that it requires one's complete time and attention almost, to keep abreast of the progress. What the ultimate result is to be one can only guess, but certainly if we compare the work that is done at present with that which was current in the times of our grandfathers, when nails were hand made, when timbers were hewn rather than sawn, and when four times the materal was employed to make a structure than is now deemed necessary, we can perceive what ground has already been passed over, by analogy, and, we can estimate what remains to be done.

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—I have referred to some peculiarities of country mechanics. I am reminded of other country peculiarities affecting not only mechanics in the building trades but also others. One of the first things that is impressed upon the young man who learns a trade is the necessity of good habits, such as punctuality, order in the way in which he does his work, neatness in finish, &c. Comparatively few persons, however, save those specially endowed by nature succeed in exemplifying, in the best manner, the idea of order until they have gone through a long course of discipline. Very frequently their affairs for a considerable period are in such a condition as to merit the term "systematic disorder." Take it in the mere matter of the keeping of their tools. Instead of having a well proportioned tool chest, with a place for everything, and every thing in its place, their saws, hammers, chisels, planes and other tools will be in various places and so scattered about that gathering them together for any purpose whatsoever is a matter of no small labor. "Orderly disorder" is the term, perhaps, that describes the condition in which they keep their things. Now disorder of this kind is worse than the usual form, for ordinary disorder is so baneful that sooner or later an effort is made at reformation, but "orderly disorder" on the other hand, frequently deceives the victim into believing that he is orderly, so that it remains unchecked and works the greatest harm.

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—But what I was going to speak about is the "orderly disorder" that is sometimes found in the country, and to save the feelings of my mechanical readers I shall illustrate it by referring to another line of business altogether. I visited a farmer sometime since, who passed among his friends as a bright and shining examplar of all the economic virtues, but who to me appeared in some respects to be quite the opposite. As I passed through wagon shed and barn, woodhouse and carriage-house—and even in porch and kitchen the same condition of things prevailed—I was obliged to notice various things carefully picked up and stowed away. The whole series of buildings had been utilized in this way. There was not a place for everything and everything in its place, but rather a great many different things and every place belonging to them, provided they could be got to fit. I counted hoes in four different places, some of them far removed from the others, scythes were in as many more positions, while knives, files, and other small tools ornamented every knot-hole and projected from every cheerful crack. All the tomato cans from the kitchen had been saved, and they were similarly distributed over the premises, each with a choice assortment of rusty nails, broken screws, stove-bolts, and odds and ends of small hardware. A box of soap was stored in the carpenter shop and a saw and a plane hung in the porch. In the loft over the carriage-house was smoked meat, while in the pantry, carefully put away, was the side lamps off his daughter's phaeton. I might continue to enumerate, but enough has been presented to show the condition of affairs. Besides this indiscriminate storing of things, useful or valuable, there was in it, among it and alongside of it, similar careful preservation of things comparatively worthless. Pieces of shingles were carefully stuck up overhead between floor beams, while some lath and a few brick kept them company. The half dozen palings left over from the garden fence were put away where they would be found when needed, provided any one remembered where they were, while odd pieces of board, straight sticks, broom handles and broken casting, likewise the pieces of tin from the new porch roof were stuck away wherever they would fit. Every projecting nail had a bit of string, a broken strap or a discrepit buckle. A piece of rope was to be found almost anywhere, and it was all poor, worn out rope, with no two pieces of the same twist and thickness. There was something everywhere, and no two things of a kind together anywhere. Had any one, possessed of a genius for order, gone through the premises of this farmer and sorted things up, as they ought to be sorted, the result would have been surprising, to the farmer at least.

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—Dirt is said to be simply matter out of place. How much dirt, therefore, there is in this world. But the farmer's premises that I have described above are no worse in this regard than many a mechanic's kit I have seen, nor yet worse than the mental condition of many a man who essays to carry on business in the building trades. Men whose mental condition is typified by the remarks of the preceding portion of this article manifest this condition by their disjointed and disconnected remarks. They are plausible, very often, and not infrequently say bright things; but, as a rule, it is easy to perceive from their conversation that there is no earnest or deep thought upon any topic whatever. Instead of being orderly they are systematically disorderly in their plans, and, as a result, they succeed in filling the old tomato cans of their minds with odd nails and screws of thoughts, instead of securing new and valuable thoughts or opinions of any kind. Whenever a demand is made upon them for something that they may be supposed to be able to supply, that which is produced, while sometimes cunningly wrought, is very generally a misfit or a back number. It is very likely to be rusty, if not also bent. If a dozen things are required the assortment displayed is a varied one, indeed. The only object that I have in calling attention to what many of my readers, I think, will regard as a correct picture of what frequently exists, is the hope that it may stimulate some young man who has tendencies in the direction named to make an earnest effort at reformation.

OLIVER.

BUILDERS' EXCHANGE COMPETITION.

The general development of the Builders' Exchange movement throughout the country, is the remarkable feature of the building business at the present time. Everybody is interested in it, and information concerning the purposes, plan of organization and practical working of exchanges is demanded on every hand.

In order to give our readers and others the opportunity to contribute to the practical literature of the subject, and further, in order to secure suitable essays for publication in these columns, we propose a competition, with prizes and general conditions, as stated below.

The general subject of the competition is "A Builders' Exchange." The precise treatment is left to the contestants, with the suggestions that each essay should define the purposes of a Builders' Exchange, the advantages that follow upon its organization, the persons who are eligible to membership in it, the general scheme of its government, and the ways in which individuals may profit by association with it.

The essays are not to exceed 2000 words each in length. Each essay is to be submitted under a suitable *nom de plume* or emblem, with the name and address of the author in a sealed envelope, bearing the same *nom de plume* or emblem.

Two prizes are offered. To the essay which shall be deemed the best of all those submitted, and which conforms to the conditions of this advertisement, the first prize of $100 will be awarded. To the essay considered the next in rank of merit, the second prize of $50 will be awarded. The committee of judges to pass upon the essays will include, among others, some of those who have had the most to do with Builders' Exchanges to date, and who are thoroughly posted on every phase of the work.

Essays submitted in this contest must reach us not later than the hour of closing business, May 10, 1890. We propose to print the prize essays in the issue of this paper for June.

The right to publish all the efforts submitted in this contest, whether taking a prize or not, is expressly stipulated. The question of accompanying the essays by diagrams or other illustrations is left to the discretion of the contestants.

Address the essays, marked "Builders' Exchange Competition," to

A. O. KITTREDGE, Editor *Carpentry and Building*,
66–68 Duane street, New York.

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BRICK-WORK AND BRICK-LAYING.—VII.

BY ARTHUR SEYMOUR JENNINGS.

IT HAS already been pointed out how great in the past few years has been the development and progress of brick architecture. Where previously building in brick was confined almost entirely to the erection of plain structures with smooth faces, we have now a large variety of different molds and ornaments manufactured in this material. But in addition to variety and form we have considerable diversity in color. There are at present as many as a dozen different shades of brick on the market, and the result is that a front of almost uniformity of tint may be obtained, or by a combination of colors graceful ornamental patterns may be formed.

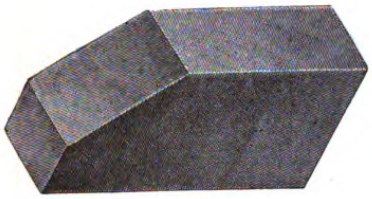


Fig. 1.—A Splayed Brick.

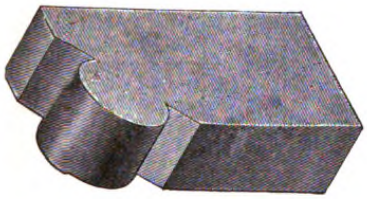


Fig. 2.—A Molded Brick.

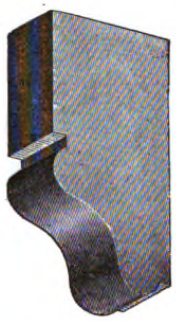


Fig. 3.—A Molded Brick.

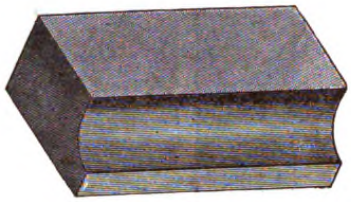


Fig. 4.—Molded Brick used in Cornices.

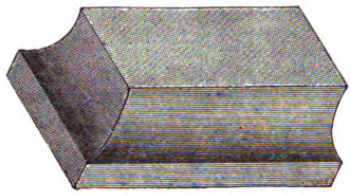


Fig. 5.—Return of Molded Brick.

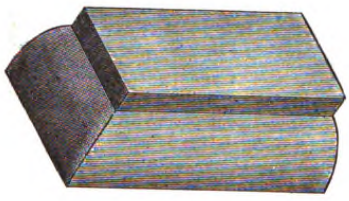


Fig. 6.—Return of Molded Brick.

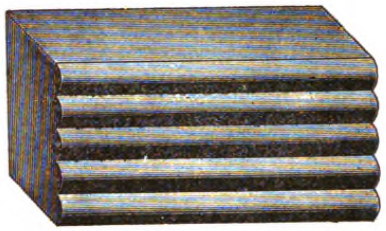


Fig. 7.—A Reeded Brick.

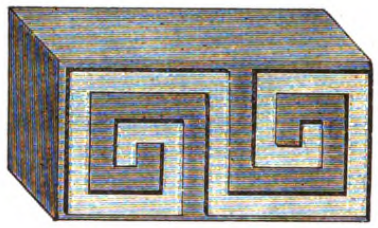


Fig. 8.—Grecian Key Pattern of Molded Brick.

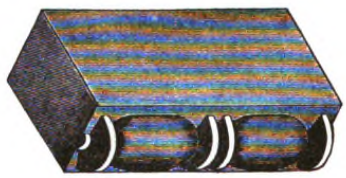


Fig. 9.—A Raised Molding in Brick.

It may be of service to give a few of the most useful forms of molded bricks. In Fig. 1 we have what is known as a splayed brick, which is largely employed for window-jambs, with the object of allowing the entrance of more light. Figs 2 and 3 represent molded bricks, which are very useful in the construction of cornices, piers, &c. Figs. 4, 5 and 6 represent a number of different molded bricks, which are employed for various purposes, such as the construction of cornices, &c. Several examples of ornamental bricks are shown in Figs. 7, 8, 9, 10 and 11, which are by The Hydraulic Pressed Brick Company, of St. Louis, Mo. The excellent forms of bricks represented in Figs. 12, 13, 14 and 15 are by The Peerless Brick Company, of Philadelphia.

Cornices, belt courses and copings are now usually constructed of molded bricks, such as those illustrated, but not infrequently they are formed of common square bricks. The principle upon which the bricks are laid in such cases will chiefly consist of laying headers in order to obtain a good through bond, and in alternating the joints. A simple method of constructing brick cornices is to lay two or three courses projecting about 1½ inch beyond the others and setting one course diagonally. This forms what is known as a "dog's tooth" course, and is shown, marked A, in Fig. 16. Belt courses are also sometimes formed in the same manner. Fig. 17 shows how molded bricks may be used in erecting piers. The tests by which the probable quality of a brick may be ascertained will depend in some measure upon the particular class of brick under treatment. The strength of a brick or its resistance to a force tending to crush it is perhaps the most important test which can be applied. Common brick crushes under a weight of from 1500 pounds and upward per square inch, while the strength of pressed brick is a good deal higher. In a series of tests made some years since, on a large number of different specimens, it was ascertained that common brick crushes by subjecting it to weights varying from 690 to 3200 pounds per square inch, the average of the specimens being 2175 pounds. Facing bricks averaged 2760 pounds per square inch and varied from 1536 to 4395 pounds.

In addition to the test of strength, which, in passing, it may be said should be conducted on a proper testing machine, such as may be found in most large iron works, there are others of importance. The first of these, and perhaps the most important of them is, absorbing qualities. An under-burnt brick is nearly always very absorbent, and is on that account generally far from durable. To test a brick in this respect it should be weighed when dry, and then be immersed in water until thoroughly soaked through. When again placed upon the scales its weight should be found to have increased not more than one-seventh. As a rule it may be said that those bricks, which are square angled, of good shape and uniform color, will be the best. But it is obvious that the same degree of test should not be applied to all bricks.

It has already been pointed out how considerably ordinary bricks vary in size. The dimensions of a few of the most common may be given here:

	Inches.
Philadelphia	8¼ x 4⅛ x 2⅝
Milwaukee	8½ x 4⅛ x 2⅝
North River	8 x 3⅝ x 2¼
St. Louis, Mo.	8½ x 4¼ x 2⅝
Maine	7¼ x 3⅝ x 2⅝

Something may be said here as to the cause and cure of the very objectionable discoloring so very frequently found in brickwork. What is referred to consists of a white efflorescence which appears on brick buildings generally soon after they have been erected, but sometimes at more distant periods. Invariably the incrustations will be found more marked after a heavy fall of rain. The efflorescence is

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sulphate of magnesia, and is variously termed, sometimes being known as "saltpeter," and in other cases as "whitewash." It is a property of sulphate of magnesia when present in bricks to effloresce on the surface after having been taken in solution, and hence the appearance after rain. Clay which contains magnesia is on account of this peculiarity best to be avoided in the manufacture of bricks, for it is very difficult to effect a cure. Sometimes, one or more coats of thick paint applied to the surface of the brickwork will be effective, but often the magnesia will effloresce under it, causing it to come out in blisters and to peel off. To be effectual it is necessary that the wall be perfectly dry before the paint is applied. In some cases it has been found that a cure will be effected by washing off the substance as often as it appears with a brush or sponge dipped into a solution of muriatic acid. Simply brushing it off from time to time, as it appears, will have the effect of ultimately removing the objection.

In concluding these papers upon the important subject of brickwork the writer would point out how excellent a material brick is for use in general architecture. For strength, durability and economy it is not too much to say that there is no building material in existence to compare with it. Formerly the use of brick was mostly confined to the alluvial districts where brick clay was found. But with the facilities for conveyance in this time there is no real reason why it should not be used in any part of the country. It is hoped that with the increased use which the material will have in coming years that bricklayers and their supervisers; that architects and builders generally will do something to improve the construction, and endeavor to bring about a more scientific system of bonding. With this object and with the view of instructing the young, the bricklayer, and other persons interested these papers have been written.

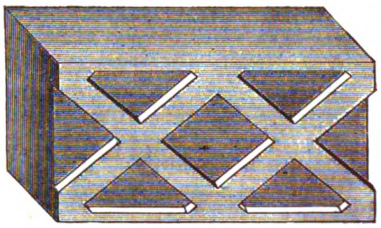


Fig. 10.—A Diaper Pattern of Molded Brick.

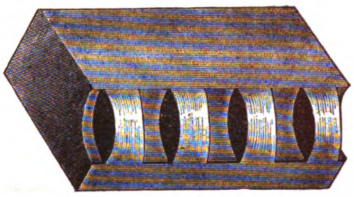


Fig. 11.—Molded Brick.

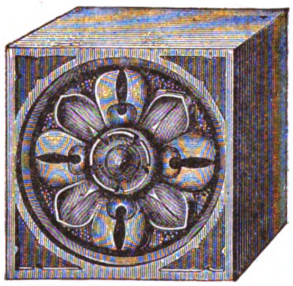


Fig. 12.—An Ornamental Brick.

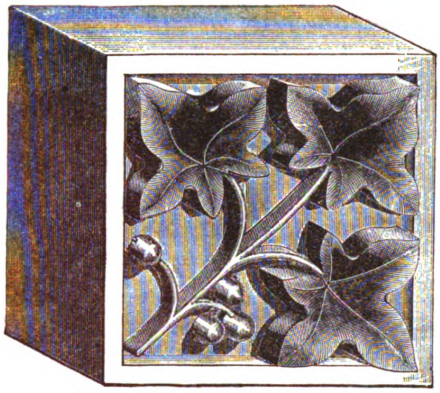


Fig. 13.—Floral Pattern of Molded Brick.

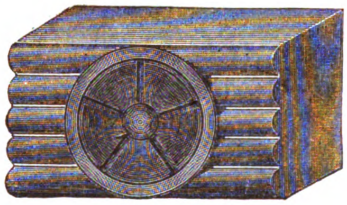


Fig. 14.—Combination of Reeds and Circles in Molded Brick.

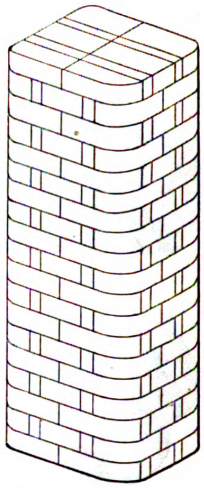


Fig. 17.—Brick Pier with Rounded Corners.

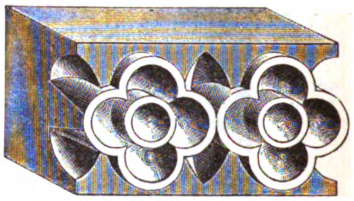


Fig. 15.—Sunken Pattern in Molded Brick.

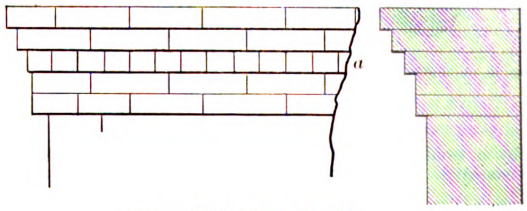


Fig. 16.—Simple Brick Cornice.

Brick-work and Brick-laying.

Slate for Roofing Purposes.

According to a recent issue of a Western paper, slate is not the most desirable article in the world for roofing purposes. It says that on a recent occasion a mill covered by a slate roof was fired by heat from an adjoining building. The heat cracked the slates and they ran off the roof in a shower, leaving dry wood exposed to the flames. Another building covered with shingles was equally exposed, and the roof of the slate-covered mill took fire before the shingled roof. The streams of water turned on the slates after they had become hot caused their rapid destruction, while the wetted shingles were kept from burning. The slated roof allowed streams of water to drip downward through the entire building, while the shingle roof protected the building which it covered. Slate roofs may prevent fires from floating sparks, and shingle roofs, when very dry, may invite fires from such sparks, but where buildings are crowded closely together almost any one of the roofing materials is better and safer than slate, because in the case of crowded buildings the slate is exposed to heat sufficient to break it and uncover the wood.

THE FEBRUARY ISSUE of the transactions of the American Society of Civil Engineers contains a valuable paper on the strength, resistance, tests and specifications of cast iron, by J. B. Johnson, of St. Louis, with an interesting discussion by George A. Just, of the Jackson Architectural Iron Works, of New York.

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DRY ROT IN TIMBER.*

HAVING traced the life history of the fungus, I should like to make a few practical deductions. First, with regard to the state of timber used in building. A tree should not be felled before it has arrived at maturity, for it has too large a proportion of sap wood to heart wood, and the season for felling should be that during which the growing and cell-dividing process is dormant, and there is no sap rising through wood cells.

Vitruvius says that felling should take place from early autumn to end of winter, and adds that the tree should be cut to the pith so as to allow the escape of the sap. By statute of James I people were prevented from felling trees from April 1 to June 30, and in France a royal decree in 1669 prescribed the time for felling to be October 1 to April 15. Napoleon I also, in an order issued to Commissioners of Forests, directed that naval timber should only be felled from November 1 to March 15.

The wood should afterward be cut up and slowly but thoroughly seasoned. This is effected by completely immersing in water, steaming or boiling, by which the protoplasmic and nutrient substances are dissolved from the cells. It must then be stacked on end in a well ventilated shed, whose floor is composed of ashes or concrete. Irregular or too rapid drying or direct sun warmth, causes the wood to split, and gives the fungus ready access to its interior. Of course the use of "green wood" is out of the question. As the rosin and tannin (a preparatory stage in the formation of rosin) afford food material for the fungus, pitch-pine cannot be considered to be rendered more, but rather less, durable by the large amount it contains. Wood must not only be dry, but be kept dry. This is impossible if the air of the chamber in which it is built is damp, as it condenses and absorbs moisture. To secure this, therefore, moisture must be prevented from rising from the soil by a layer of asphalt or concrete; from rising up the walls from the foundations by a damp-proof course; from soaking through the walls by building an air-drain, so that no earth is allowed to be in contact with them above the damp-proof course, unless asphalted outside or built hollow; and lastly by securing thorough ventilation, so that there is no corner where the air can stagnate. All vegetable soil must be removed from the site, for ammoniacal exhalations assist the germination of spores; the drains must be sound, and the mortar made of clean sand. The house should be well dried before the floors are laid and joinery fitted, and it has been suggested by Professor Hartig that the ends of all joints and timbers built into the wall should be previously creosoted, so as to protect them during the critical time when the walls are drying.

Wood should not be painted unless thoroughly dry, as it imprisons the moisture instead of allowing it to evaporate, and is thus no protection against dry rot. Linoleum on floors is objectionable for a like reason.

The darkness under boarded floors and behind skirtings is congenial to the fungus, and so too is the warm air produced by a heating apparatus; for it must not be forgotten that warm air will hold more moisture before it is saturated than cold air, and so absorbs it from whatever holds moisture, whether from damp ground or damp brickwork.

Nor must we forget when we ventilate under boarded floors by inserting air bricks that a considerable draft is not at all a necessary consequence, as a column of air of uniform density will not readily move in a horizontal direction.

Many preservatives have been suggested, and many patents taken out for securing timber from dry rot,—by steeping in corrosive sublimate (mercuric chloride $HgCl^2$) in Kyan's process, by injecting creosote under pressure in Bethell's, zinc chloride in Burnett's, and copper sulphate in Boucherie's. Of these creosoting seems to be the most successful. Creosote is obtained in the distillation of coal tar, and probably owes its antiseptic properties to the presence of crude carbolic acid, which could not be used by itself, as it is slightly soluble in water. The effects attributed to creosote are as follows: 1. It coagulates the cell contents, thus giving solidity to young cells. 2. Absorbs oxygen from the cells. 3. Resinifies within the cells, and so excludes air moisture. 4. Acts as a poison to fungi.

When, however, timbers are built into a house, it is impossible to impregnate them with poison. If they are attacked by dry rot it will be necessary to find out the extent of the disease. This can be done to some extent by a scratching noise being made at one end of the beam and listening at the other, for if the fibers are intact the sound will readily be conveyed; if the beam is decayed it will give a dull sound on being tapped, and will allow a gimlet to penetrate it very readily. If the fungus has only penetrated a short distance the beam may be painted with corrosive sublimate dissolved in methyl alcohol, a method which Professor Hillhouse, of Mason's College, told me he had found very successful. Methyl alcohol has great penetrating power, and acts as a vehicle to convey the corrosive sublimate into the texture of the wood, evaporating in time and leaving the corrosive sublimate behind to do its work.

In a slight attack hot lime wash may be sufficient.

Notwithstanding, however, the fact that decayed wood will absorb the washes more readily than sound, these frequently do not penetrate to a sufficient depth, and as only those parts of the mycelium of the fungus are killed which are in contact with the poison, the hyphæ in the deeper parts of the timber remain as active as ever; the rot is not stayed, but its ravages are now hidden from view. Except in a slight attack, then, it is better to take the timbers out and burn them, and then replace with new timber after having taken the precaution to see that the conditions favorable to fungus growth are no longer fulfilled. It would be an advantage also to disinfect the air. It is particularly necessary that all infected timber and every particle of mycelium, and certainly every fructification, should be burnt.

In conclusion, I would say that dry rot is an easily preventible disease, though more difficult to eradicate when it has once obtained a hold. And I trust you may find this short sketch of the life history, habits and suitable conditions of growth of *Merulius lachrymans* of some help when you have to deal with a case of "dry rot."

*Concluded from Page 68, April, 1890.

Chicago Builders and Trade Schools.

At a recent meeting of the Chicago Builders' and Traders' Exchange the subject of establishing a trade school was discussed, and the following committee was appointed to formulate a plan and report at a special meeting to be held for that purpose on the 26th inst.: J. G. McCarthy, D. V. Purington, George Tapper, William Goldie and F. V. Gindele. At the invitation of the committee Col. R. T. Auchmuty, of New York, pioneer in the trade school movement in the United States, delivered an address before the exchange on the 17th inst. The speaker was introduced by W. P. Ketchum, president of the exchange, who said that Col. Auchmuty is now at the head of the only successful trade school in the country, that of New York City. We are able to give only a condensed report of Colonel Auchmuty's address, which was extemporaneous. He stated that the American people are now attracted toward the trades as never before, that the Western fever, the gold fever and the war fever periods had passed by, and it had become a most momentous question with Americans how they might bring up their children into what would yield them a sure support in manhood. And the matter had become the more serious in that the trades unions show such marked hostility to allowing the children of Americans to enter the trades, although they warmly welcome mechanics who land at Castle Garden and take them into their ranks. The United States stands forth, he declared, as the only nation, civilized or barbarous, which made no effort to care for and protect its young people in the matter of a future support. Thoroughly impressed with the danger to the next generation of the youth growing up in idleness, he instituted the New York Trade School. He then proceeded to recite the history of that institution, which, beginning with 30 pupils in 1881, had 520 upon its rolls last winter, and has sent forth in all no less than 2500 graduates. He gives instructions in plumbing, stone cutting and brick masonry, fresco and painter work and in tailoring. His course of instruction is three months for day pupils and six months for night pupils, who attend three evenings each week. Those passing from his schools readily found employment and made intelligent mechanics. Young men enter at ages from 18 to 20 years. He defended the short term, declaring that in that time they had abundant opportunity to learn the practical workings of their trade, and that six months of active pursuit of it made them competent journeymen. He had a large number of large-sized photographs which he displayed, showing work done in his various departments. One of these was the picture of a large factory that had been put up by 25 young men, after three months' instruction under his method. These photographs passed out in the audience excited unusual interest and called forth warm praise. After reciting his plan of teaching he earnestly urged upon the builders' and traders' exchange to start a trades school in Chicago.

E. W. Blatchford, head of the Chicago School of Manual Training, was present at the meeting, and made an address on the same subject. He indorsed the work done by Colonel Auchmuty, as well as his suggestions for a trade school at Chicago. The existence of his own training school evidenced the need for a trade school. Boys entered the former at the age of 14, and, passing out at 17, would be ready to enter the latter and be glad to avail themselves of its higher advantages. None were held in higher honor among thinking people than the workers, and the Commercial Club had honored itself when it founded the training school, as the Builders' Exchange would exalt itself by starting a trade school. He was followed by J. G. McCarthy, chairman of the special committee of the exchange having the question of a trade school under advisement, who declared that the matter was receiving the most serious attention of his committee.

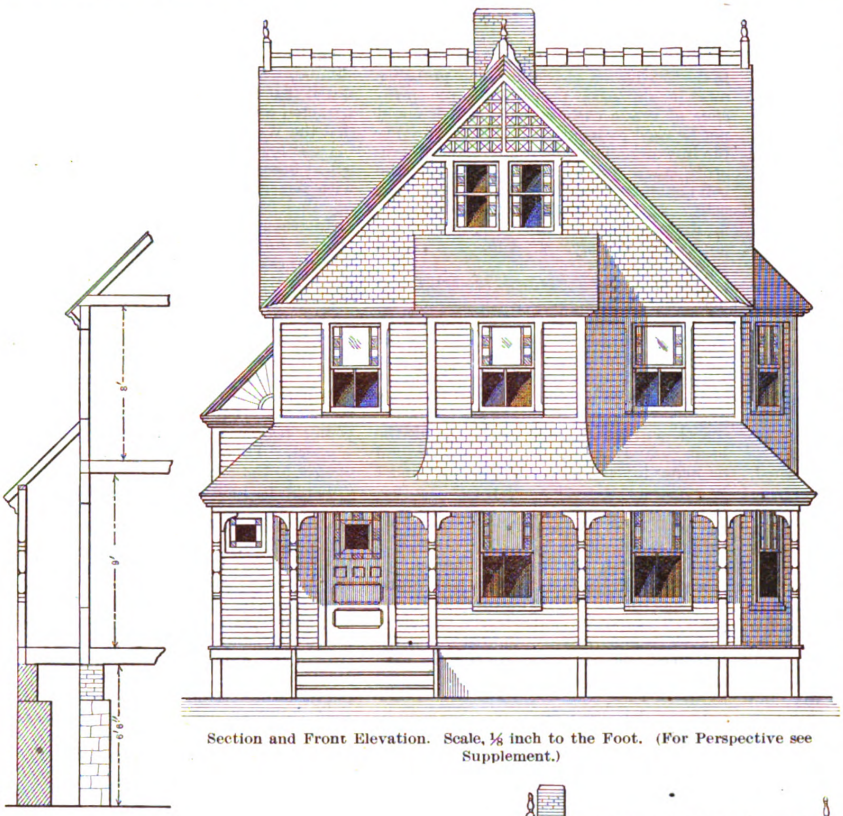
A vote of thanks was given Messrs. Auchmuty and Blatchford. The senti-

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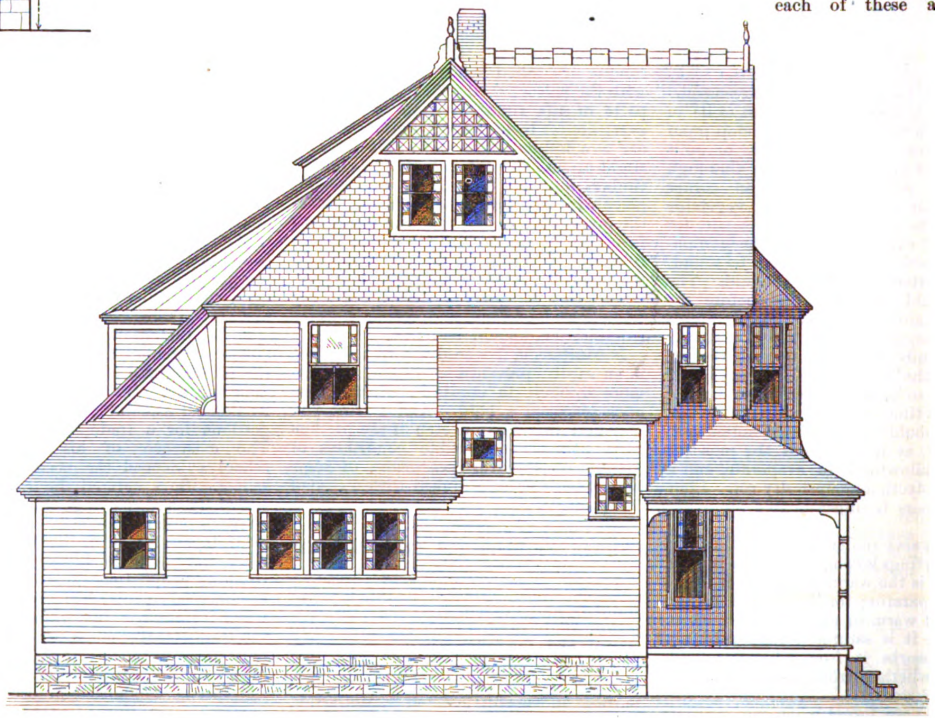
ment of the members is strongly in favor of the project if the necessary financial support can be received.

Cottage of Moderate Cost.

The house which we represent on this and the opposite page has recently been erected by the American Patent Portable House Mfg. Company for their manager, Mr. Earl Lee, of Corona, Queens County, N. Y., at a cost of about $3000. A perspective view of the building will be found upon the supplement accompanying this issue. From an inspection of the floor plans, which are shown on the page with the details, it will be seen that the house provides for 11 rooms, exclusive of a commodious hall. The kitchen is placed at the rear, and from it opens a large pantry. The chimney flue is located in the corner of the pantry, and is constructed of brick up to the main roof. It is then conducted between the rafters by means of a terra-cotta flue up to the attic, above which it is connected to the main chimney. This plan has been followed in order to obviate the difficulty usually resulting from low kitchen chimneys. From the main hall of the house opens the parlor and dining-room, while the sitting-room is reached from either of these apartments. On the second floor are four sleeping-rooms provided with ample closets, while in the attic are three more sleeping-rooms, making seven altogether. It will be observed that the stairway is cut off from the first hall by a sliding door, which is placed to prevent the heat rushing up the stairs in cold weather, thus rendering the lower hall as comfortable as the other rooms. Over the bathroom is placed a copper-lined tank, having a capacity for about 225 gallons. The house is furnished with brick-set range, beside which is a 35-gallon boiler, porcelain wash-tubs and hot and cold water connections. A force pump is also provided for supplying the tank. The house is finished, inside and out, in a substantial manner, the roof being covered with cypress shingles. The provisions made for heating and ventilating are especially interesting. The open fireplaces in the reception hall, parlor and sitting-rooms have an iron back about ½ inch thick, which arches over toward the front about 3 feet, 3 inches above the hearth. From each of these arches an iron pipe of greater thickness conducts the smoke to the chimney, which, about 6



Section and Front Elevation. Scale, ⅛ inch to the Foot. (For Perspective see Supplement.)



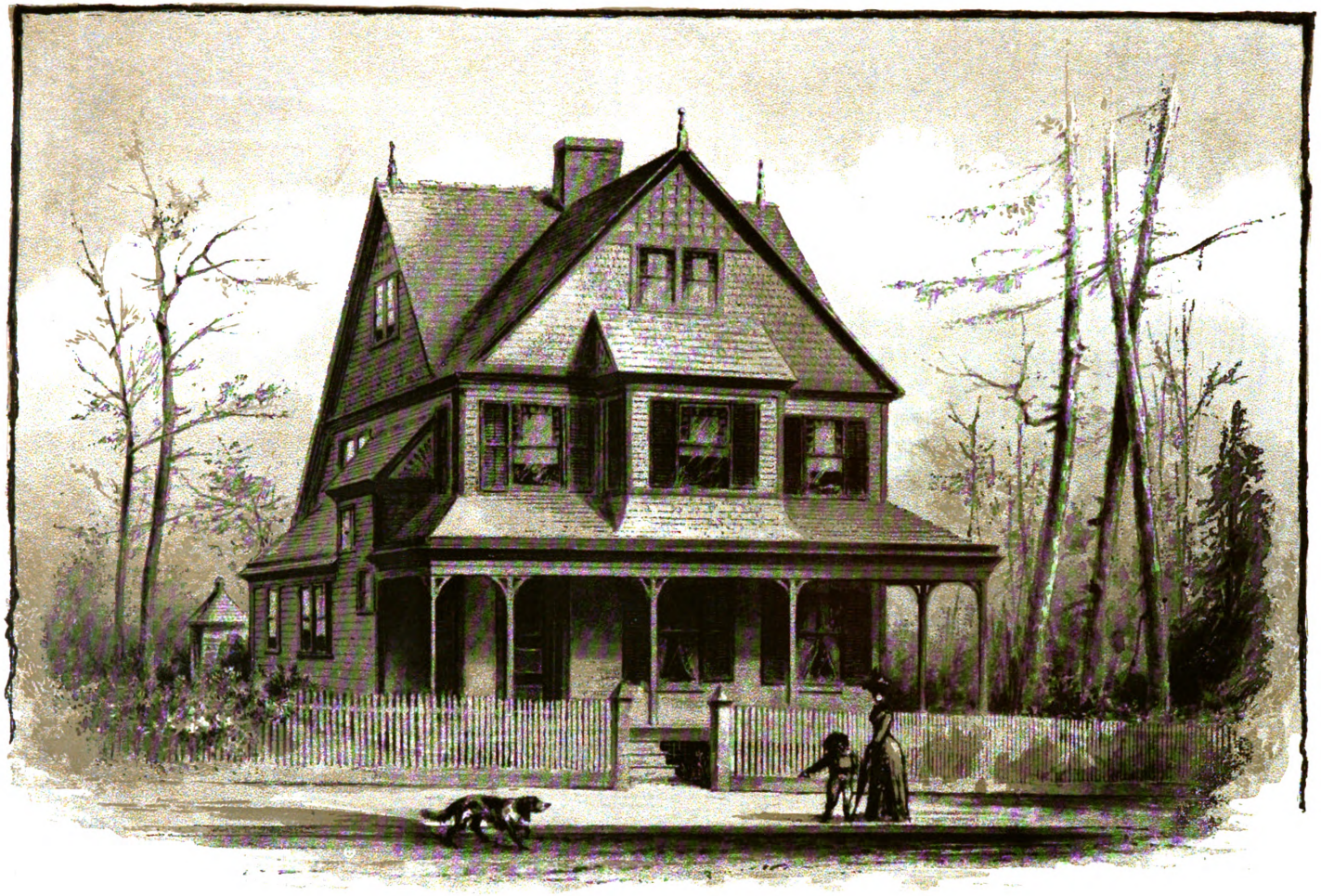
Side (Left) Elevation.—Scale, ⅛ Inch to the Foot.

Convenient Cottage of Moderate Cost. Earl Lee, Corona, L. I., Architect.

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COTTAGE AT CORONA, NEW YORK.

EARL LEE, ARCHITECT.

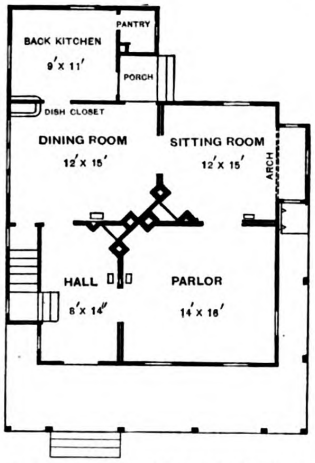
FOR ELEVATIONS AND PLANS SEE PAGES 94 AND 95

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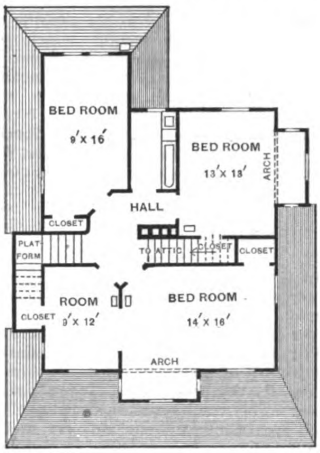
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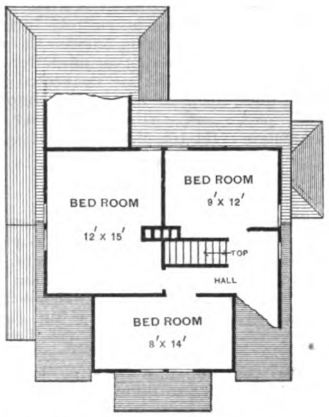
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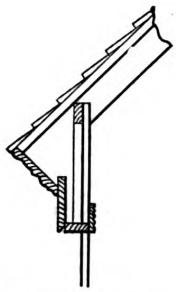
First Floor.—Scale, 1-16 Inch to the Foot.



Second Floor.—Scale, 1-16 Inch to the Foot.



Attic Plan.—Scale, 1-16 Inch to the Foot.



Section at Eaves.—Scale, ½ Inch to the Foot.

Detail of Trim.—Scale, 1 Inch to the Foot.

Section through Trim.—Scale, 3 Inches to the Foot.

Section through Side.—Scale, ½ Inch to the Foot.

Section through Front.—Scale, ½ Inch to the Foot.

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

Cottage of Moderate Cost.—Floor Plans and Details.

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feet above the first floor, assumes a square shape and contains four flues. The space behind the fireplace is entirely inclosed with brickwork, making flues for the passage of hot air. The hot-air pipes from the furnace in the cellar are connected with these flues, the heat being taken into the hall, parlor and sitting-room over the mantels near the top of the apartments.

Wooden Columns.

The advantage of wooden columns in buildings in which fires occur is pretty generally recognized by architects and builders at the present time, and more particularly by the insurance companies. Speaking upon this subject Mr. E. M. Shaw says in an issue of the London *Architect:*

The contents of a building have undoubtedly much to do with its safety or danger, but, in estimating the whole risk, the materials of which the building is constructed, must never be put out of consideration. Every building cannot be erected with brick columns and groined arches, but there is a vast range between these and the miserable cast-iron posts too commonly to be seen, many of which have been put in without having been tested for strength even at the ordinary temperature of the atmosphere, much less at that of fire. The following illustration may be given of a fact well known to all firemen of experience, but seldom proved to demonstration for those not specially interested:

A fire occurred in a warehouse of enormous proportions and raged with great fury for five hours, at the end of which time it was extinguished, and a very large portion of the building and its contents saved. The warehouse was constructed of brick walls; it had wooden floors supported on wooden beams, which in their turn were carried on wooden story posts about 12 inches thick, and although serious damage was done not one portion of the heavy woodwork was destroyed. After the fire the proprietors allowed the chief of the fire brigade to remove one of the story posts, with a section of the beams and other parts surrounding it above and below. This post had been subjected to the full action of the fire during the whole of its duration, as already mentioned, or, making full allowance for everything, including the delay of the fire attacking the particular spot on which it stood, and the time at which the cooling process commenced, certainly not less than four and a half hours. As large quantities of water had been used, and it was probable that everything had been saturated, the wood was carefully dried before a strong fire until not a trace of moisture remained in it. It was then set on end in an open yard, exactly as it had stood in the warehouse, with the pedestal underneath, the cap above, and the beam across the cap, more than a ton of shavings, light wood and heavy wood were placed around it, and after the whole heap was saturated with petroleum a light was applied to it, and, after this, large quantities of petroleum and turpentine were pumped on it. At the end of two and one-half hours the post, beam and other parts were withdrawn from the fire, and within a few minutes from the time they were withdrawn they ceased to burn. A few feet were then sawn off horizontally, at that part which had suffered most from the flames, and afterward the same place was split longitudinally with steel wedges in order to examine its condition. The post was of pich pine, about the most inflammable wood known, and yet after exposure for seven hours to fires, the fury of which could not be exceeded except in blast furnaces, it contained within it a quantity of perfectly uninjured and apparently fresh wood, probably capable of supporting the whole weight which the original post was designed to carry. Immediately after the saw cut, and again, after the cleaving with steel wedges, the center was carefully examined and found to be just preceptibly warm to the touch, but nothing more, thus proving that the fiber, in which the strenght lay, was quite uninjured.

Strength of Stonework.

In a paper prepared by Prof. I. O. Baker, of Illinois, published in our contemporary *Stone*, we find the following remarks on the strength of stone masonry:

The universal custom in determining the ability of stone to resist pressure is to test the compressive resistance of small cubes. The results obtained by testing small specimens of stone are very useful in determining the relative strength of different kinds of stone, but such results are of no value in determining the ultimate strength of the same stone when built into a masonry structure. The strength of a mass of masonry depends on the strength of the stone, on the size of the blocks, on the accuracy of the dressing, on the proportion of headers to stretchers, and on the strength of the mortar. A variation in any one of these items may greatly change the strength of the masonry. The importance of the mortar as affecting the strength of masonry to resist direct compression is generally overlooked. The mortar acts as a cushion between the blocks of stone, and if it has insufficient strength it will squeeze out laterally and cause a tensile strain; therefore, weak mortar causes the stone to fail by tension instead of by compression. Stone is several times stronger to resist compression than tension, and hence, where great strength is required, it is necessary that the mortar should be of the best.

No experiments have ever been made, for obvious reasons, upon the strength of stone masonry under the conditions actually occurring in masonry structures; but experiments made upon brick piers 12 inches square and from 2 to 10 feet high, laid in mortar composed of one volume Portland cement and two sand, show that the strength per square inch of the masonry is only about one-sixth of the strength of the brick. An increase of 50 per cent. in the strength of the brick produced no appreciable effect on the strength of the masonry; but the substitution of cement mortar (1 part Portland cement and 2 parts sand) for lime mortar (1 part lime and 3 parts sand), increased the strength of the masonry 70 per cent. The method of failure of these piers indicates that the mortar squeezed out of the joints and caused the brick to fail by tension. Since the mortar is the weakest element, the less mortar used the stronger the wall; therefore, the thinner the joints and the larger the blocks, the stronger the masonry, provided the surfaces of the stone do not come in contact.

It is generally stated that the working strain on stone masonry should not exceed one-twentieth to one-tenth of the strength of the stone; but it is clear, from the experiments on brick piers referred to above, that the strength of the mosonry depends on the strength of the stone only in a remote degree. In a general way, it may be said that the results obtained by testing small cubes may vary 50 per cent. from each other, or say 25 per cent. from the mean, owing to undetected differences in the material, cutting, and manner of applying the pressure; and also that stones crack at half of their ultimate crushing strength. Hence, when the greatest care possible is exercised in selecting and bedding the stone, the safe working strength of the stone alone should not be regarded as more than one-fourth to three-eighths of the ultimate strength. A further allowance, depending upon the kind of structure, the quality of mortar, the closeness of the joints, &c., should be made to secure safety. Experiments upon comparatively large specimens are but little help in deciding this question; the only way is to determine the load carried by actual structures. The following are the greatest loads carried by stone masonry that were discovered by an extended search through engineering literature.

Early builders used much more massive masonry, proportional to the load to be carried, than is customary at present. Experience and experiments have shown that such great strength is unnecessary. The load on the monolithic piers supporting the large churches in Europe does not exceed 30 tons per square foot (420 pounds per square inch), or about one-thirtieth of the ultimate strength of the stone alone. The stone-arch bridge of 140 feet span at Pont-y-tu-Prydd, over the Toff, in France, erected in 1750, is supposed to have a pressuse of 20.7 tons per square foot (290 pounds per square inch) on hard limestone rubble masonry laid in lime mortar. A former bridge at the same place failed with 64 tons per square foot. Rennie subjected good hard limestone rubble in columns 4 feet square to 22 tons per square foot (300 pounds per square inch). The granite piers of the Saltash bridge (England) sustain a pressure of 9 tons per square foot (125 pounds per square inch).

The maximum pressure on the granite masonry of the Brooklyn Bridge is about 28½ tons per square foot (about 400 pounds per square inch); the maximum pressure on the limestone masonry is about 10 tons per square foot (125 pounds per square inch). The face stones ranged in cubical contents from 1½ to 5 cubic yards; the stones of the granite backing averaged about 1½ cubic yards, and of the limestone about 1¼ cubic yards per pier. The mortar was 1 volume of Rosendale cement and 2 of sand. The stones were rough axed or pointed to ½-inch bed-joints, and ½-inch vertical face-joints. These towers are very fine examples of the mason's art.

The pressure on the limestone piers of the St. Louis Bridge was, before completion, 38 tons (527 pounds); after completion the pressure was 19 tons (273 pounds) on the piers, and 15 tons (198 pounds) on the abutments. The limestone masonry in the towers of the Niagara Suspension Bridge failed under 36 tons per square foot, and were taken down; however, the masonry was not executed.

At the South Street Bridge, Philadelphia, the pressure on the rubble masonry in the pneumatic piles is 15.7 tons per square foot (220 pounds) at the bottom, and 12 tons at the top; this is unusually heavy, but there are no signs of weakness. The maximum pressure on the rubble masonry and cement mortar of some of the large masonry dams is from 11 to 14 tons per square foot. The proposed Quaker Bridge dam, which is to impound water for New York City, and which is the largest in the world, is designed for a maximum pressure of 16¾ tons per square foot on massive rubble masonry in best hydraulic cement mortar.

T. V. POWDERLY believes in radical measures to exclude unworthy emigrants. Slavonians, and not Hungarians, as generally supposed, are driving the better class of men from the mining regions. Many Welshmen have thus been supplanted, quite a number returning to their native land. "We are sending missionaries to Africa," said Mr. Powderly, "and importing heathens by thousands." Stimulated immigration, in his opinion, is almost as bad as assisted. Many emigrants enter the United States via Canada.

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THE NEW "WORLD" BUILDING.

PROBABLY the most notable structure of which the great city of New York, or any other city, can boast is that at present in process of erection at the corner of Park row and Frankfort street, designed to be occupied by the *World* newspaper. Some idea of the bold and striking appearance of this magnificent edifice may be gained from an inspection of the illustration shown upon pages 98 and 99 of this issue, and for which we are indebted to the courtesy of Harper & Bros. The dimensions of the site upon which the building stands are 115 x 136 feet. The plans were prepared by Mr. George B. Post, who was the architect of the new *Times* building, an illustration of which appeared in these columns some time since. The hight of the *World* building, including the domed tower, is 18 stories above the sidewalk. The building proper is 13 stories high, 11 of which will contain 150 large offices. The walls of the building on Park row and Frankfort street are of red Corsehill Scotch sandstone, with buff terra-cotta and polished granite ornamentation. The sandstone rests upon a foundation of rock-faced Quincy granite. The entrance arch is 78 feet high to the key, with a span of 30 feet. The main front rises nearly 200 feet from the curb to the parapet on the 13th story. This floor is to be occupied by the compositors, while the roof will carry the art department of the *World*, including a completely furnished photographic gallery. Here, also, will be a restaurant for the employees of the paper. The tower, which is 50 feet in diameter, will be devoted to the writing force of the paper. There will be six elevators, two running to the 13th story to be used exclusively for the compositors; one for the editorial staff, running to the 18th story; while the other three will be for the occupants of the offices. A driveway from Frankfort street is to admit wagons for the reception of papers, which will come from the press rooms. The machinery in the sub-basement, where are located the presses, will be driven by a 300-horse-power Corliss engine. The electric plant located under the sidewalk will have a capacity for 3500 incandescent lamps. The boiler room, with 1000 horse-power capacity, is on the side of the building adjoining the Brooklyn bridge, but is outside the walls of the building.

DECOMPOSITION OF STONE.

FROM the report of Dr. G. W. Hawes, United States Government, we take the following paragraphs relating to the decomposition of stone, which, we think, will prove of interest to our readers:

There are many more factors which determine the value of stones for purposes of construction than are often considered in the elementary treatises upon this subject, and the rules laid down are often determined by the local circumstances. A more extensive study of building stones frequently vitiates the rules which apply in limited areas. It is, for example, stated that, in order to determine whether a stone will withstand the action of the weather, one should visit the quarry and observe whether the ledges that have been exposed to the weather are deeply corroded, or whether these old surfaces are still fresh. This is not a fair criterion, because the applicability of such a test is modified by geological phenomena. North of the glacial limit all the products of decomposition have been planed away and deposited as drift formation over the length and breadth of the land. The rocks are therefore in general quite fresh in appearance, and possess but a slight depth of cap or worthless rock. The same classes of rock, however, in the South are covered with the rotten products resulting from long ages of atmospheric action. They may be rotten to great depths, and the removal of the worthless rock is often difficult. This is due to the circumstance that no agencies have here operated to scrape off and remove the loose material from their surfaces in recent geological time.

There are other peculiarities of decomposition regarding which too absolute rules have been laid down. Pyrites is considered to be the enemy of the quarryman and constructor, as it decomposes with ease and stains and discolors the rock. But here, too, there are features which very seriously modify the effect of this decomposing substance. Pyrites, in sharp, well-defined crystals, sometimes decomposes with great difficulty. If a crystal or grain of pyrites is embodied in soft, porous, light-colored sandstones, like those which come from Ohio, its presence will with certainty soon demonstrate itself by the black spot which will form about it in the porous stone, and which will permanently disfigure and mar its beauty. If the same grain of pyrites is situated in a very hard, compact, non absorbant stone, the constituent minerals of which are not rifted or cracked, this grain of pyrites may decompose and the products be washed away, leaving the stone untarnished.

We believe that the microscopic study of these stones is, even in such simple cases as this, necessary for a correct determination as regards the influence of decomposing agents upon the stone.

Again, some of the constituent elements of rocks are so frequently found in a decomposed condition that they are considered to be deleterious, when present in large quantity, on account of their well-known tendency to decompose. For example, olivine indicates a very marked tendency to decompose, as indicated by the vast accumulations of serpentine which are so frequently found to be a result of its decomposition, but the circumstances which in past time have brought about this decomposition may have been very different from those which indicate that it will decompose under the present influences. We wish to bring prominently forward that we consider that a decision as to the probable action of the agents producing decomposition in rocks should be largely dependent upon careful microscopic examination of the structure of the rock. Our experience has demonstrated that a rock of a given character, as regards ultimate composition and mineral constituents, may be easily affected by the weather if its constituent minerals, as indicated by their microscopic structure, are so fractured that they are laid open to atmospheric agencies through rifts, no matter how small, while the same stone, with the same constituents, may be eminently resistible to decomposing agencies if its constituent minerals are sound, whole and impermeable, as indicated by the microscopic structure.

In the old world, where immense cathedrals, planned long ago, have been in the process of construction for hundreds of years, it has not been uncommon to see portions of the building fall into decay before the structure was finished, and the process of restoration often consumes large sums of money while the process of construction is yet going on. It thus very frequently happens that a variety of stones is used in the construction of the same building, because in this process of construction experience is gained indicating inapplicability of the stones used for durable structures. In this case it is experience alone which finally dictates the most suitable material; and even to this day, here in America, there is no other criterion to apply to a building stone save the test of experience, and the result is that buildings can be pointed to which, like those old, immense structures before referred to, are already crumbling while yet in the process of construction. In addition to the consideration of the humidity of the atmosphere, the influence of the purity of the atmosphere is also important in deciding on a building material. For example, in the smoke of Pittsburgh it would make very little difference what the material employed for construction might be, so far as appearances are concerned, since it would soon assume the gray color peculiar to all the buildings of the city, but the capacity of a stone to resist acid vapors would become very important, since the only point necessary to be considered in selecting a stone would be as to whether ornamental structures are defaced and disintegrated by the vapor fumes peculiar to this atmosphere.

NEW PUBLICATIONS.

SEWERAGE AND LAND DRAINAGE. By George E. Waring, Jr. Second edition. Published by D. Van Nostrand Company, 1890.

One of the most sumptuous books in the literature of sanitary engineering is the well-known work by George E. Waring Jr., entitled, "Sewerage and Land Drainage," the second edition of which has been issued by the publishers. The book is too massive to permit of any estimate or criticism in detail. The most that we can do is to indicate its scope and touch very briefly upon the manner of its presentation. To begin with the material of the volume, it is a cloth bound book, some 10 x 13 inches in size, containing over 400 pages. As the author states at the very beginning, while much of the book is devoted to land drainage, including the great works of Holland, by far the larger part is given up to what is more especially known as sanitary engineering. Disposal of waste and water in towns and cities is very thoroughly discussed and much attention is given to the more immediate matter of house drainage. The work is freely interspersed with engravings, and contains a remarkable number of folding plates. Where the subject illustrated, like sewerage plans of towns, is too large to be suitably presented on a single page, resource is had to folding plates. In glancing over the book it will be noticed that reference is not infrequently made to plumbing specialties, and regarding this

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From Harper's Weekly.

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THE NEW "WORLD" BUILDING.

(*See Page* 97.)

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feature the author says: "Patented articles, systems and methods are described without hesitation, on the general principle that if they are useful there is no propriety in waiting until the terms of their protection shall have expired before making them publicly known. Some of these patented inventions are my own, in others I have a pecuniary interest, and in still others I have no interest whatever. All will be treated alike, and precisely as other things not patented are treated." We further learn from Mr. Waring's introduction that his work is founded largely upon his own experience and observation, and while the illustrations are mainly drawn from his own work, he has used diagrams and plans of others wherever essential to clear explanation. Mr. Waring has had an extensive experience in house drainage and sanitary matters, and in his preface a brief review of his professional life is given.

Fire-Proof Whitewash.

A recent issue of one of the English papers contains the following recipe for fireproof whitewash, which may be of interest to those builders in this country who are not already familiar with recipes of a similar nature:

It is found that a most effective composition for fire-proofing exterior surfaces may be formed by slaking a sufficient quantity of freshly-burned quicklime of the best grade, and when the slaking is complete, there is added such an amount of skim-milk, or water, in its absence, as will make a liquid of the consistency of cream. To every 10 gallons of this liquid are added, separately and in powder, stirring constantly, the following ingredients in the order named: Two pounds of alum, 24 ounces subcarbonate of potassium or commercial potash, and 1 pound of common salt. If white paint is desired, no further addition is made to the liquid, though the whiteness is found to be improved by a few ounces of plaster-of-paris. Lampblack has the effect of giving a number of shades, from slate color to black. Whatever tint is used, it is incorporated at this stage, and the whole, after being strained through a sieve, is run through a paint mill. When ready to apply, the paint is heated nearly to the boiling point of water, and is put on in its hot condition. It is found that the addition of a quantity of fine white sand to this composition renders it a valuable covering for roof and crumbling brick walls, which it serves to protect.

A Model House.

In the course of a lecture delivered some days ago, before the ladies of the Physiological Institute, Miss Anna Foster described the manner in which a house should be constructed, having in view due regard for health. She said:

"I am going to construct for you a model house. Perhaps it will not be as pretty nor as showy as you might desire, but your own health and that of your children will amply compensate for any lack of symmetry. This is to be a sanitary house, and, whether large or small, cheap or expensive, will depend on your own pockets and inclinations. A large part of the expense will be incurred in the building of the cellar, the form and placing of the heating apparatus and the ventilation—this last, chief of all. The site of the house should be slightly elevated, and the soil by which it is surrounded should be gravelly. There should be no grove nor clump of trees so close to it as to shut out the sunlight. The ground should be thoroughly drained, and great care taken to have the floor and walls of the cellar rendered impervious to moisture. The several large windows with which the cellar should be supplied, should be kept open at all times excepting in especially inclement weather, for cellars should be bright and light and airy. The walls of the rooms should be real air-chambers. There should be no dark chambers nor rooms—no large closets without ventilation. At the top of the hall there should be a glass skylight to be generally kept open to carry away vitiated air. The heating should be by a system of hot water or steam pipes in the cellar. The hall skylight is the general ventilator, but each room should have its own system of ventilation, and modern ingenuity has thus far failed to devise anything superior for this purpose to the old-fashioned fireplace. Kitchen odors should find immediate vent, and this can be accomplished by the use of a galvanized iron hood over the stove, to which is attached a pipe leading to the chimney. It is well to have the kitchen cut off from the rest of the house as far as possible. If it is necessary to have a window open, place under the lower sash a strip of wood about 6 inches wide and as long as the sash is. This will admit the air between the sashes. The bathroom should be isolated as much as possible. All pipes should be left open—not hidden by woodwork—so that holes and other defects could be discovered at once. Bathrooms should not be carpeted; an oilcloth or hard wood flooring is preferable, and tiling is best of all." At the conclusion of her description of the model sanitary house, Miss Foster said that in seeking a house for the summer, no place at which the water is supplied from a well should be selected and all rooms should be thoroughly aired every morning.

A Palatial Hotel.

The city of Mexico is about to construct a magnificent hotel, which is estimated to cost in the neighborhood of $2,000,000. The plans have been prepared by Architect Isaac Taylor, of St. Louis, and call for a structure to occupy a block 200 x 420 feet, five stories in hight, broken in the center by a massive tower of two additional stories, and a look-out floor 150 feet from the ground. On the flank of the building is to be located a second tower 120 feet high. The hotel will be constructed around an open court 100 x 225 feet in size. The exterior of the building will be constructed of native stone, carried on the backs of burros from the quarries located 70 miles distant. The hotel will have 400 guest rooms, will be absolutely fireproof, and equipped with electric lights, hydraulic elevators and other appliances introduced, it is said, for the first time in Mexico. The principal rooms on both fronts of the building are provided with oriel windows. On the first floor will be the reception parlor, billiard-room and three dining-rooms, with kitchen and service-room approachable from the outside. The main dining-room will be 60 x 200 feet, 40 feet in the clear, and is designed to be the banquet hall of the city. The roof of the hall is of open truss work in carved woods, and on one end will be a gallery for spectators at balls and banquets, and another for the orchestra, which will play at dinner each evening. The walls are wainscoted 10 feet high in Mexican onyx, and the floor will be a mosaic of Mexican marble. The walls are to be further decorated with frescoes in oil and mosaic panels. The subjects illustrated will be taken from Mexican history. The large dining-room will accommodate 1500 at a sitting. The finish of the hotel will be upon a magnificent scale, it being stated that the Turkish bath department will cost $35,000, while the bar-room fixtures and permanent decorations will involve an expense of $60,000. The rotunda, 50 x 100, will be floored in marble and onyx, as well as its walls, while the corridors will be floored with marble and wainscoted, the woodwork being of rosewood, ebony, mahogany and other precious woods. Every room in the hotel will have an outside exposure. It is expected that two years from the time ground is broken will be required to complete the structure.

New Building Material.

A Santa Fé contractor by the name of Monier, while on a recent visit to Paris, is said to have learned the secret of the manufacture of a new and cheap building material, which he is about turning to good account. In Paris he found many large structures built of concrete mixture, of which volcanic sand is the chief ingredient. He spent much time familiarizing himself with the details of the French methods of manufacture, and on returning home he immediately set about experimenting with the volcanic sands which exist in such vast quantities near Santa Fé. As a result he is able to show specimens of his manufacture which seem to bear out every claim for them as a building material. Four ingredients are used in its manufacture.

Volcanic sand, lime and water are the known elements. The secret exists in the fourth ingredient and in the proportion of materials used to produce the required result. The stuff is one-half lighter than stone, is turned out in molds, requires no burning, and, it is said, can be manufactured as cheaply as brick. It is claimed for it that it is more durable than sand, and the action of the weather has no effect on it. In appearance it is a chalky white, mottled like granite. It can also be made into hollow brick and laid soft in the walls between the molds and left to dry like concrete, when it becomes as solid as a stone wall. Mr. Monier has applied for letters patent on his invention, and already has his plans nearly ready and perfected for beginning its manufacture in Santa Fé on a large scale. Since volcanic sand and lime rock abound in parts of the Rocky Mountains, it is thought that the manufacture of this class of material will soon develop into a very profitable industry.

Sub-Contracts.

The following circular was issued, bearing date of Chicago, March 1, 1890. It touches upon a matter of great importance to the building trades, and is in effect a practical application of one side of a discussion started by the National Association of Master Builders: "*Whereas*, The practice of letting contracts to general contractors who afterward peddle the sub-contracts out to the various branches of trade is increasing, and is tending to the serious injury of such sub-contractors, *Therefore*, We, the undersigned, architectural iron workers, *Resolve*, That from and after March 1, 1890, we will decline to estimate on or take contracts for iron work in amounts exceeding $1000, on any building where it is not agreed that we shall be principal contractors for work in our line. Bouton Foundry Company, Holmes, Pyott & Co., Union Foundry Works, Hansell, Elcock & Co., Schillo, Cossman & Co., Clark, Raffen & Co., M. Benner & Co., Dearborn Foundry Company, Vierling, McDowell & Co., F. E. Roberts, South Halsted Street Iron Works, Snead & Co. Iron Works, Haugh, Ketcham & Co., Iron Works, A. Bolter & Son, H. A. Streeter, The Winslow Bros. Company, Braumoeller & Mueller, W. H. Chenoweth Company, Dauchy Iron Works."

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MEASUREMENT OF ROOFS.*

BY TRIANGLE.

IF THE ROOF shown in Fig. 40 was to be covered with slate or shingles the tinner might be chiefly interested in finding the length of the valleys, which are indicated by *b d* and similar lines on plan. By measuring *a c* on the elevation alone we obtain the length of the rafters, while the length of the valleys is a diagonal line. We could not obtain the length of the valleys by measuring the roof plan, as the lines there shown are what might be called flat, or as they would appear when viewed from above. They are the length of the valleys on plan, but not of the valleys themselves. While we cannot obtain the length of the valleys from either the plan or elevation alone, by combining the two facts are furnished us by which a diagram can be constructed from which the length of either the hip or valley can be obtained. The principle used, which can be applied to either hips or valleys, will be found very useful by tinners, slate roofers and others. By taking the length of the valley line, as shown in plan by *b d*, and taking

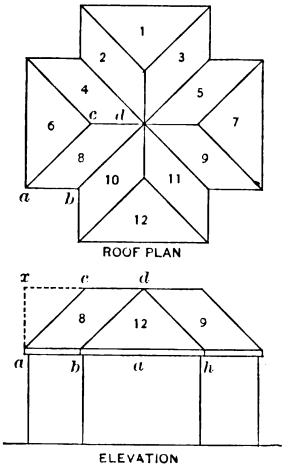


Fig. 40.—Hipped Roof, the Plan of which is Two Equal Parallelograms.

titude." It might be well to mention that the hypothenuse of a right-angled triangle is its longest side, or the side which is opposite to the right angle, and that a square described on it is equal to the sum of the squares described on the two other sides, as shown in Fig. 42.

It may never have occurred to the reader how the above rule could be applied to obtaining the length of valleys or hips or be used in determining roof surfaces. According to it, however, to obtain the length of the hypothenuse of a right-angled triangle the first step would be to obtain the squares of the base and altitude. Now, squaring a number means

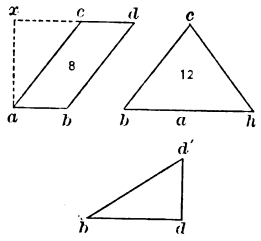


Fig. 41.—Roof Slopes and Triangle for Obtaining Length of Valley.

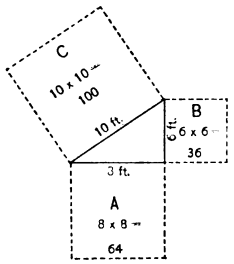


Fig. 42.—Diagram Showing Relation of Hypothenuse and Sides of Right-Angled Triangle.

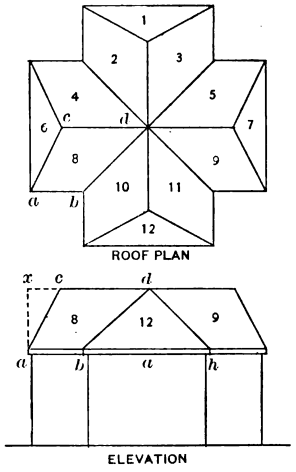


Fig. 43.—Hipped Roof with Unequal Slopes.

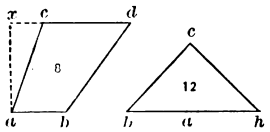


Fig. 44.—Slopes of Roof Shown in Fig. 43.

Measurement of Roofs.

the vertical hight between *a* and *d*, from the eaves to the ridge, as shown in elevation, two dimensions of a right-angled triangle are obtained, as shown by the lower triangle in Fig. 41, the hypothenuse of which, being the line *b d'*, will show the length of the valley. Suppose the length of valley line *b d* in plan to be 8 feet, and the hight of roof from eaves to ridge, *a x* of elevation, to be 6 feet, the length of valley can be obtained as follows: We can draw a line 8 feet long, and from one end of this line, and at right angles to it, draw another line 6 feet in length, and then connect the terminal points of the two lines; this last line drawn will be the length of valley. The length of hip *a c* in plan would be obtained in a similar manner. Draw a line the length indicated by *a c* on plan, and at right angles to it at one end draw a line 6 feet long and by connecting the two points the length of hip would be obtained. In some school arithmetics is a rule with reference to right-angled triangles which reads something like this: "The length of the hypothenuse of a right-angled triangle is equal to the square root of the sum of the squares of the base and the altitude." It might be well to mention that the hypothenuse of a right-angled triangle is its longest side, or the side which is opposite to the right angle, and that a square described on it is equal to the sum of the squares described on the two other sides, as shown in Fig. 42.

It may never have occurred to the reader how the above rule could be applied to obtaining the length of valleys or hips or be used in determining roof surfaces. According to it, however, to obtain the length of the hypothenuse of a right-angled triangle the first step would be to obtain the squares of the base and altitude. Now, squaring a number means multiplying it by itself; and taking the dimensions above given as an example, we will first obtain the square of the base by multiplying it by itself, which gives us $8 \times 8 = 64$. The square of the altitude is $6 \times 6 = 36$, and the sum of the two is 100. We have thus complied with one of the requirements of the rule, as we have obtained the sum of the squares of the base and altitude. The next step is to obtain the square root of 100, and as the square root of a number is a number which multiplied by itself once will produce that number, we can tell by inspection that the desired number is 10, as $10 \times 10 = 100$. An inspection of Fig. 42 will show the principles upon which the above rule is founded, and that the squares A and B being equal to the squares of the base and altitude their sum is equal to the square C, which is constructed on the hypothenuse of the triangle. This interesting proposition is said to have been discovered by Pythagoras, who was so overjoyed at his good fortune that he sacrificed a hecatomb to the Muses. A study of the diagram shown in Fig. 42 will show that it is very easy to find the length of one side of a right-angled triangle when we know the length of the hypothenuse and one of the sides. To do this we square the hypothenuse and the known side and take the difference; the square root of the difference will be the length of the other side. Take the dimensions given as an example, let it be required to determine the altitude of the triangle shown in Fig. 42. The square of the hypothenuse is 100 and of the base 64; their difference is $100-64=36$, and the square root of 36 is 6, so the altitude of the triangle is 6 feet. From the above it will be seen that knowing the length of the hip or valley as shown on plan, and the hight from the eaves to the ridge as shown in the elevation, the length of the desired member can be determined by calculation or by constructing a figure and measuring it.

In practical work we would not be likely to encounter numbers that would be as easy to figure as those used in the illustration, as fractions are apt to come in, making the calculations complicated. To construct full-sized figures showing the different parts of a roof, or drawing the two sides of a triangle, one arm of which is 8 feet and the other 6 feet, and then measuring from point to point for the purpose of determining the length of the third side of the triangle, is something that under ordinary circumstances is not easy to perform. The most convenient way to do is to either use the scales shown in the second chapter of this article or, what is fully as good, a common pocket-rule, and draw the figure to some scale. Taking the example above given the figure could be drawn to a scale of 1 inch = 1 foot. We would then draw a line 8 inches long, and at right angles to the end draw another line 6 inches long, and by connecting the points the third side of the triangle would be found to be 10 inches, or, according to the scale used, 10 feet. In estimating hips, valleys and many roof

*Continued from page 86, April, 1890.

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surfaces it will be found expedient to construct such diagrams as may be required, using any convenient scale for the purpose and making the calculations in the manner last described.

The laying out of diagrams representing the various roof surfaces should be interesting to the tinner, even though he may not have to do with roofs or their coverings, as the diagrams representing the shapes can be considered as their patterns. As an example, we will take the roof shown in Fig. 40. The end portions of the roof shown in plan by 1 6 7 and 12 are triangles. In figuring these shapes the width of the base of the triangle can be taken from the plan by measuring along the line of the eaves or from the elevation by measuring along the eaves, as *b h*. The hight of the triangle can be taken from the length of rafter *a c* in elevation, as shown by 12 in Fig. 41. which gives the shape or pattern for one of the ends. The inner portions of the roof, as 2 3 4, &c., in plan and 8 and 9 in elevation, are rhomboids. In figuring these shapes the width can be taken either from the plan, measuring along the line of the eaves, as shown by *a b*, or from the elevation, measuring along the eaves, as at *a b*. Supposing that a diagram is to be constructed giving the shape of the rhomboid shown in elevation and plan by 8. We would first draw the line *a b* in Fig. 41, in length equal to *a b* in plan or elevation, and at right angles to *a b* at *a* draw *a x*, equal to the length of rafter *a c* in elevation, and from *x* draw *x d* parallel to *a b*, in length equal to *x d* of elevation. Then by marking *x c* equal to *x c* of elevation and drawing the lines *a c* and *b d* we have a figure that can be considered as the pattern or shape of *a c d b* in plan or elevation. In the figure just drawn (8, Fig. 41) *a c* is the length of hip and *b d* the length of valley, and as the hip and valley lines in plan and elevation are parallel, as are the ridges and eaves in plan, *a c* and *d b* in 8 and *b c* and *h c* in 12 are the same length.

Another way of figuring the rhomboids shown by 8 and 9 on plan would be by taking the width either from the elevation, measuring along the eaves, or upon the plan, measuring along the line of the eaves or along the ridge. The length of these shapes would be measured on the elevation by laying the rule along the line of the rafter or profile of the roof. In pursuing this method we would have to regard the single elevation presented first as a side elevation and then as an end elevation; in other words, since the four faces are equal, regard it as two separate elevations. Thus, supposing we desired to calculate the surface shown by 8, we would measure the width either by ridge or eaves in the plan or by the corresponding dimensions in the elevation. Then for the length of hips we would measure along the gable, the line of which is shown between 12 and 8 in the elevation. Using the elevation as first referred to, it would stand for the face of the building shown by the way the cut is placed. Using it as last referred to, it would stand as though it represented the face of the building at the side of the position first named. It will be seen that all of the necessary measurements for the calculation of the roof surface in Fig. 40 can be obtained from the elevation, but the plan is necessary to show the length at eaves or ridge of 2 3 and 10 11 on plan. If an experienced mechanic were to figure such a building, and only a single elevation were presented to him, with the statement that the four fronts were alike, it is probable that one of the first things he would do would be to prepare a roof-plan. While this plan might be only a rough sketch, it would serve to show the shape of the roof as viewed from above. This sketch might not be correct in all particulars to begin with, as the first impressions might not be the right ones, and some time and study would probably be required to produce a sketch that would correspond with the elevations.

If the reader is not accustomed to estimating from plans and elevations he should not be discouraged if some study is required in order to understand them. When an architect commences on a set of "plans," as the drawings are often called, it is probable his first step is to draw a plan showing the size of the building. The different floor-plans would probably receive more or less study, as would the various elevations. Now, it is hardly to be expected that a mechanic can understand at a glance what may have required hours or days of study on the part of the architect to accomplish. Another point worthy of consideration is that the architect commencing at the beginning works out each problem step by step, and when it comes to the roof if it is shaped as are many of the complicated ones, considerable study may be required in order to draw the various shapes so the desired results may be obtained.

That it is easy to make mistakes or receive wrong impressions from plans and elevations can be inferred by comparing Figs. 40 and 43, which at first sight might appear to be duplicates, especially to one not accustomed to the study of drawings. A comparison of the two will, however, show that they differ materially from each other. In this example, as in the preceding, all of the dimensions necessary for calculating the roof surface can be obtained from the elevation, the plan being used as a tally-sheet to show what is necessary to be done to complete the calculation. The roof shown in Fig. 43 is calculated in a similar manner to Fig. 40, save that the inside portions of the roof, 2 3 10 and 11, are trapezoids in form instead of rhomboids. In Fig. 34 is shown the roof shapes as derived from Fig. 43. The hight of triangle 12, *a c*, is obtained from *a c* of elevation, the other dimensions being obtained in a similar manner to those of the triangle in Fig. 41. The hight *a x* of 8 in Fig. 44, is the same as *b d* of elevation, *x c d* and *a b* being obtained as previously explained; *a c* of 8 and *b c* or *h c* of 12 are the hip lines and must be the same in length; *b d* in 8 is the valley-line. An inspection of the plan will show how the various parts join each other, as 10 and 11 join 12 at the hip and 10 and 11 join 8 and 9 at the valleys. A comparison of Figs. 41 and 44 will show that the valley-lines *b d* in each are the same in length, but as the line of rafter *a c* in Fig. 43 is thrown forward, it must reduce the hight of 12 and similar parts.

(To be continued.)

Resonance of Buildings.

In a recent issue of the *Contemporary Review* was an article by Sir Morell Mackenzie upon the above subject, from which we make the following interesting extracts:

There are some buildings which are so utterly bad from the acoustic point of view that even experienced speakers are little better off than novices. The House of Lords has, or used to have, an unenviable reputation in this respect. A story is told of the late Lord Lyttelton that, after exhausting his voice in vain efforts to make his brother peers hear a motion which he wished to propose, he in despair wrote it down and asked the clerk at the table to read it out. That functionary, however, was quite unable to decipher the writing, and Lord Lyttelton complained that he was cut off from communication with his fellows. Science has not always been successful in coping with the acoustic difficulty. In 1848 it was so difficult for speakers to make themselves heard in the French Chamber that a committee, consisting of the leading scientific luminaries of the day, such as Arago, Babinet, Dumas (the chemist), and the author of "The Three Musketeers;" Macquerel, Chevreul (the centenarian who died the other day), Poillet, Regnault and Duhamel, was appointed to study the case and suggest a remedy. After numerous experiments they hit on a contrivance, designed on the most scientific principles, which was to make the orator's voice ring like a clarion to the farthest benches. The last state of the speaker, however, was worse than the first; he felt as if his voice was stifled under a huge night cap, and the highly scientific sound reflector had to be discarded as a failure. Indeed, modern public buildings are so often defective in this respect that I am not surprised to find M. Ch. Garnier, who designed the Grand Opera in Paris, exclaiming dolefully: "The science of theatrical acoustics is still in its infancy, and the result in any given case is uncertain." So impressed is he with the shortcomings of modern architecture as regards the conveyance of sound that he frankly confesses that in the construction of the opera house he "had no guide, adopted no principle, based his design on theory;" he simply left the acoustic properties of the building to chance. The result has not been altogether satisfactory, though it has been no worse than in many other buildings, where the architect did his best to make the acoustic conditions perfect. One of the most remarkable buildings, from the acoustic point of view, that I have ever seen is the beehive-shaped temple in Salt Lake City. It holds from 12,000 to 14,000 people, and one can literally hear a pin fall! When I was in the temple with some other travelers in 1882, the functionary corresponding to the verger of ordinary churches stood at the furthest end and dropped a pin into his hat. The sound of its fall was most distinctly audible to all present. The scratching of the pin against the side of the hat was also plainly heard across the whole breadth of the building. The temple was designed by Brigham Young, who professed to have been directly inspired by the Almighty in the matter, as he knew nothing of acoustics. The resonance of the building is so loud that branches of trees have to be suspended from the ceiling in several places in order to diminish it. It is likely enough that Brigham Young's inspiration had a not very recondite and purely terrestrial source, for his beehive is only a slight modification of the whispering gallery in St. Paul's. The bad acoustic properties of buildings may be remedied by what doctors call palliative treatment. Charles Dickens's experience as a public reader made him a man of ready resource in meeting such difficulties. On one occasion when he was going to lecture at Leeds Mr. Edmund Yates, who had spoken in the same hall the evening before, sent him word that the acoustic conditions of the place were very bad. Dickens at once telegraphed instructions that curtains should be hung round the walls at the back of the gallery. By this means he was able to make himself more easily heard.

A Gigantic Sheet-Metal Statue.

W. H. Mullins, successor to the firm of Bakewell & Mullins, Salem, Ohio, has lately completed a sheet-metal statue of very large dimensions, representing the German hero Arminius, or Hermann, who drove back and slaughtered the Roman legions under Varus. The finished statue which is over 35 feet high, measuring from the foot to the point of the sword, is to be erected at New Ulm, Minn., and will stand on a pedestal of elaborate architecture and appropriate hight. The figure is made of sheet copper ranging from 24 ounces to 4

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pounds. The seams are all countersunk and riveted, and the statue itself is supported on a strong framework of iron. The artistic features of the work are clearly presented in the accompanying engraving, and by means of the figure of a man at the side its large proportions will be readily comprehended. The manufacturer informs us that he believes he is safe in saying that the statue of Hermann is the finest piece of work of the kind ever attempted on this side of the Atlantic. The colossal figure of Liberty in New York Harbor, which also is of sheet copper, as our readers know, was executed in France, and so of course would not come in competition with the one we illustrate. The modeling of the figure here shown was done by Alfonz Pelzel, and the magnitude of the work will be realized when it is stated that about 20 tons of clay was used in the model, and that the roof of the building in which the modeling was done had to be taken off and an annex added to make room for the construction of the figure.



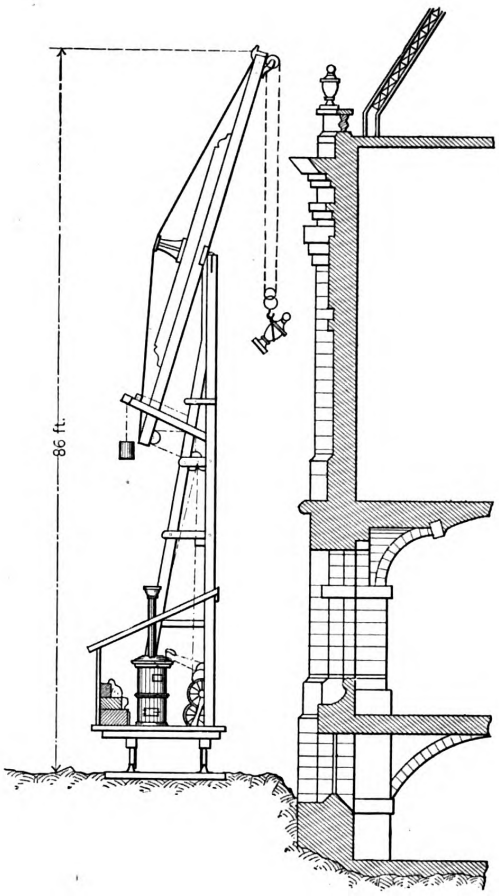
A Gigantic Sheet-Metal Statue.

Steam Cranes as a Substitute for Scaffolding.

In commenting on an article relating to scaffolding, and the economy of steam cranes as a substitute therefor, Mr. Arthur J. Vye Parminter, in a late issue of the *Building News*, says:

It is certainly an interesting question as to whether the employment of steam cranes, and so dispensing with heavy scaffolding, is economical or not. Having been for the past few years connected with various buildings in Paris and the north of France, I have had the opportunity of observing the various systems employed in this country. Of course, in brick buildings and others of minor importance, ordinary scaffolding is used, with the usual hoisting gear. But in large constructions steam cranes are fast coming into use, to the exclusion of all exterior scaffolding. The "Palais des Beaux Arts," of Lille, on which I am now occupied, a building which will cost nearly 4,000,000 francs (architect, Monsieur Ferdinand Delmas), was built from foundations to cornice by means of steam cranes, no exterior scaffolding whatever being used. The crane, on the balance system, gave every satisfaction; blocks of stone weighing nearly eight tons were easily hoisted and then carefully lowered to their places in the walls. Rails laid at a certain distance from the walls around the whole building allowed for the sideward movement of the machine, the rate of speed attainable being from 30 to 40 feet per minute; 2500 cubic feet have been posed in one day's work with this crane. Counting all this, there is no doubt that the crane, as regards economy and speed, supersedes scaffolding, especially in the case where the stone is dressed and carved before building. In the case of the Palais, as the stone used was soft, the blocks were only rough-cut before posing; a light scaffolding being raised for the work going on at present of molding and carving the exterior.

But with all the advantages, as regards speed and economy, the crane has many drawbacks. The necessity of careful supervision during the bedding of the blocks is absolute, as once the stone is posed it is next to impossible to get at the lower joint for examination. Again, if the building is at all large, several cranes have to be employed; for, as the sideward motion of the machine is comparatively slow, portions of the walls are liable to be built considerably above the rest, thus throwing undue and unequal strain on the foundations. But still, with careful management and strict supervision, there is no reason why the steam crane should not be employed on large buildings to the saving of time and expense. I inclose a sketch of the "grue roulante" as at work.

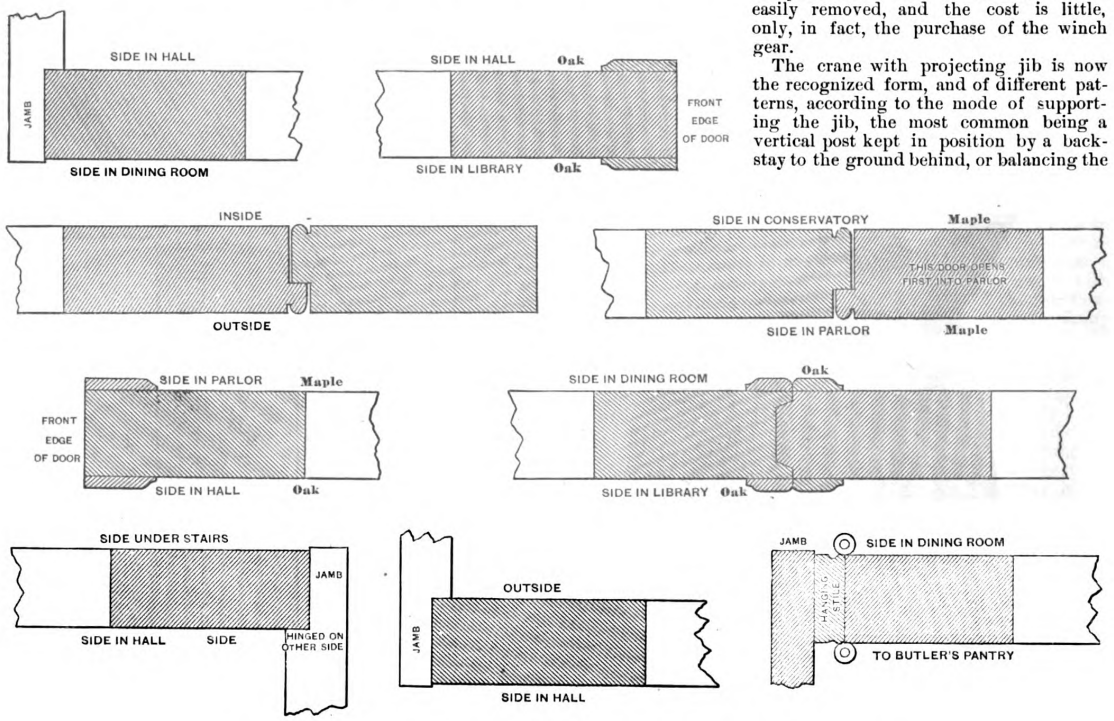


Steam Cranes as a Substitute for Scaffolding.

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HARDWARE DRAWINGS.

WITH the artistic excellence of modern hardware and the vast ranges of styles from which selection is to be made in the fitting up of a first-class residence there is great room for the display of taste, either upon the part of the architect or upon the part of the house owner. In many instances it is the pleasure of the house owner, or of some member of his family or friend, to assist in the selection of the hardware, especially in the matter of door trimmings. Very often contracts are made by which the owner reserves to himself the right of selection, the builder simply putting in place that which the owner supplies. Almost every manufacturer of artistic door hardware at the present time provides special facilities for the display of his goods in order to enable architects with their clients, or the householder alone, to make judicious selection for the trimmings to be used in certain places. With this habit established in the community and with the fashion of the householder indicating his taste and preferences, it is incumbent upon the architect to provide such drawings as give the hardware manufacturer a clear conception of just where the required pieces go, and how they are to be employed. This gives rise to a special requirement in the preparation of details. How this has been worked out by at least one architect is clearly shown by the engravings upon this page, which have been prepared from drawings made by S. C. Merry, for a residence to be erected for Mr. B. Head, at Islip, Long Island. The selection of hardware was made from the well-known stock of the Yale & Towne Mfg. Company, and it is to the New York office of this concern that we are indebted for the originals from which these engravings were made and for the particulars upon which this article is based. The sections represent portions o the different doors in the house in question, for which special hardware was to be selected. They answer such questions as, how the doors swing; what their different faces are, so far as the kind of wood is concerned; whether they are sliding doors or doors of the usual variety; how they are rabbetted, &c. The drawings speak for themselves, and our readers will be interested in looking them over and seeing how carefully they comply with the well-known requirements in such cases.



Hardware Drawings.—Sections of Doors for which Special Hardware is Required.

Scaffolding.

In a recent issue of *The Building News*, London, we find the following interesting remarks on the subject of scaffolding:

Considerable improvements have been made in the construction of temporary erections for buildings. The old fir poles, which at one time did service in the erection of ordinary buildings, and which at certain stages were strengthened by ledgers, which in their turn carried the putlogs for the planks, are largely superseded by more modern expedients, notably the upright framework of timbers and gantries, with sheer cranes for lifting. These structures of squared timbers occupy little room, and can be placed within the outer boundaries of the building site, thereby saving outside scaffolding, the occupation of space on the pavement or above the heads of pedestrians and the risks of accidents by *débris* or materials falling from the platforms. The timbers used in their construction are generally balks, and their design for important buildings necessitates some skill and arrangement. The American builders have become expert scaffold constructors, and the tall tenement houses and monster hotels have called into requisition the use of gigantic structures which our forefathers would have wondered at. Not only in the temporary framework of timbers, but in the lifting appliances, have there been advances made. The simple derrick, the most primitive hoisting apparatus, which consists of a strong mast or balk of timber kept in position by guy ropes, and having a crab or winch operating on a set of sheave-blocks at the top, was probably the kind of apparatus used in the erection of our great cathedral churches. The substitution of two poles for one, tied together at the top, and slightly inclined and acting as a kind of jib with a guy rope or pole behind, was an improvement, and, in fact, constitutes the principle of the sheers. The lateral stability of the two legs, and the readiness with which such an appliance can be fitted up, has made it of value to the builder who does not wish the more complete form of a crane. It can be easily removed, and the cost is little, only, in fact, the purchase of the winch gear.

The crane with projecting jib is now the recognized form, and of different patterns, according to the mode of supporting the jib, the most common being a vertical post kept in position by a backstay to the ground behind, or balancing the jib and its load by a weight behind the post, forming a kind of counterpoise or platform. In large works the jib is supported by stays of timber, those being anchored to the base of crane, which is extended on the ground. On plan, the two backstays form a square angle, thus allowing the jib and its load to be swung round three-quarters of a circle. The backstays are made to support the upper pivot of the vertical post which revolves with the jib. The steam winch and boiler are often placed on the base as a counterpoise. The lifting power is increased by drawing in the jib by the back chain which holds it to the vertical post, and the inclination of the jib by being raised or lowered increases or otherwise the power in proportion to the radius of the jib. On elevated staging the advantage of thus being able to draw in the load to any required distance is material; the crane commands a wide area or sweep. We believe cranes of this kind are fitted

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up from £30 to £40 for a ton with a radius of 25 feet, and at a proportionate price for greater weights.

There is one great advantage in a scaffolding having the platforms and lifting gear independent of the structure, and placed within the walls of the building. The appearance of the work as it proceeds or rises in elevation can be seen. The old-fashioned scaffold has some advantages, but it obscures the work from below. In the erection of buildings in the North of England and in France this independent method of scaffolding is used, the work is done from the inside, and the materials are raised by cranes. The French "Jenny" is a scaffold on the principle we have described. For expeditious building the independent stage or tripod with crane is indispensable, though there are builders who still claim for the old-fashioned English outside scaffold merits, particularly for buildings of ordinary character. The tripod scaffold is usefully employed where a central court or area allows of its erection within the buildings, or for stone and iron structures when heavy masses of materials have to be raised and swung into position. All danger of overloaded scaffolds is prevented.

Standard Fire Doors.

The Underwriters' Association, of New York State, has adopted the following standard for fire doors:

The doors must be made of two thicknesses of tongued and grooved inch-boards, laid diagonally across each other, and nailed with wrought-iron nails, driven flush and clinched on the other side. This door must then be covered on both sides and edges with sheets of tin locked together like a tin roof. These sheets must be secured in place by narrow cleats of zinc, the same as in roofing buildings; nails driven through the sheets will not be allowed.

When the doors are made in two parts, the edges of the doors where they come together should be rabbeted, the single boarding of one door extending over that of the other about 1 inch, so as to make a close joint. These doors must then be hung on iron hooks set in the brickwork (similar to those used for outside window shutters), and the heavy strap hinges bolted firmly to the doors. The doorway must have an iron sill resting on the solid brickwork; and a brick rabbet at the top and sides (or a light framework of iron or wood covered with tin, made and secured to the brickwork), for the doors to shut against as a stop or jamb.

The latch must be of wrought iron, and the catch (an iron brick cast with a projecting catch) securely fastened in the brickwork. If the doors are in two parts, other satisfactory arrangements, that will secure a strong fastening and close joints, will be allowed. Doors of this description must be placed on each side of the brick wall (shutting into the opening and being flush with the wall) so as to leave a dead air space between them.

When, for any reason, swinging doors cannot be used, sliding doors made in accordance with the following instructions will be accepted instead, viz.: The doors must be made large enough to project 3 inches beyond the opening on each side, top and bottom, and be composed of two thicknesses of tongued and grooved inch boards, laid diagonally across each other, and nailed with wrought-iron nails, driven flush, and clinched on the other side. The doors must then be covered on both sides and edges with sheets of tin locked together like a tin roof. These sheets must be secured in place by narrow cleats of zinc, the same as in roofing buildings; nails driven through the sheets will not be allowed.

These doors, in all cases, must be suspended from the top by iron frames (bolted firmly to the doors), with iron wheels running on a track made from a bar of iron 2 inches deep and ¼ inch in thickness, the latter to be firmly bolted to the brickwork, at intervals of not more than 2½ feet. This rail must be placed on an incline of ¼ inch to the foot, and at such a hight that, when the door is closed, the door will cover the entire opening by at least 3 inches, as above indicated.

The stop or jamb against which the door shuts must be made of angle-iron, ¼ of an inch in thickness, and be bolted firmly through the brickwork. To this a wrought-iron catch (for the wrought-iron latch to shut into) must be riveted, while at the lower corners, suitable flaring iron dogs should be bolted to the brickwork, to keep the doors from swinging out at the bottom. Doors of this description must be placed on each side of the brick wall, and the doorway have an iron sill resting on the solid brickwork. When it is necessary to have these doors open during the day, they can be held back by a hook or latch, provided with a fusible link, or small cotton cord. But these, as well as all other fire-doors, must invariably be closed at night, and at all other times when the passageway is not in actual use.

The Jerry Builder.

The following verses were recited by Mr. Alexander W. Murray, at the Chicago Masons' and Builders' banquet, held at Kinsley's, on the evening of March 5, of the present year:

Andy Dupe, for himself a home would build;
A lover of pelf and very self-willed;
Of smartish mind he could see, it is true,
The way easy to grind a dollar from you.

To an architect of skill and probity
I did direct as one most worthy
To draw his plans, define them well,
Detect crooked jams, or a bull-head swell.

Advice would ask, but would not heed;
A thankless task it was, indeed,
To warn this knowing man (it would only bewilder)
Against so slick a sham as a Jerry Builder.

The news goes 'round, Dupe is going to build!
It was not long when one of handsome gild,
Of oily tongue, with a colored plan,
Andy's door bell rung and trapped our man.

The contract's let, well bonded, too,
Some wonder yet; can this be true,
A bond so strong so frail can prove
To punish wrong or jail a rogue?

It's no care of his, be they owner or sub.
From both will squeeze a profit, and there's the rub;
He'll take that first, and with the rest
Build on trust a shell, at best.

The cellar to excavate, an alley to fill,
One load at two-rate goes into his till
On proper dimension stone, quarry chips in the wall,
Mud, not mortar, is the style of his gall.

Hog 'em in Lime, and sammon, too;
No need of a line man, that wall is true;
What is the matter? at noon you'll be quick;
Be sparing of mortar, no shoving of brick.

Culls for the joists, two feet apart,
Headers without mortise (Yankee dove-tailing art),
Knots in the flooring, bridging there's none,
And thus keep soaring until the roof's on.

On the roof he is grave, for here it is plain
The hollows will save smaller gutters for rain
I. C. T(h)in without coating, cornice anchors eight feet apart,
Flakes of morter for coping is the way of his art.

Ribon slate on the dome, a half inch lap will do.
'Tis but a crazy man's home, it will last his life through.
Barks, knots and saps, nail close my lather,
The smaller the gaps, a greater saving of plaster.

Put on the putty with a darby thin—
It's a pity there's no darbies on him.
Warped are the frames, no molding on base;
It is one of the games of the curse of his race.

A tile sewer without cement or any glaze at all
Poor traps without a vent, a dummy in the wall.
Light copper in the tubs, no safing on the floor,
Tested by a dummy plug, pipes are tight, to be sure!

The furnace in the cellar, a burner grand for coal;
A coal gas generator, a breeder of a cold;
A single pipe conveyor, no fresh air duct for it,
As a human slayer there's nothing to equal it.

This shell, to embellish, the painter's made to sin;
To cover all that's hellish, the putty is rubbed in;
Sham fresco on the ceiling, a sour-paste on the wall;
The Bum painter is only giving his money's worth, that's all.

The story is old. No "chestnut bell"
His tongue can hold, nor funeral knell
Bury with shame, and to oblivion,
The "jerry" sharper in the art of building.

Many have not learned that an honest reputation
Cannot be earned by "jerry" speculation;
That the cheapest contractor is not the lowest bidder,
Nor can he of honest character underbid a Jerry Builder.

MORAL.

The men to trust to build a home:
Be they wielders of trowel, hammer, brush or soldering iron,
Each his art of skill must ply;
Have a character for truth; timely lead and timely follow,
As the building grows towards the sky.

WE HAVE RECEIVED from Harry Brothers, Dallas, Texas, a circular descriptive of H. W. Harry's metallic shingles, manufactured under patents recently granted. The circular dwells particularly upon the important feature of strength of construction. For the side lock there is a standing groove or double-seamed joint, which the manufacturers say avoids the very common source of trouble in a great many tin shingles—namely, grooves or gutters that are relied upon to carry off the water, but often become filled with accumulated dust and dirt in such a manner as to cause the concealed gutter to overflow into the building. They also direct attention to the cross lock which is employed, and point out that they have the only shingle with a cross lock and lap combined.

A NEW SYNAGOGUE is now in process of erection in Brooklyn, which is expected to be among the finest in the country. It is on the northeast corner of Bedford and Lafayette avenues. The architecture will be a modification of the Byzantine order, with a large central dome of polished copper and lofty minarets. The main facade on Bedford avenue will be 60 feet wide, and on Lafayette avenue the building will extend backward 120 feet, with a wing 20 feet wide. The main consideration in erecting the building is to get a good auditorium. The materials used are pressed brick and brown stone. The title of the synagogue will be the Temple Israel, and it will be the property of the Congregation of Reformed Jews.

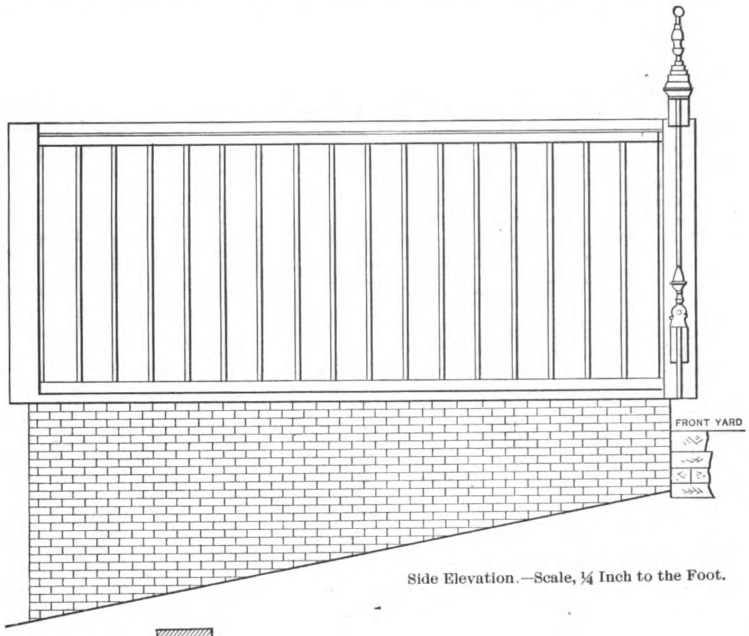
AMONG improvements projected by the iron trade of Chicago are the following: The Gates Iron Works propose to build a machine shop in connection with their foundry on Clinton street; a $50,000 factory is to be erected on the north side of the city for the Chicago Safe and Lock Company; the buildings at Nos. 148 to 154 Wabash avenue, recently leased by the Yale & Towne Mfg. Company and J. L. Colby, are to be improved at a cost of $25,000; negotiations are in progress for the purchase by the Ajax Forge Company of 30 acres of land for a new site for their works near the Galena line of the Northwestern road.

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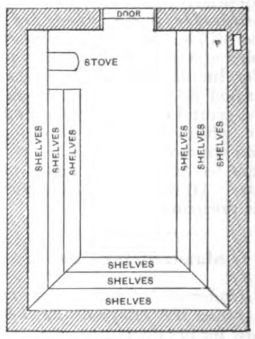
CORRESPONDENCE.

Building a Greenhouse.

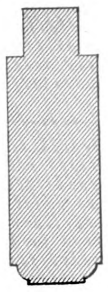
From R. E. F., *Eureka Springs, Ark.*—I notice in the December number of *Carpentry and Building* a correspondent inquires for plans of a greenhouse, and as I have just finished a building of this kind I take pleasure in inclosing drawings. The design is taken partially from suggestions contained in various issues of the paper. The door in the north end of the building folds down, exposing to view from the street the flowers contained within the structure. When folded up, the door protects them from the north wind. The greenhouse is heated by means of a small stove, the pipe running behind shelves, as shown in the plan. The building is glazed with D. S. French glass. The cost of the structure was about $200.



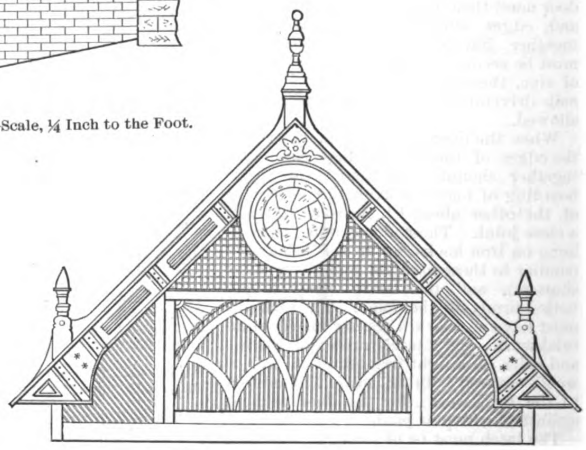
Side Elevation.—Scale, ¼ Inch to the Foot.



Floor Plan.—Scale, ⅛ Inch to the Foot.



Rafter.—One-Half Full Size.



Elevation of North End.—Scale, ¼ Inch to the Foot.

Building a Greenhouse.

Rust on Carpenters' Tools.

From J. C. W., *Pine Hill, Pa.*—Will the editor kindly allow me space to ask some of the readers of *Carpentry and Building* what is best to keep rust from tools? It is impossible to keep tools dry, especially in the spring of the year, when sudden showers are frequent, and when one does not have time to grab all his tools and run, especially when at work framing. Some of the tools will be left out in the rain, and when work is resumed the tools will certainly look in very bad shape. Will not some one give me a recept for preventing tools rusting, as it will benefit not only myself, but probably other readers of the paper?

Hood Intersecting a Conical Roof.

From H. C. B., *Lisbon, N. D.*—I inclose herewith some rough sketches illustrating the problem proposed by "J. S. B.," of Philadelphia. Referring to the sketches, Fig. 1 shows the method of obtaining the lines A A, as requested. First draw the line of porch roof with conical corner, as shown. Directly above it draw an elevation of the ogee hood which is to be placed upon it, as indicated by 2 in Fig. 1. Then divide the elevation by a perpendicular line from B, continuing the same down to E, thus dividing the circular part of the plan in the middle. Divide the ogee line A B into any number of parts, as 1 2 3, &c.; also divide B C into the same number of parts, as 8 7 6, &c. From A and the points 1 2 3 let fall perpendicular lines, intersecting the line of plan D E F in the points *a b c d e f g* and *h*. At H erect H I equal to the rise of the roof. Draw a line from B to I, and with the compasses carry the line around to J. From H draw H K perpendicular to G H. Connect J K, which will give the slant of the roof. From the points 8 7 6, &c., on B C, draw lines parallel to B I to H I, and from these with the compasses around to H J. Continue the same parallel to H K until they intersect the line J K, as at *a a a a*, &c. From *a a a a*, &c., parallel with F K, draw the lines 1 2 3 4, &c., until they strike F G, which is the point where the conical part of the roof begins. Part of the hood will intersect conical part of the roof, and the remainder will intersect the straight part of the roof. What it is desired to do is to establish points through which the curved lines *a a a* desired by "J. S. B." will pass. With the foot of the compasses at G carry the lines 1 2 3 4 and 5 from where they strike F G around, intersecting the perpendiculars let fall from A, 1 2 3 and 4 in the elevation at the points *x x x x x*. Carry the line 6 7 and 8 from G F around to G D, and from these points draw lines parallel to the lines of the porch on that side, getting the lines let fall from 5 6 7 in the elevation, in the points I I I. Having found these points it is an easy matter to draw the lines of intersection *a a*, desired by "J. S. B." At 3 is shown a way to obtain a pattern of one-half of the elevation is divided into, in all equal, to the stretch-out of A B. Erect perpendiculars on these points L M, continuing the same on each side of L M. From 1 1 1 *x x x x x* carry lines across parallel L N, getting the perpendiculars just established above L N, in the points *o o o*, &c. Below L N proceed in the same way, carrying lines across from *a b c d*, &c., getting the perpendiculars in the points *h h h h*, &c. Draw the curve

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through *o o o*, &c., and *h h h*, &c., which will give the required outline. The triangular piece at N (*a n p*), is the covering for the side at A in the elevation. The reason for the various steps taken will, I think, be obvious. Fig. 2 shows how to develop one-half of the front hood, which is circular, and will be understood by a moment's study without, I think, further explanation.

From F. E. G., *Leroy, Minn.*—In the February number of *Carpentry and Building* "J. S. B.," of Philadelphia, asks for a rule to find the lines A A shown in his Fig. 1. I do not know that the following can be called a rule, but perhaps it will explain. Referring to the sketch, B C is half the elevation of the face of the hood. Divide B C into 13 equal parts. D F E is a section through the hood, D F being the ridge of the hood, D E the face and E F the pitch of porch roof. D F must be at the same hight or in line with B. Now draw lines parallel to B D F from points 1 2 3 4, &c., on B C, until they intersect with E F. Then draw lines of intersection parallel to D E until they cut D F, thus establishing the points 1 2 3 4, &c., on D F. Draw B L N square to B D, starting at the point L transfer spaces on D F to L N, making L N equal to D F. Draw N P at an angle of 45°. With N as center and N L as radius, describe the arc L P, which represents half the round corner of porch. The straight line M is the edge of the straight part of the porch. With the same center describe arcs from points 13 12 12 11 10 9, &c., until they cut N P, and from points thus established draw lines parallel to M. Now draw perpendicular lines from 1 on B C until it cuts line from 1 on L M. Draw a perpendicular line from 2 to line 2 and so on up to 13. Through the points of intersection trace the line A A, which will give a half plan of the porch and hood. To obtain the pattern for the cover of hood draw a horizontal line from L. Commencing at O lay off on L R the divided spaces on B C. Drop perpendicular lines O, 1 2 3 4, &c., from L R, and then from where line 1 from B C crosses L P draw a horizontal until it cuts line 1 from L R, where 2 from B C crosses L P draw a horizontal line to line 2 from L R, and so on. Then from where 13 from L N cuts 13 from B C draw a horizontal line to line 13 to L R; where 12 from L N cuts 12 from B C draw a horizontal line to 12 from L R, and so on. Through the points of intersection trace *x* and *x'* and the shape of the covering of the hood will be obtained. It will be noticed that the horizontal line from the intersection of 10 L N and 10 B C runs into the line from the intersection of lines from 13 L N and 13 B C. Hence it is necessary to trace line *x* through the point where line crosses 10 and 13 L R.

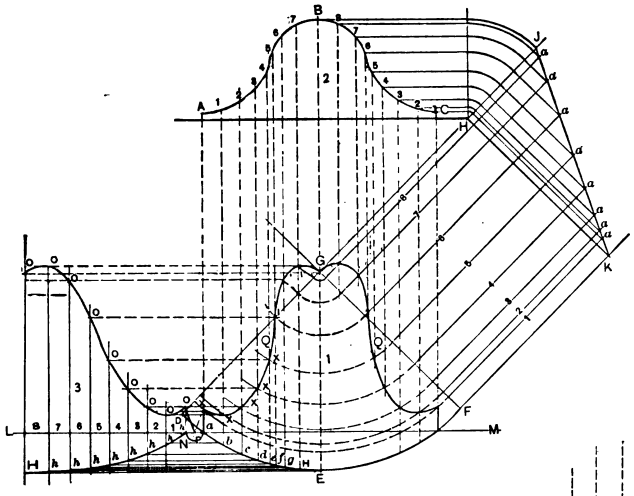


Fig. 1.—Plan and Elevation, Contributed by "H. C. B."

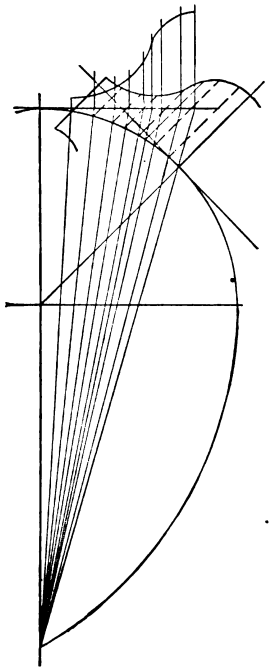


Fig. 2.—Pattern for Developing Half the Front of Hood.

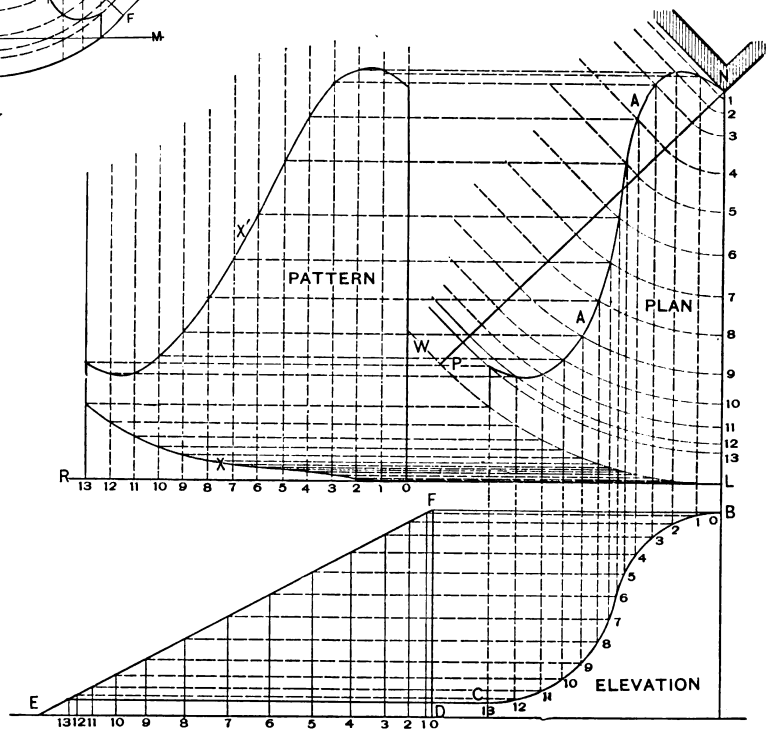


Diagram Submitted by "F. E. G."

Hood Intersecting a Conical Roof.

Drawing Plans of a House.

From H. S. O., *Minneapolis, Minn.*—I am studying architecture at home, but find I am not progressing as rapidly as I could wish. I desire some of the readers of *Carpentry and Building* to show me how the different parts of a house should be drawn; that is, commencing at the foundation and working up to the completion of the building. This would be a great help to me and I am of the opinion that it would be interesting to many of the readers.

Note.—The question raised by our correspondent is one in which the practical readers of the paper cannot fail to be greatly interested. It is a golden opportunity for them to tell some things which are not to be found in books. We would be glad to have letters from them showing the ideas of practical men representing the various parts of building construction upon paper. The columns of *Carpentry and Building* are always open for the discussion of practical topics of this kind, and the subject cannot receive too great

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attention at the hands of those who are in a position to show what our correspondent desires to learn.

Framing a Barn.

From L. C., *Columbiaville, Mich.*—I notice in the October of *Carpentry and Building* an inquiry from "E. W.," of East Portland, Ore., for a plan of a bank barn. I send herewith a sketch showing the manner in which we would build a barn of the description named, in this section of the country. "E. W." asks for a plan of a barn 30 x 60 feet. I have made the drawing 36 x 60, as 30 feet is too narrow for any barn intended for hay or grain. It will be seen by referring to Figs 1 and 2 that the center sill running lengthwise of the barn is not framed into the basement, but is set the thickness of it in the wall. Resting on top of it are the cross sills. The crosses on the foundation plan show the position of all the posts that rest on the foundation. The breast girts shown in Fig. 4 should be left out in the center bent in the lower floors, giving a clear passage from one floor to the other.

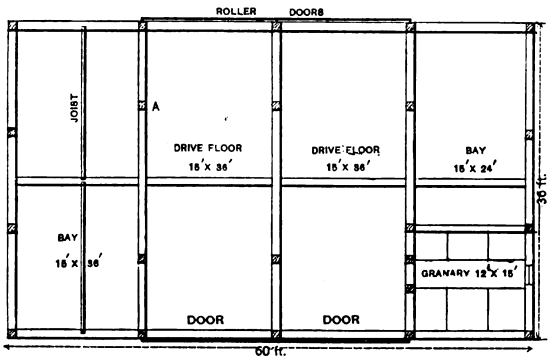


Fig. 1.—Plan of Barn.

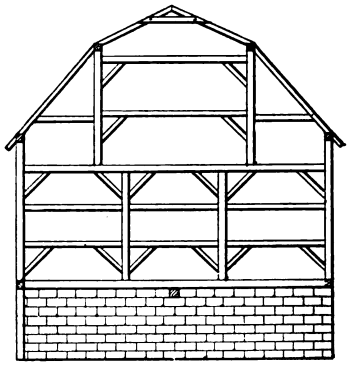


Fig. 2.—End Elevation.

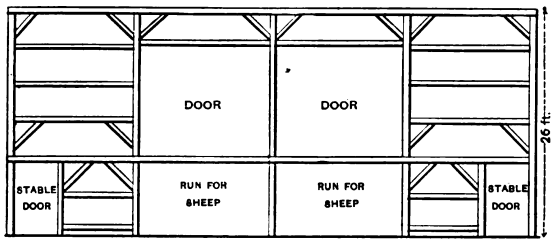


Fig. 3.—Side Elevation.

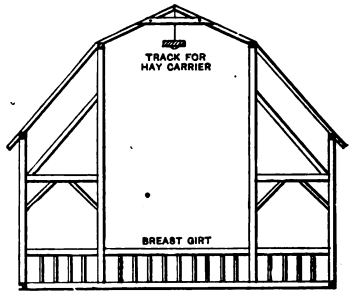


Fig. 4.—Showing Driveway.

Framing a Barn as Suggested by "L. C."

Right and Left Hand Doors.

From W. L. M., *Reading, Mass.*—In answer to "G. F. M.," who inquired in the March number of *Carpentry and Building*, with regard to what constitutes right and left-hand doors, I would say that in jurisprudence there are unwritten laws as well as written laws, the former as well understood and as forcible as the latter. Customs of different localities make a law as binding as the written law, and the ruling of judges in the past from precedents which go far to determine what the rulings will be in similar cases ever after. It seems to me that when custom has so far established what constitutes a right and what a left hand butt, that all manufacturers cast into a butt of a door which swings to the right when opened from you the letters "R H," and *vice versa*, and the question which is a right and which is a left hand door cannot arise any more than which make the larger amount, ½ dozen dozen or 6 dozen dozen.

Mitering a Plank at the Valley.

From S. J. W., *Centerville, S. Dak.*—I have derived a great deal of benefit from *Carpentry and Building* and I desire to submit a question to its readers. It is this: Can a plank be mitered at the valley without twisting it, where the pitch of one roof is 12 inches to the foot and the other 16 inches to the foot?

Question in Hand-Railing.

From M. W., *Scranton, Pa.*—In the December number of *Carpentry and Building* for 1889, there appeared a question on hand-railing by "J. C," Cedar Rapids, Ia. He desired to be supplied with complete drawings for face mold, falling mold, spring bevels, bevels for joints and every other necessary line to complete the construction of a rail over a quarter space plan, containing four winders in the quarter. With reference to this question I desire to propose the following method, trusting that others interested in the subject will furnish drawings and explanations exemplifying their methods. I have no doubt there are many who have occasion to construct this kind of wreath in the course of their practical experience, and it would be exceedingly interesting and beneficial to young students to know the various ways and means employed in accomplishing it. In all cases where the pitch line of tangents deviates from the pitch of the stairs and the easing to be formed in the wreath piece, the joints will not be square to the face of the plank nor square to the tangents.

To find the correct bevel to which to work the joints, both for the face and vertical side of the wreath, as well as their practical application in the manipulation of the wreath, is what is difficult to perform except to the thorough mathematician or the practical stair builder. While not presuming to identify myself with either of these enviable personalities, I have so thoroughly tested the method I herein propose as to be perfectly satisfied of its practicability.

Referring to the sketches, Fig. 1 represents the plan of quadrant, being struck with a 12-inch radius. The tread of straight flight is 9½ inches, and the risers 7 inches, as specified in the communication of J. C. Fig. 2 is the elevation. Unfold the tangent as shown. Draw the ordinate C D, as well as a tread and riser of the lowest flight. Draw the perpendicular line 9 5. Draw a tread and riser of top flight. Draw both top and bottom rail as shown. Mark the joints about 4 inches from 5 and 1 at F and E. From the center of the rail at joints draw the pitch line of tangents. Draw the line C 1, cutting the pitch line of tangents. Draw 1 S square to the pitch line of tangents. Draw 2 0 square to pitch of flight. Draw 3 0. Fig. 3 represents the face mold. Draw to straight line and mark upon it 1, 2, 3, 4, 5 equal to 1, 2, 3, 4, 5 of Fig. 2. With 1 as center and with radius C D, of Fig. 2, describe the arc 8. With 4 as a center and radius 4 1 cut the arc 8 in 8 and complete the parallelogram. Draw the minor axis and square to it. Draw the major axis. Take 4 as a center and the radius of the quadrant on the plan as a radius, describe an arc cutting the minor axis in 7. With 7 as a center describe a circle or points of the rail. On the points 8 and 5 with radius N M of Fig. 2, describe circles as shown. From points 5 and 8 mark distances equal to 5 and 1 E, of Fig. 2. Draw the line 8 3 to meet the monor axis in 0. Draw 0 5. The angle these two lines make with the tangents will be the bevel to cut the face joints on the face mold at 6 and 9. The

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marks on the major axis are the points where the pins are to be fixed to describe the curve of inside and outside of face-mold. Fig. 4 represents the falling mold or outside of wreath. Draw the lines A E and I F at right angles to each other. From I, as center, draw the curve B C equal to the outside of the rail on the plan, A B being the stretchout of the same. From F draw F A. From A and F draw the pitch of the stairs, cutting the perpendiculars shown. This gives the length of falling-mold for outside. The width will be equal to the depth of the rail. The bevel 8, Fig. 2, is to square the wreath at both ends. The bevels 6 and 7, of Fig. 2, are for the ends of the wreath vertically, and to be used after the wreath is square or twisted. The bevels 8 and 5, Fig. 3, as previously stated, are to be used on the face of the face-mold. Note A B on the elevation, Fig. 2. The face-mold should be the length of A B longer than its length, as shown in Fig. 3.

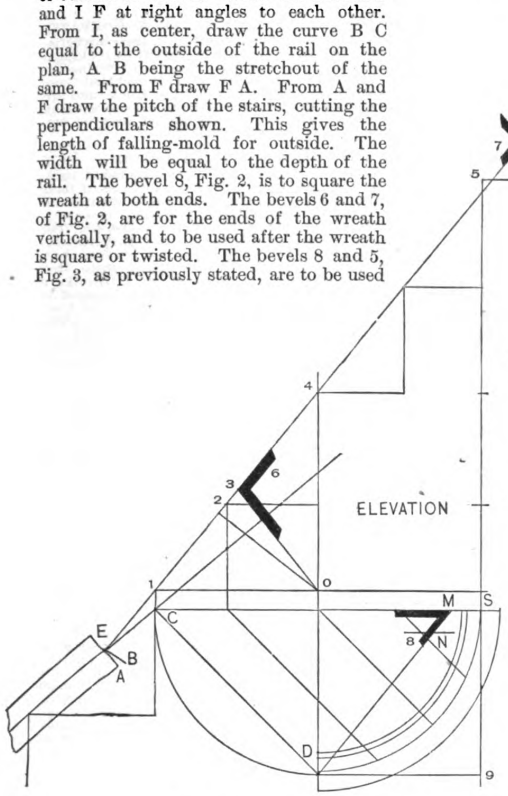


Fig. 2.—Elevation.

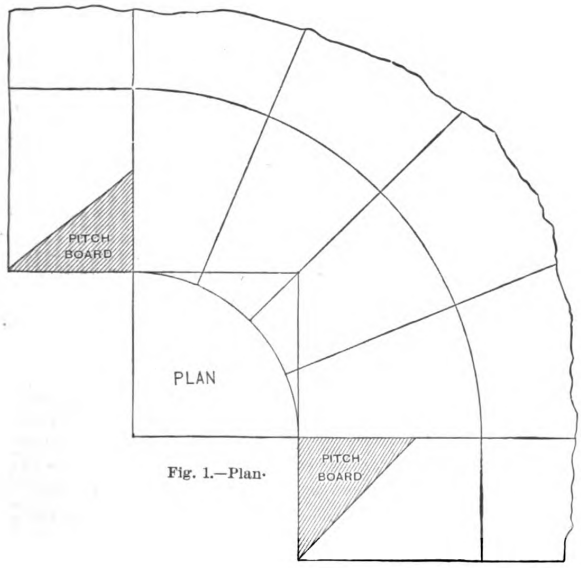


Fig. 1.—Plan.

Question of Percentage.

From S. W., *Newark, Ohio.*—A short time since I furnished an estimate and was awarded the contract for a frame house to cost $3000. Before commencing the execution of the contract, the owner desired it canceled, on the ground that he did not then require a residence, as he had been presented with a house and lot. He desired to remunerate me for annulling the contract; but, having no precedent, I did not know what would be a fair compensation. I would like to hear from builders located in cities on this subject. I would like to know what would be a fair percentage to charge.

Hanging Barn Doors.

From G. W. F., *Fisherman's Bay, Sonoma County, Cal.*—I desire to learn through the columns of *Carpentry and Building* the best method of hanging barn doors on rollers? I should also be glad to know what is considered the best roller to employ for the purpose.

Plan for Stable.

From C. S., *Homer, Ont.*—I desire to ask some of the readers of *Carpentry and Building* to give me a convenient plan for a stable under a bank barn.

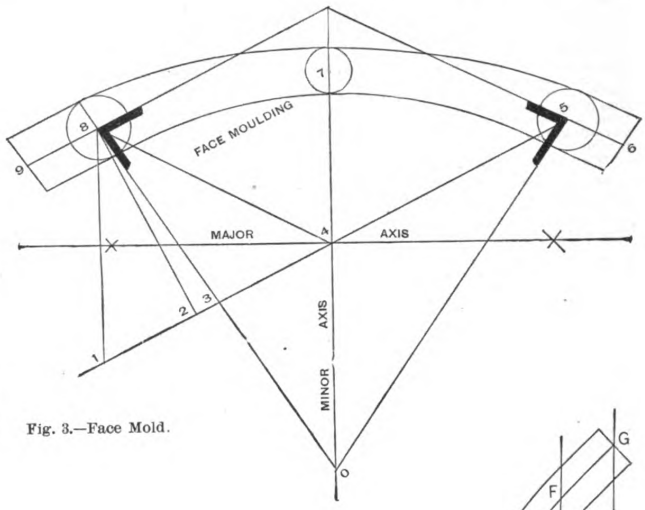


Fig. 3.—Face Mold.

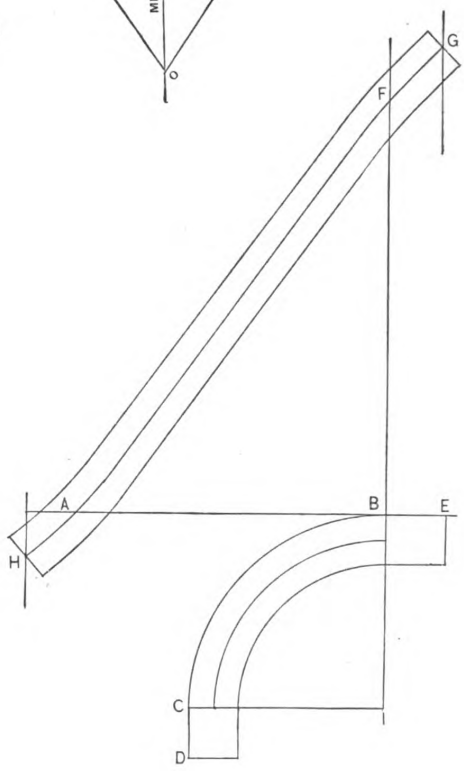


Fig. 4.—Falling Mold for Outside of Rail.

Question in Hand-Railing.—Diagrams Submitted by "M. W."

Note.—The question of properly framing bank barns is one which has been receiving more or less attention in our columns for some time past, and it is possible that our correspondent may derive some suggestions from what has already appeared. We refer the matter, however, to our readers, in order that different plans of the kind referred to may be brought out.

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TRADE NOTES.

THE GLEN COVE MACHINE COMPANY, Limited, of Brooklyn, N. Y., have issued a very neat catalogue of 30 pages illustrating some of their improved machinery for planing and molding mills In their introduction to the trade the company refer to the improvements in planing mill machinery which they have made, to their enlarged works and new tools and to the rapid increase in the demand for their product. The printing is done in a tinted ink upon good paper, the appearance of each page being enhanced by a plain red border carrying the name and address of the company. The machines illustrated are especially designed for rapid first-class work, and constitute a varied and interesting assortment.

THE JOSEPH DIXON CRUCIBLE COMPANY, Jersey City, N. J., are sending out a circular directing especial attention to Dixon's Traction Belt Dressing and Leather Preservative. It is claimed for this product that it absolutely prevents a belt from slipping and thoroughly preserves the leather, besides protecting the elasticity of the belt. In the circular it is mentioned that this preservative has been on the markets of Europe and this country for many years, and has given thorough satisfaction in all cases. A number of testimonials from well-known manufacturers refer to the advantages they have derived from using the product.

THE COSMOPOLITAN MAGAZINE announces a series of architectural competitions. One of these relates to public baths, another to public laundries and a third to tenement house co-operative kitchens. Richard M. Hunt, president of the American Institute of Architects, Richard L. Hoxie, U. S. Corps of Engineers, Albert F. D'Oench, ex-superintendent of the New York City Department of Building, Seth Low, president Columbia College, Cornelius Vanderbilt and the Editor of the *Cosmopolitan Magazine* are designated as the Committee of Award. Six hundred dollars is the amount of prizes. The efforts are to be submitted on or before May 10, 1890. The office of the magazine is Fifth avenue, Broadway and Twenty-fifth street, New York City.

W. R. OSTRANDER & Co. announce to the trade that owing to the urgent need of more commodious quarters, they will move on May 1 to 195 and 197 Fulton street, New York, where they will carry in stock a full line of Speaking Tubes, Whistles, Annunciators, &c.

FRANK H. CLEMENT, Rochester, N. Y., favors us with a copy of an illustrated catalogue of wood-working machinery which he has just issued. The volume consists of 60 pages of carefully-arranged letterpress, bound in colored paper covers, and has been issued for the use of proprietors, foremen, superintendents and purchasing agents of works, and is intended to be filed for reference. Attention is given to the varied line of wood-working machinery manufactured by Mr. Clement, and illustrations are presented, giving the reader a very clear idea of the appearance of the cuts. The line of machinery shown includes automatic lathes, band sawing machines, boring machines, furniture planers, hand lathes, combination saw benches, sand-papering machines, variety shapers, pulley, shafting and molding machines, and other goods of special interest to those engaged in the wood-working industry.

THE CINCINNATI TOOL COMPANY, Cincinnati, Ohio, are offering the trade an adjustable carpenter's clamp made with two sizes of bars. It has square-thread wrought-screw malleable crank, steel bar and dog. The length of bar varies from 2½ to 5 feet for the light pattern and from 5 to 10 feet for the heavy pattern.

IN THEIR ADVERTISING CARD this month the A. B. See Mfg. Company, of Brooklyn, N. Y., show an illustration of their new steel screw belt elevator, for which many claims are made. It is made in three sizes, is of new design and both right and left handed, being provided with double thrust collars of bronze

THE EGAN COMPANY, of Cincinnati, have issued a poster of large size, showing an almost endless variety of wood-working machinery which they are manufacturing. The center of the sheet is devoted to a panel in colors, containing the name and address of the company, while directly below is a bird's-eye view of their works. The object of the company in issuing this poster is to enable their customers to have in their offices a sheet showing almost at a glance the varied assortment of the company's product.

THE HILL INSIDE SLIDING WINDOW BLIND ASSOCIATION of the United States and Canada held their annual meeting at Chicago on March 26, continuing in session three days. Firms from eight States were present, and a very interesting meeting was held. The officers elected were: W. H. Ycomans, Patterson, N. J., president; Wm. G. Frye, St. Louis, Mo., vice-president, and W. H. C. Monroe, Sidney, Ohio, secretary and treasurer. The directors included, in addition to the above gentlemen, D. G. Crane, of Burlington, Vt., and H. W. Watson, of Jamestown, N. Y. The meeting adjourned to meet in Cincinnati the first Wednesday in February, 1891.

THE EXECUTIVE COMMITTEE of the Metropolitan Museum of New York, having in charge the matter of lighting the building, have adopted the system of reflectors brought out by I. P. Frink, 551 Pearl street, New York. The work of lighting all the galleries in the Museum is being rapidly pushed forward by Mr. Frink, and it is expected very soon the Museum will be thrown open on two evenings in the week. It is claimed for this system of lighting that the paintings will be evenly covered with a light without glare, while throwing the interior of the room into the shade.

WILLIAM MILLER, manufacturer of Miller's Inside Sliding Blinds, Milwaukee, Wis., is distributing some very attractive advertising cards, on which is illustrated in colors the method of attaching and using these Blinds.

THE EGAN COMPANY, of Cincinnati, Ohio, have in preparation a new catalogue, which will contain illustrations and descriptions of what they state is the largest line of recently Improved Wood-working Machinery in the country. The publication will be of handsome appearance, and from all we can learn, of such a character as to be of great interest to those engaged in Wood-working operations.

THE I X L PUMP LUMBER AND MFG. COMPANY, Goshen, Ind., are distributing an interesting little pamphlet of a size convenient for the pocket, devoted to their specialties. The construction of I X L wood pumps are illustrated and described and a price-list of the various sizes presented. Attention is also given to verandah posts, screen-doors, step-ladders, drive well points, etc. The fourth page of the cover bears an engraving of rather a comical nature entitled "Perpetual Motion Applied to an I X L Pump."

WE HAVE RECEIVED, with the compliments of W. J. Burton & Co., Detroit, Mich., a copy of a pamphlet of nearly 175 pages entitled "Industrial Advantages of Detroit." In this volume the superior advantages of Detroit as a manufacturing city are pointed out, and many of the leading manufacturers are briefly alluded to. On page 70 we find an interesting notice of the firm above mentioned who, as our readers know, are extensive manufacturers of sheet-metal work and of the Eastlake metallic shingle, the Eastlake paint and roofing sundries. The notice is illustrated by several engravings one of which shows the appearance of the Eastlake metallic shingle as applied to a roof.

THE CINCINNATI PANEL COMPANY of Cincinnati, Ohio, have recently issued a circular calling attention to the fact that they have purchased from the E. D. Albro Company, of that city, the machinery heretofore used by them for making veneered paneled stock, built up wood-work, &c. The company have been organized for the special purpose of making veneered paneled stock, desk and table tops, backs, and all kinds of built up wood-work, fret stock, as well as stock for organs and pianos, wagon sides, buggy sides and carriage panels. The company have secured the services of F. Kohl, late superintendent of the panel department of the E. D. Albro Company, and all the skilled workmen employed by them. The company's buildings are large, and are equipped with a complete line of new and improved machinery.

THE FULTON IRON AND ENGINE WORKS, of Detroit, Mich., report a gratifying demand for their Sure Grip Steel Tackle Block, an illustration of which appeared in these columns some time since. The company state that they have placed their goods on the European markets, and within the past month have received orders for over 400 tackle blocks for shipment to England, Scotland and other European countries, The special advantages claimed for the Sure Grip include its power to hold a load at any point without fastening the rope, with the certainty that the heavier the load the more firm the grip.

E. C. STEARNS & Co., Syracuse, N. Y., are sending to all the prominent architects of the United States a wooden triangle, as a "gentle reminder" as they put it of the Warner Hanger. The triangle is very neatly finished, and bears upon one side the inscription "Compliments of E. C. Stearns & Co., Syracuse, N. Y. Use the Warner Hanger."

THE STANLEY RULE AND LEVEL COMPANY, New Britain, Conn., show in their advertising space this month a general view of Stanley's Patent Duplex Level, which they are pushing upon the attention of the trade. This level possesses many features of novelty and is meeting with favor wherever introduced.

THE TAFT COMPANY, of Hartford, Conn., manufacture an interesting line of natural and artificial wood ornaments, some designs of which are shown in their advertising card this month. These ornaments include rosettes, borders, escutcheons, corner blocks, heads, &c.

THE FOX MACHINE COMPANY, 387 North Front street, Grand Rapids, Mich., present in their announcement elsewhere in this issue some interesting particulars relative to the Fox Patent Universal Dado Saws, Trimmers and Mitering Machines. It is said of the latter that there are more than 2000 in use, while of the Dado Saws there are over 400 in use. The machines are made in various sizes and adapted to meet varying requirements.

THOMAS LEE, Cincinnati, Ohio, calls attention elsewhere in this issue to his Rain Water Filters, and to the fact that power machinery is used exclusively in his works.

WE HAVE RECEIVED from Nevins & Haviland, 406 Broadway, New York, an interesting pamphlet, showing numerous designs of Anaglypta. This is said to be a new English sanitary wall covering, embossed in high and low relief. It is already sized for both paste and decoration in oil paint, metals, lacquers, varnishes and glazes. It is said to match perfectly at joints and to lose none of its sharpness in hanging. The engravings contained in the pamphlet before us represent frieze designs, borders, filling designs and dado designs in great variety.

CHARLES A. STRELINGER & COMPANY, Detroit, Mich., call attention in their advertising space this month to the Patent Swivel Loop Extension Dividers which they are offering the trade in a number of sizes. It is said that these Dividers are made of the finest stock, and are first-class in every particular. They are easily adjusted, and a common pencil may be employed in connection with them.

THE MUNCIE ARCHITECTURAL IRON WORKS, of Muncie, Ind., have issued a catalogue of somewhat liberal proportions of their wrought-iron fencing, plain and ornamental iron work, crestings, finials, stable fixtures, vases, settees, jail and station house cages, &c. The work is profusely illustrated and sufficient descriptive text presented as to render them easily understood. The company state that their works are in charge of Mr. C Hanika, a thorough mechanic, who has been engaged in the general architectural and iron fence business for 20 years. The company employ skilled mechanics in every department, and with excellent shipping facilities and special machinery and patterns for manufacturing, are in a position to execute contracts promptly.

KIMBALL BROTHERS, Anamosa, Iowa, request those interested to send for circulars describing their improved quick and easy raising hand power elevators and hoists. Attention is called to these devices in their advertising space this month.

ELSEWHERE IN THIS ISSUE Merchant & Company, Philadelphia, direct the attention of those interested in the building trades to a little work entitled "A Tin Roof," giving attention to tin roofing and showing how to select one, and to specify for a tin roof in order to obtain the best results. The firm also solicit applications for a copy of their Formulea, which will be sent free of charge.

JOHN ROYLE & SONS, Paterson, N. J., have distributed an illustrated circular showing Royle's Improved Routing Cutters, which they manufacture in several styles and sizes. The statement is made that these cutters are made of the finest quality of steel, are of uniform size of shank, and in the different sizes are uniform in cutting sweep. Each cutter has its designating letter, together with its size stamped on the shank, the standard being the diameter of the circle it cuts.

JAMES H. BARTON, Barton Hights, Richmond, Va., states that he has laid off and is now building up what promises to be one of the handsomest additions to that city. He has under construction 40 Queen Anne residences and expects to make a very attractive suburb. He reports having erected 400 houses in the city of Little Rock, Ark., and 100 in Memphis, Tenn.

WE HAVE RECEIVED from the New England Artistic Carving Company, 621 Albany street, Boston, Mass., a catalogue profusely illustrated with examples of round, square, octagonal and fancy turned work which this company are reproducing. Attention is given Newels, Posts, Chair Legs, Columns, Fancy Moldings for furniture, picture frames and other fancy forms. In the opening pages a list of names of firms carrying a stock of the company's goods on hand is presented. The catalogue consists of 24 pages of text, is oblong in shape, and is bound in colored paper covers. Accompanying it is a price-list which will be found of general interest in this connection.

L. J. MCCLOSKEY & Co., 59 North Second street, Philadelphia, Pa., favor us with a circular calling attention to McCloskey's Liquid Royal Wood Filler for filling pine and hard woods without rubbing off. The statement is made that by means of this filler a perfectly smooth and hard surface can be obtained, and that it is particularly adapted for pine, where it is of the utmost importance to retain the original light color of the wood. The manufacturers state that it is only necessary to give the softest wood one coat of the liquid filler and one coat of varnish or oil finish, to obtain a finish much superior to that usually resulting from the use of two coats of shellac or two coats of varnish. The firm have also placed upon the market what is known as McCloskey's Amber Finish designed for finishing the interior of public buildings, churches, mansions, &c., in natural wood. It is stated that this finish is not affected by air or dampness; that it will not mar white or turn yellow with age; that it will rub and polish with either oil or without, and has a heavy body, is durable and elastic. Attached to the circular relating to the Royal Wood Filler, are several specimens showing the practical application of this filler.

C. E. JENNINGS & Co., 79 and 81 Reade street, and 97 Chambers street, New York City, announce that it is their intention hereafter to illustrate goods of their own manufacture in alphabetical order. In the April issue of this paper they illustrated auger bits and augers, and in the present issue it will be observed they call attention to their line of bung *borers* and brace bits. In the June number of *Carpentry and Building* it is their purpose to advertise chisels, and to continue in this manner in succeeding issues until the series is exhausted.

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CARPENTRY AND BUILDING.

A MONTHLY JOURNAL FOR THE BUILDING TRADES.
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DAVID WILLIAMS, - - PUBLISHER AND PROPRIETOR.
A. O. KITTREDGE, - - - - EDITOR.
JOHN S. KING, - - - BUSINESS MANAGER.
66 & 68 DUANE STREET, NEW YORK.

JUNE, 1890.

This Number.

A month since, in laying before you a supplemental plate possessing certain new art features, we ventured to say we had still another surprise in store for you. We did not attempt to tell what it would be, nor to excite your curiosity by hinting at its character. Now you have it in your hand you can weigh it, you can count the pages if you like, or you can compare it upon any basis you choose with any other architectural or building paper you have at hand, or have ever seen. The better test, however, will be to read it through, examine the illustrations, and then estimate its attractiveness and real worth to you as a subscriber. Upon even casual examination, you will find that as usual the paper is composed of two principal parts or divisions, the so-called "reading" pages, and the advertising pages. Each of these in quantity, however, exceeds anything we have ever before sent out, and, by the nature of the matter presented, is also divided into two parts. The reading pages resolve themselves, on the one hand, into those containing the usual assortment of articles upon mechanical and trade topics, house plans and details, together with letters from readers; and on the other hand, into those which are devoted to the discussion of builders' exchanges, and the labor situation, and to other similar topics outside of the regular work we have heretofore attempted. The two classes in the advertising pages are first, those containing display cards and announcements; and second, those which address the reader in confidential terms, and, in essay or narrative form, give him facts about different lines of goods in a way to impart valuable information, while holding him interested to the end.

Builders' Exchanges.

There is so much about builders' exchanges on other pages that perhaps we might be excused from even mentioning the subject in this column. However, we want to say a word or two about the interest that exchanges have for the building trades before completing the analysis of the contents of this number, which we have outlined in the preceding paragraph. A builders' exchange is simply an association of builders, organized and maintained for the mutual advantage of the men in its membership. An exchange benefits builders just as any similar organization benefits the trade or business in which it is maintained—with this difference, that the builders in the past, having had none of the advantages of practical co-operation and acquaintance, and the mutual respect following upon association in any capacity, are in position to reap greater rewards from their effort in this direction than any other trade we know of. The advantages of exchanges in other lines of business are very generally conceded. Indeed, many will say at once that without exchanges certain departments of the world's business could not be conducted at all. Builders, then, are simply waking up to the advantages of conducting their business upon plans that have been found the best to follow in other branches. Builders are interested in exchanges, and in what is familiarly described as the exchange movement, because there is sure to follow most excellent results, among which may be mentioned better business methods, saving of time in important business details and larger profits, because competition will be within reasonable bounds.

How is Labor Affected?

The mechanic, be he carpenter, mason, stonecutter, plumber, bricklayer, roofer, or what not, looks askance upon the organization of the master builders into local and national exchanges, and wonders how his interests are affected thereby. Is it good or bad for labor to have the bosses thus associated and banded together? Unquestionably it is to the benefit of labor, and the speedy understandings reached in different parts of the country the past spring, concerning hours of work and rates of pay, when committees from the organizations among the workmen on the one side, and from the builders' exchanges and employers' associations on the other, met in conference, are ample evidence in support of the assertion. Intelligent leaders among the labor organizations in years gone by have lamented that they have been obliged to fritter away valuable time in cases of disputes, in meeting employers one by one, and in each case fighting the battle clear through from beginning to end. Now organization meets organization. Pros and cons are discussed, and as a result the conclusions reached are pretty sure to be all that the existing condition of business will warrant and public opinion sustain. Labor should not be jealous in the least of the organizations among employers. Quite the contrary. It should feel flattered, for the masters are only following the most excellent examples set by their journeymen.

Who are the Best Organizers?

We run no risk of overstatement when we assert that even now, with the considerable progress the builders' exchange movement has made, the workmen can give the bosses large odds in the matter of organization and skillful direction of forces, and yet excel them. You need not tell the master builders of your town that we said so, but it is a fact that the employers have yet a great deal to learn and to do in the matter of working together for the benefit of their class before they will be on the same relative plane as the workmen now occupy in this regard. Of course there are exceptions to be noted. Some builders' exchanges are so happily constituted and so ably directed as to leave little or nothing to be desired, and on the other hand there are some labor organizations which are so poorly managed as to really prejudice the cause in which they claim to be working. But speaking in general terms the workmen excel in these matters, because they have had far greater experience, and because further, as the result of careful thought and study, they have reached the position of being able and willing to make the individual sacrifice now necessary to the advancement and the general good of the class in the future. On the other hand, the master builders at present fail of the good they will ultimately accomplish in their organizations, because, for the most part, they are as yet looking only at the immediate profits. When they reach the point—the majority of them—of being willing and able to sacrifice the present dollar of the individual for the future hundred dollars benefit to the class, the building trades will be revolutionized, and that, too, in the mutual interest of employers and workmen.

Editorial Pages.

And now let us resume our reference to the contents of this issue. In order to present a general consideration of the builders' exchange movement and to illustrate and describe one of the best and most complete exchanges in the country, we have added a number of pages, so as not to encroach in the least on what the reader has reason to expect each number of this paper to contain. And further, also, in careful consideration of what the reader may think, and remembering likewise that there are various classes represented in our constituency of subscribers, we have not allowed the extra pages and the new matter that they contain to bear altogether on one side of the leading question of the day. While explaining builders' exchanges, we also give a history of the eight-hour movement, and alongside of the article from W. H. Sayward, secretary of the National Association of Master Builders, describing the objects and uses of that organization, are other articles bearing upon practical arbitration, the present condition of labor in the building trades and kindred topics. The paper taken as a whole better reflects the building trades as they are at present, from the standpoint of both employer and employee, than anything ever published. We might further particularize and name different articles, but the reader will prefer to pick them out for himself. He is likely to find them so numerous and covering such a variety of topics, that the suggestion of preserving this number of *Carpentry and Building* as a souvenir is not out of place.

Advertising Pages.

We have already mentioned the two general kinds of advertising which this issue contains. Both are interesting, and there is not a page or line of either kind

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that should escape the careful reader. The day has gone by when advertising was unimportant and something to examine which would be a loss of time. Advertisers have become shrewd and careful contributors to periodical literature, and with all deference to the profession we represent, we may declare that there is lively competition at present between advertisers and editors as to which interests and instructs the reader the most. Perhaps in this issue we shall be obliged to yield the palm to the advertiser for several reasons, prominent among which are that he has occupied more than twice as many pages as have been allotted to us, and that in spite of the varied contents of our part of the paper, he has introduced ten topics to our one. Again, we are given to theorizing and moralizing, while the advertiser is entirely practical and appeals directly to pocket interests.

Reading Advertisements.

If you are not in the habit of reading advertisements now is a good time to begin. You will find them more profitable than you may suppose, but you will not get the greatest possible benefit out of them unless you go one step further. Every manufacturer and dealer who advertises issues a circular, or a catalogue, or a technical treatise, relating to his goods, and this you ought to secure. We make no secret of saying that these catalogues and treatises are frequently the sole inspiration of most important editorial writings, and perhaps we shall lessen our influence and estimated importance in the world when we suggest that you go directly to headquarters for some of the information you need. All jokes aside, however, we would say it is greatly to the advantage of every intelligent man in the building trades to examine and study catalogues and circulars and to compare different lines of goods, to the end of becoming familiar with all of them, and in all other available ways to lay about him for the information that is absolutely necessary to keep him abreast of the times. This is a fast age in more respects than one, and no man can afford to neglect the proffer of a new catalogue simply because he has seen one issued by the same firm some time in the past. There is nothing in literature, the daily newspapers alone excepted, that is so carefully kept up to date, and so thoroughly revised from time to time, in a way to include all the latest and best ideas, as the catalogues of live business concerns.

Descriptive Advertising.

One of the striking things about the advertising in this issue of the paper is the descriptive advertising in which a considerable number of our patrons have indulged. If you turn over the pages you will find a number of essays on important subjects more or less illustrated, all of which contain information that is valuable to the builder. We shall not occupy space here to enumerate all of them, but brief reference to some of the more prominent ones will cause you also to examine those that we do not specifically mention. Iron fronts are in demand in a large section of the country, and one firm tells how they are made and erected. Tin plates for roofing purposes may be a hackneyed subject, but no one will fail to read the several pages which a prominent importing house occupy in describing their leading brands and their methods of doing business. Bricks are made everywhere, but there are comparatively few concerns that make bricks of a kind to ship to every State in the Union. One company explain why this is and give the reader an excellent idea of their styles and shapes. Furnaces and ranges come up for consideration in the planning and arrangement of every dwelling, and the architect or builder who reads what this paper contains and who possesses himself of all the literature that is offered him on the subject will have no excuse for going astray. Metallic tiles and shingles are staple goods at the present time, and several competing firms vie with each other in expounding the merits of the different systems of construction. Pianos are not often advertised in building papers, and yet every builder wants a piano in his own home. How about building pianos right into the house, like any other fixture, as a "selling" or "renting" feature? The way in which this may be done is explained by an enterprising piano manufacturing firm. Domestic gas machines are discussed in this issue in a way to put hundreds of builders to studying the question of illumination, to the end of making their buildings more attractive to both buyer and tenant. Composition roofs, concrete work, cement for plastering, reflectors, tools and various specialties are likewise pleasantly discussed and described. Architectural ornaments, statuary, center pieces in sheet metal, cornices, finials, metallic lath and fire-proof construction, all appear in interesting form. Elevators, gas engines, heating apparatus, ventilators, and many other articles, all important, are also presented in a fashion to command the reader's attention, and to contribute to his general information.

Our New Cover.

Of course we are expected to say something about our new dress, the change in the color of our cover, and the new head or title on the cover page. But you noticed all these when you first took up the paper, and therefore the simple admission of being sensible of the improvement is about all that is necessary. There are one or two other things, however, to which attention should be directed, and prominent among them is the new index of advertisers. In addition to the index arranged according to the articles advertised, you will notice an index of the advertisers in alphabetical order. This will prove a great convenience in all those cases where the advertising pages are used as a directory, and whenever it is desired to obtain the address of an individual or a firm without reference to the particular article they may be advertising. Other minor changes and improvements will be observed if the reader chooses to look for them, which are scarcely important enough to warrant special reference, but which, nevertheless, go to make the paper attractive, and we hope useful as well.

Builders' Banquets.

In other portions of this issue we present accounts of two notable occasions in Philadelphia during the past month, one being the banquet in celebration of the opening of the new exchange room of the Operative Builders of that city, and the other being the reception tendered to the architects of Philadelphia by the Master Builders' Exchange. It has been only a short time, comparatively, that pleasant occasions of this kind have occurred in the building trades, although their importance in other directions has long been recognized. For contractors, architects, builders and material men to assemble around the same table, to eat and drink together, to chat, tell stories, make speeches, sing songs and, in general, to enjoy themselves as rational beings, marks a new era in the building trades. Other lines of business have profited by the judicious intermingling of social amenities with the dry facts of business in the past, and there is no reason against, but every reason in favor of, the builders doing the same thing. The reception tendered to the architects by the Master Builders was particularly notable, because it manifests a new order of things in the relations existing between these two important classes in the community. It was in every way a success, and deserves to be emulated in every part of the country.

The Census.

Mr. Robert P. Porter, Superintendent of the Eleventh Census, solicits the co-operation of manufacturers throughout the country in that work, which will be inaugurated on the second day of June. He calls attention to the fact that the report must depend wholly upon the accuracy and thoroughness with which answers are given to the questions propounded, and that the personal interests of every manufacturer are involved in the character of the report on manufactures. It will be quoted for the next ten years as the official announcement of the exact industrial condition of the country, and will be the basis for any future legislation that may be enacted in regard to the wants of the people in whatever pursuit engaged. The Superintendent of Census has taken every possible precaution in the preliminary work to make this census complete and satisfactory, and the earnest co-operation of those engaged in productive industry is all that is now necessary to secure valuable results. Emphasis is laid on the fact that answers to the questions relating to every manufacturer's business will be held strictly confidential. They will not be disclosed to any competitor or other persons, nor used by the Government as predicate for the purpose of taxation or license, or in any way adversely to his individual business. The questions contained in the census

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schedule are those suggested by manufacturers and other persons most interested in the progress of the country, and cover ground absolutely essential to the proper presentation of its industrial conditions and resources. The expert special agent in charge of this branch of census work is Mr. Frank R. Williams, who has personally visited the principal manufacturing centers, consulted representative manufacturers, publishers of trade journals and practical business men generally, for the purpose of ascertaining the proper scope of the inquiry for each branch of manufacture. The Superintendent of Census, therefore, urges upon all manufacturers that it is of vital importance to each that an accurate report be made.

Prize Essays.

In our April and May issues we directed attention to a competition in essays descriptive of builders' exchanges. A considerable number of our readers, who are identified with these organizations in different parts of the country, took part in the contest, with the result of favoring us with so many essays as to make the labor of deciding between competitors a job of no small magnitude. However, the committee of judges have done their work most carefully and in time to permit our publishing the first and second prize essays in this number. The first prize ($100) goes to Wm. J. Fryer, Jr., New York, and the second prize ($50) goes to Wm. F. Beran, Baltimore. Their efforts will be found on another page. The roll of honor, mentioning the more important essays in the order of their merit, gives the following list: 1. "Anti-Innocuous desuetude;" 2. "Corinthian;" 3. "Guild Brother," and 4. "Bruce." With all deference to those who have taken part in this contest, and not in the least in the spirit of unfriendly criticism, but instead solely to indicate just where building exchange matters stand at the present time, we would remark that while several of these efforts are most commendable essays upon the idea of association, all of them are rather general in view of the particular conditions set forth in the competition. Further, in the estimation of the judges, all of the essays manifest crudeness in certain essential particulars, and show conclusively that the fundamental ideas of exchanges for builders are not yet fully understood and appreciated by every one. There is still room for able advocates and defenders of the Builders' Exchange movement. Our essayists have not cleaned the field by any means.

Architects of the Past.

In speaking of the controversy which has been developed between the master builders and a firm of architects over the contracts for the Williamson School Buildings in Philadelphia, the *Press* of that city says: "The present situation has undoubtedly grown up from the great change which has taken place during the past generation in the method and manner of putting up buildings as well as the vast increase in their size. Thirty years ago the architect counted for very little on the ordinary building. The great mass of school-houses, business blocks and dwelling-houses were built on patterns familiar to every one. This was often true even of churches. The construction of a building was nearly all there was of its erection. The details were accessible in any "Stair-Builders' Guide," and the plan of nine-tenths of the buildings was familiar to every one. Few architects had had a careful training or education at home or abroad. Some were simply builders with a little additional training and aptitude for design. There were many honorable, conspicuous and brilliant exceptions, but it was undoubtedly true, in many cases, that the architects who could design did not know how to build, and those who knew how to build could not design. The owner and the builder were the two important factors under these conditions, and the architect, if he was employed at all, represented a much less important element."

Architects of To-day.

The past 30 years have greatly altered this. American architects have received an artistic and technical training equal to that of architects anywhere. Their share in the work of a building has greatly increased. Design has become more important, and each year sees it rated at a higher value. The increasing size of buildings has introduced a host of technical difficulties and problems which need all the training of the engineer to meet. Unless the master-builder is himself a trained engineer, and no one expects him to be, he is unequal to them. In addition, our courts, guided less by the actual condition of affairs here than by parallel English decisions, have held architects to a responsibility for poor construction for which the builder has in the past been held accountable. All these changes have tended to alter the position of the architect. It has given him increased importance, greater control and a more immediate supervision. Nothing can change the necessity for the contractors or for some central authority. No architect can afford to give an edifice the supervision needed while under construction, to add to his labors the control and management of the capital needed in building. At the same time, the tendency is certain to be toward the direct contact of the architect with the group of contractors engaged on a building. This may be through one contractor who takes the entire edifice and sub-lets it; it may be through a clerk-of-works or superintendent paid by the owner—a frequent English practice—or it may be by some one representing the architect. No one plan will suit all cases; but it is safe to say that all plans in practice will tend to give increasing scope and importance to architects, although architects as a class will find it is to their professional and personal advantage that there are master-builders, with the capital, experience and ability needed in assuming the erection of a great building. It is safe to say, also, that any rules adopted by the Board of Master Builders in a city like this, ought to be modified or disregarded only after careful consideration.

Another Reformer.

There came to this office recently a signed postal card, issued from Washington, which is quite a curiosity in the line of political science. We presume many others have received this appeal, but for those who have not had the honor of getting one of the communications, it may be of interest to tell them what it contained. The distributor of the postal card is apparently of the opinion that one of the greatest evils under which this free republic suffers is the laws which permit the accumulation of wealth beyond a moderate amount. The writer refers to three prominent wealthy men of the United States, and shows how their present fortunes of $800,000,000 apiece would double every 12 years, the awful outlook being that in a very short space these gentlemen, or their descendants, would be worth $20,000,000,000 each, and that this process of compounding would continue indefinitely. The remedy suggested is constitutional amendment, prohibiting the individual from amassing more than a certain sum, say $1,000,000, under penalty of confiscation of the surplus by the Government. The absurdity of the proposition will be seen at a glance. Though it is possible that individual fortunes have in some cases increased to a degree detrimental to the public good, the proposal to put a stop to such increase by direct legislation is pernicious in the last degree. It is perhaps absurd to give any serious thought to the economic vagaries of this would-be reformer, but our only reason for drawing attention to his nonsense is to show that he is one of the many who are adding their mite to the stock of public discontent, and, so far as possible, endeavoring to persuade others into an equally unhappy state with themselves. If he and all his craft will spend a little time in the study of history, they will discover that the concentration of capital and the arrogance of wealth was, relatively speaking, infinitely worse a few centuries ago than it is now, and that the laboring classes of the present day are living in luxury compared with their distant forefathers. We do not mean that things are right as they are, for undoubtedly great evils exist, but things relatively are not so bad as men of this kind represent them to be. It is certainly much better to let these abuses right themselves, as they certainly will in time, than to attempt to make the law the sovereign remedy for everything.

Trust vs. Combination.

The word trust has become odious, on account of hostile legislation, and its use is studiously avoided. But combination goes on just the same, except as the formularies of organizations are modified to avoid legal entanglements. None are more eloquent than the promoters of these in portraying the evils of competition among

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small proprietors, as contrasted with the advantages of doing business on a scale of some magnitude, with a smaller proportionate number of salaried men, less machinery, &c. "Yet, there is one other feature about these combines," as remarked by a contemporary, "which demands serious attention—that is, the over-capitalizing and selling process which characterizes nearly all of them. They are huge speculations of the most reprehensible sort, inviting unknown disaster in the future, when new smaller capitalized concerns start up in competition, as they inevitably will. There is but one means of preventing a crash in these speculative enterprises some day, and that is for the public to refuse to invest their savings for the benefit of speculators. Competition in the end will certainly squeeze out all the water in these combines; and the crash when it arrives will not be confined to the investing public, but will bring disaster upon industry and labor everywhere at the same time. The public should beware of the wily promoter and his flattering prospectus.

Matters and Things.

Some builders are disposed to become discouraged whenever local building is interrupted, and whenever anything occurs to make the building business less desirable or profitable for the time being than usual. Under such circumstances. They seem to think that every thing is going to the demnition bowwows, and that nothing but ruin stares them in the face. Of course such things are more or less constitutional, and the victim of thoughts and feelings of this nature is simply suffering from a disease quite as pronounced as many for which physicians are called. What remedy, if any, there is for such a complaint or disorder I shall not pretend to say, but it does seem to me that a little study of the statistics of the country ought to act as a soothing draft if it does not serve as a veritable tonic. The nation is developing at a phenomenal rate, and the builders are the first ones to profit by it. New buildings are always in demand where prosperity attends. In a new settlement buildings are the first requirement to house the people. As the community becomes older, new buildings and better ones are demanded in place of those first built, and at the same time buildings for schools, markets, churches, libraries, theaters, clubs, art galleries, and for hundreds of purposes suggested by wealth and culture, come into demand. The builder serves first, last and all the time; and as long as the country continues to grow and develop as at present there would seem to be no possible chance of any great disaster overtaking the building business.

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—A new census is now being taken and approximate results of the work are already before the public in the way of estimates, based in part upon ascertained facts, and in part upon the knowledge of specialists. The daily papers are teeming with comparisons of this or that State or city or industry as it was 10, 20, 30 or 50 years since and as it is now. All these things are both interesting and instructive, and if anything were needed to take the builder out of a fit of despondency concerning his business, some of these figures ought to do it. First let me say this: Inasmuch as there is no probable obstacle in sight to the nation's continued progress, but on the contrary every reason apparently why development should be more rapid in the future than in the past, it is fair to assume that what has been done in the past ten years, for example, will again be done in the next ten years. A retrospective glance, therefore, becomes in effect a look ahead, and this is the element of encouragement in the figures as they become known. I have not, as yet, noticed any estimates of the progress of the nation as a whole, in which the builders' interests are set forth, but figures from some of the cities are before me from which great encouragement may be drawn. Further, it is not unreasonable to believe that the progress in the country at large is in some degree represented by the progress of some of the parts composing it.

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—Let me give you some of the figures now current concerning New York City—the metropolis of the nation, the financial center of the country, and the one city of all the large cities we have that prospers because the nation prospers, and not by reason of some little sectional boom, nor yet from purely local causes. It may be regarded as the thermometer of the nation, and I venture to believe that as wonderful as some of the figures are that follow, the figures for the whole country in similar items will be quite as wonderful. The cost of buildings in New York erected in the ten years from 1870 to 1880 was in round figures $175,400,000, and in the ten years from 1880 to 1890, $492,500,000. Here is shown a building business of upward of $327,000,000 in ten years, or an average of over $32,000,000 a year. As large as this figure may seem, it is a fact that single years in the last half of the decade have seen these figures more than doubled, while Brooklyn, regarded by many as only a New York lodging house, or at best a suburb, has for several years past been doing a business close up to the average of the metropolis, as expressed above. Again, ten years ago New York had only 60 hotels. Now there are 125. Then there were only 65 theatres and other places of amusements; now there are 158. Then there were only 1000 flat buildings, now there are upward of 3000. The churches have increased by 140; factories by 1390; municipal building by 95, and public schools by 82. The growth in population is estimated to be no less than 484,000. The figures for the other cities are no less remarkable, but I shall not weary the reader with them. A single illustration will suffice. Philadelphia is adding at present something over 10,000 dwellings to the accommodations of the city a year. They estimate about six persons to a building there; accordingly they figure that Philadelphia is growing at the rate of upward of 60,000 people per year, which, as will be seen by the preceding figures, is in excess of the progress of New York, taking the average for the last ten years. With such growth and development in the cities and in the country to match, surely the builder has no cause for despondency, but every reason for hopefulness.

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—I said something in this column a short time since about the country mechanic, criticising him somewhat upon his lack of enterprise in working around difficult places, and his failure in many cases to secure a finish in his building work in a way to do him credit. Now, I want to tell his fellows in the cities about some of the advantages which the country mechanic enjoys and which they are denied. In the first place, his is free of the tyranny of unions. He is, in the best sense of the term, independent. In many cases he is his own boss. Building operations in the country are not managed in a way to make large gangs of workmen desirable or profitable, and, accordingly, for the most part, he works with a single helper, or with two or three fellows. As a rule, he has steady work, with pay for as many hours per day as he may choose to work, from the first fair days in early spring until freezing weather comes on in the fall, and not infrequently he has inside work to do all winter. Failing in this he has the time for reading and study, for getting out the work for his own house, or an addition thereto, or for a new fence, or he may use it for visiting, or in other forms of recreation. A lot costs no more than the city mechanic pays for a month's rent, while a half acre, just a little "way out," can be had almost as cheap. A cow can be kept for what he pays for milk in the city, and if he is disposed to do a little gardening, or if wife and children like outdoor exercise, to the extent of tending a garden patch, the cost of living will be still further reduced, while the quality will be immensely improved. If he is industrious and enterprising he can soon have his own house even though he had no capital to start with. He occupies a position in the community that would never be possible for him to attain in the city, while his children grow up under influences far superior to what would be possible to secure for them there. All this looks well, you say, and yet very few country mechanics attain such a desirable condition of life. Yes, very true, but why? Man is lazy by nature. He needs a spur. It is easy to live in the country, so easy that men become indifferent and get into the habit of allowing things to drift. In the city there is constant drive and push. Enterprise is necessary even to maintain the poorest plane of living. The picture I have painted requires for its realization simply this—a transference to the country of the same energy and enterprise as are employed in the city. Nothing more. With this condition it is not only possible, but it is extremely easy.

—Every builder, referring now to those who build to sell or to rent, aims to make a profit, and various schemes are resorted to for accomplishing this most desirable end. One will build on cheap ground, and depend upon the general desirability of the house he puts up to mark an advance in prices so as to secure him a profit. Another will trust to close business management, careful buying and intelligent supervision of men to produce a house costing so much less than average buildings of its class as to make a fair profit possible. Still another will attempt to use poor materials and to beat down labor so as to have a margin on his side. Others, again, will depend upon attractiveness in design and upon careful planning and arrangement to make their buildings salable. While still another class will carefully look after the heating and plumbing and lighting and electric bells, to say nothing of closets and dumb waiters and side boards and built-in ice boxes, and the hundred and one other little thing, comparatively inexpensive in themselves, but wonderfully dear to the housewife, and the presence of which add measurably to her estimated worth of the house. I might prolong the list of methods that are at the command of the builder for making a profit, but enough have been referred to for an introduction to what follows. What I desire to present is not a new idea in itself, but it is something of which it seems to me builders, of houses of moderate cost at least, have as yet failed to see the full advantage.

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—Books have been written in praise of pure water. Poets sing about it and every one prises it next to pure air for breathing. But with a supply of pure water guaranteed there yet remains the need of means of use. If it is for drinking it must be cooled, and for this purpose we have the ice chest and water cooler, more or less complicated. If it is for bathing it must be warmed, and for this we have the range boiler, or plumber's boiler as it is sometimes called. But each of these means for adapting the water to use as commonly arranged is inadequate. I shall not stop to discuss cold water, for when our drinking water does not suit us we put in a piece of ice, a bad habit to be sure, but one that serves in the emergency. When, on the other hand, our hot water supply is inadequate we are obliged to go without. Now, right here is the idea I want to get before builders. In families of the better class an abundant hot water supply is prized to a degree you have no conception of unless you have investigated the question, and where hot water is most appreciated, the extra fire in the kitchen to keep the boiler full is considered very objectionable. It is not the question of fuel consumed, not at all; it is the waste heat and general discomfort of "firing" in the room where the principal work of the day has to be done, and the necessity of keeping the range constantly going or being without hot water at the particular moment it is wanted.

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—The idea, then, for making the house attractive so as to sell for a profit is this. Provide an independent hot water supply, the firing to maintain which shall be out of the kitchen. Let the kitchen range or stove have nothing to do but to cook. This proposition is not unreasonable with the hot water heaters that are on the market. Warm the house by hot water circulation and arrange the same heater to supply the bath room, and also the hot water for kitchen use, for all purposes except cooking. I am led to these remarks by the planning of a certain suburban residence I have recently inspected. The boiler or heater for hot water circulation for heating purposes is arranged to heat an auxilliary tank by means of a coil, so as to permit water for laundry purposes to be drawn free from the taint of rust that might come from the cast iron radiators. The system is so constructed that hot water can be drawn at will, and so far as the possibilities of the case are concerned, it might be drawn from any radiator in the house. Valves in the mains are so arranged that the hot water for circulation for heating can be cut off in part or completely at will, and the fire in the boiler is maintained 12 months in the year. The boiler is outside the house, where attention to it is handy for the man about the place, and where ashes are no nuisance to the house. The result is hot water in the greatest abundance at all hours, and the opportunity to have a little heat in the house in the wet and cold days of spring and autumn, when the regular heating of winter is not on. To hear the satisfaction expressed by the family referred to would convince any builder that here is a pointer of importance.

OLIVER.

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STUDY IN HOUSE DESIGN.

WE TAKE pleasure in laying before our readers a study in house design of which Mr. W. A. Pearson, of Dayton, Ohio, is the author. This design provides for four rooms upon the first floor and three upon the second. The arrangement is a convenient one, access to the three principal rooms being gained from a commodious hall. The kitchen is in the rear and communicates with the dining room through a china closet. The kitchen is furnished with the modern conveniences and has opening from it a panty of ample dimensions. It will be noticed that there is a back stairway leading directly from the kitchen. On the second floor the three chambers are conveniently reached from the main stairway. Ample closet room is provided, which is a feature likely to be fully appreciated. The sills of the house are specified to be 4 x 6 inches, halved together at the corners and joints. The joists are to be 2 x 8inches for the first and second floors, 16 inches on centers and the attic joists 2 x 6 inches; also 16 inches on centers. The studding is to be 2 x 6 inches, placed 16 inches between centers, doubled at the corners and openings. The plates are to be 2 x 4 inches doubled, lapped at the corners, well jointed and spiked together. The rafters are to be 2 x 4 inches, placed 2 feet between centers and the valley rafters 2 x 6 inches. The roof is to be covered with pine shingles laid 5½ inches to the weather and well nailed to 1 x 3 inch lath. The inside finish in the parlor, hall, sitting-room, dining-room and kitchen is specified to be of yellow pine, while the finish in the pantry, closets and second story is to be of poplar. All exterior wood and tin work is to have two coats of paint. The cellar is intended to be the full size of the house.



Front Elevation.



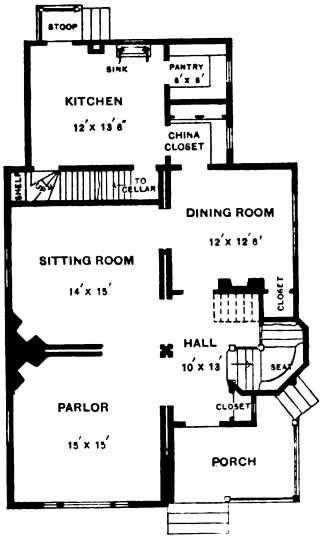
Side (right) Elevation.

Study in House Design.—W. A. Pearson, Architect, Dayton, Ohio.—Scale, ⅛ Inch to the Foot.

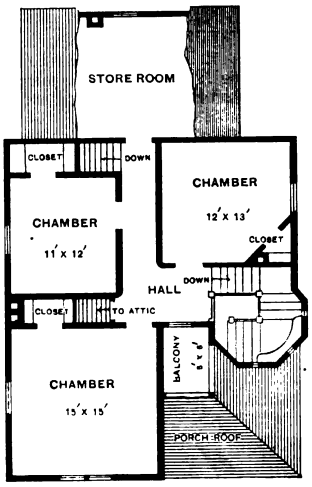
Cast Iron and its Application for Artistic Purposes.

A lecture on the above subject was recently given in London before the Society of Arts by Mr. W. R. Lethaby, who illustrated his remarks by numerous examples. He claimed for cast iron a position in serious art, and said he proposed by an examination of specimens to arrive at an appreciation of the metal, and of certain methods of manipulation. By a careful selection of the forms and treatment suited to the structure and texture of the material,

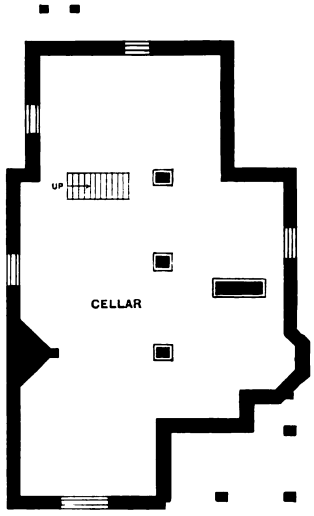
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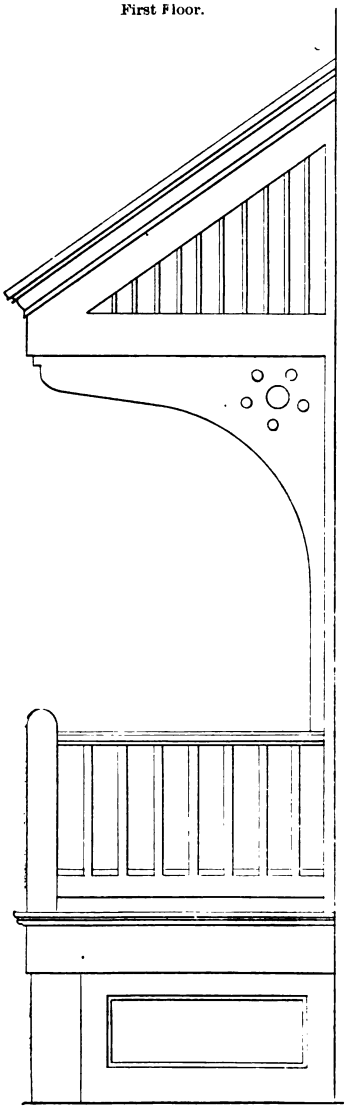
First Floor.



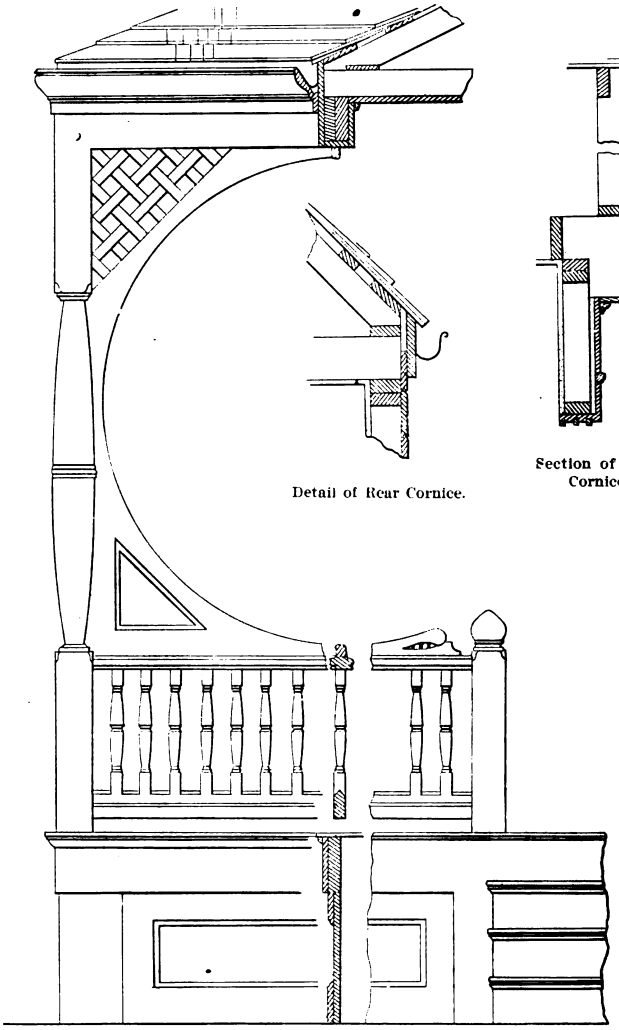
Second Floor.



Foundation.



Elevation of Stoop.



Part Elevation and Section of Porch.

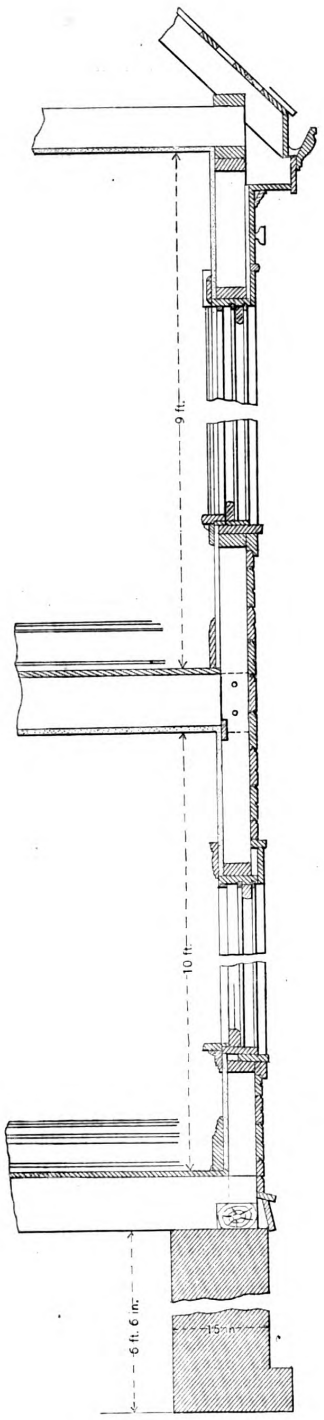
Detail of Rear Cornice.

Section of Gable Cornice.

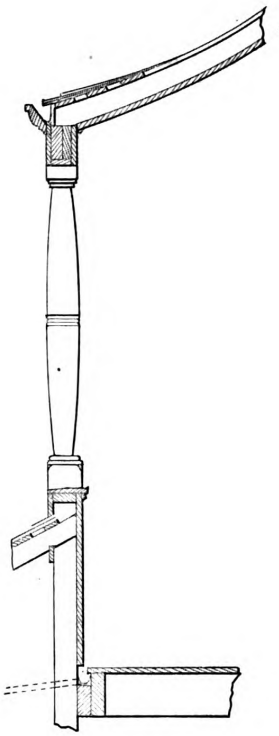
Study in House Design.—Floor Plans.—Scale, 1-16 Inch to the Foot. Details.—Scale, ½ Inch to the Foot.

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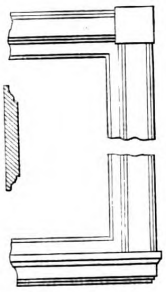
and its application to common place needs, artists had in all ages given the charms of fitness and honest simplicity, and accepting the comparative valuelessness of the thoroughly as a modeler from cast iron—from no choice of his own it may be, nor choice probably of subject; and yet by far the most popular work of style, were only cast iron. The torch-holders on the top of the same screen with reliefs of heads surrounding the bowls were also his. Table supports, stoves and



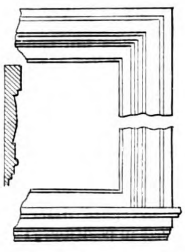
Section Through Wall.



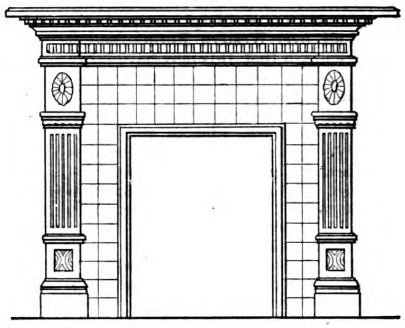
Section of Balcony.



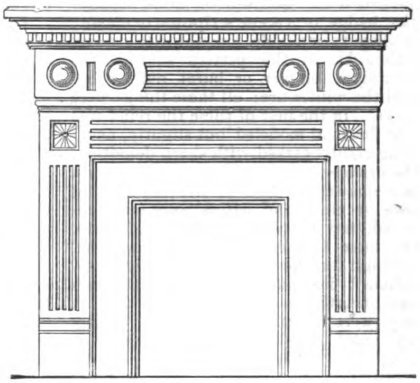
Detail of Finish in Kitchen, Pantries and Second Story.



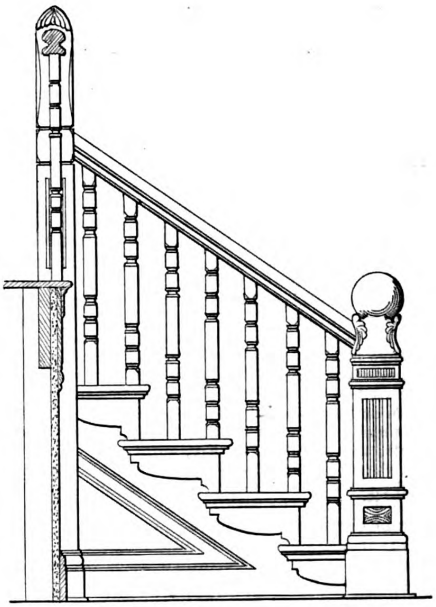
Detail of Finish in Parlor, Sitting and Dining Rooms.



Parlor and Sitting Room Mantel.



Dining Room Mantel.



Detail of Main Stairs.

Study in House Design.—Details.—Scale, ½ Inch to the Foot.

metal, had used it for the vehicle for slight thoughts and slighter execution. By far the greatest of our designer sculptors, the late Alfred Stevens, worked long and modern sculpture, the little lions on the outer rail of the British Museum, of which so many other artists were glad to keep casts by them as examples of breadth and grates also occupied his care. Although the invention of casting in iron was made very early, and was referred to by Pausanias, Pliny, and other classic writers, there

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was no evidence to show that casting iron was practised in England before the Middle Ages, nor at what time it was then introduced. M. Viollet-le-Duc supposed that it was known in France in the thirteenth century, to which date he attributed a fragment of St. Denis. In the fourteenth century cast-iron artillery was probably founded all over Western Europe, and it is likely enough that this may have introduced the furnaces into Sussex. Magnificent bronze sculptures were cast here in the thirteenth century by Torelli, the artist of the lovely Queen Eleanor and Henry III., at Westminster Abbey. There were in Sussex and Kent many iron grave slabs, the earliest of which, that at Burwash, was almost certainly in work of the fourteenth century, and many dated examples of subsequent ages existed, one of the latest known being one of 1752 at Wadhurst.

In the great open fireplaces where logs burnt on the hearth of hall and kitchen, cast-iron slabs called firebacks were put against the wall behind the fire. They were found alike in France, in the low countries and in England, and invariably charged with some device, arms, inscription, badge, or a scene scriptural or classic, an allegory or a fable, something to suggest a thought, as the pattern adorned the opening in summer, or burnt red-hot behind the winter fire; all these things were books. In the best of these the relief was kept flat, and modeled but slightly, never being rigidly carved with sharp definition. The ornament in Gothic example always gave some suggestion of life and growth, roses or vines, and letters were often reversed, and so used as parts of designs. The later firebacks were very numerous, although for the most part now in "collections" instead of adorning the cottage hearth or the hall for which they were specially made, for hardly any exact duplicates occurred, and in very many instances the arms or an inscription identified the former owner's family. The coat-of-arms were large or small, with or without supporters, or a number of small shields filled up the whole space; many had the Royal arms, others horsed warriors galloping in attitudes expressive of a consciousness of the converging gaze of nations. Many of the subjects were drawn from the Biblical or mythological story, and some devices referred to the Stuart Kings. The actual achievement in the poorest of these firebacks was low enough. Some were, in fact, almost grotesque, but yet they all had that fresh touch of a real motive—a direct reference to some expressive gesture or pleasant object; all treated with great simplicity, and that instinct for balance and spontaneous fitness and freedom in the ornament, without any forcing the material or obstrusive display, which was the mark of the traditional crafts. The system was, almost without exception, to keep a flat field, which showed in pretty wide spaces all over, and the modeling on this was in low relief—the less the better—evenly balanced and of equal length throughout, so that the light was distributed in narrow edge lines right over the surface.

To sum up in a word, a decorated piece of iron, instead of a cast sculpture of bossy high lights, and the ground lost in the weight of the relief. The firedogs or andirons which accompanied the backs on the hearth made a parallel series. De Caumont and Viollet-le-Duc cited examples of late fourteenth century and fifteenth century in France. Many of later date in England still carried on the Gothic forms. From an arched base, sometimes cusped, sprang a stem, which carried a small shield, a capital, or a head. These were interesting historically, but were not the models we should follow. We had seen enough of the "Gothic revival" in cast iron; what we wanted was new thought based on practical needs, and the Gothic spirit of a search for beauty untrammelled by formulas. Still later examples of the seventeenth century were figures or "terms," the best designed of which were signed "Carron," To be successful the figure should be just a solid post without weak projections or detail. Perfectly plain turned vase and baluster forms on a base, or obelisk-like posts on pedestals, were also used, and were as appropriate as any. Simplicity alone never failed; it was the charity of design that would cover a multitude of sins. To aspire was well, but to aspire vulgarly and fail vulgarly was to make art an offence and distaste. Mr. Lethaby described the grates that fill the older houses in London, for the most part, of excellent design, and remarkable examples of careful casting; some were, he found, quite plain with just a molding or two, and others were fluted and beaded all over with tiny ornament on flat surfaces; the simplicity of the general forms saved the ornament from being worrying. Having alluded appreciatively to the cast iron of China and Japan, with especial reference to the sword hilts, tea kettles and vases from the latter country, the lecturer turned to the wider aspect of the subject, remarking that he was not one of those who wished to see in iron a material for a new architecture; nor did he wish its extended use, rather inversely a smaller field, but that field as full of flowers as might be. But while we used iron in some degree, while we even needed iron, while it might grow into wider necessary use, we should lend what grace we might to it, so that if obtained with cost, the greatest of all cost—an unkindly labor—it might not be misspent and more than spoilt, used to insult a trained understanding in the brutality of its vulgar insolence. But art went with bad commerce, bad goods, bad society. It was true in every department of work, of all materials and every form of pay, what the ironmaster said to Emerson: "There's always good iron to be had; if there's cinder in the iron 'tis because there was cinder in the pay."

MEASUREMENT OF ROOFS.*

BY TRIANGLE.

THE ROOF shape shown in Fig. 45 is peculiar. As the four sides are alike, but one elevation is needed to show the building. The several portions of the roof are separated by two ridges which cross each other at right angles in the center, from which point four valleys radiate to the corners. Eight hips separate the gable portions of the roof from the inside surfaces. While a roof of the shape shown is seldom met with in ordinary buildings, it is quite interesting as showing that while the roof may appear quite complicated from an inspection of the plan or elevation, it is really composed of duplicates of two parts, as 8 and 12. In Fig. 46 is shown the shapes of parts as derived from plan and elevation; the same method being used as in Fig 44. The base of triangle *b h* 12 can be obtained from the line of eaves in plan or elevation, the hight being the same as *a' c* of elevation, which gives the shape of any of the four gables. The shape of any of the inner portions of the roof, as 8, is obtained as previously described, *a' d* of elevation being taken for the altitude as shown by *a x*, Fig. 46, and *x c d* being the same as *x c d* of elevation. The valley line is shown by *a d* and the length of hip by *a c* of 8′ and *b c* or *h c* of 12. If the valley line only was required we would draw A D equal to *a d* of plan and D X equal to hight of roof. Then A X would be the length of valley, which should be the same as *a d* in shape 8′. This example illustrates in a very forcible manner the inaccuracy of a rule-of-thumb sometimes employed by the tinner in calculating hips and valleys, which is about as follows: Measure the length of the rafter as shown in the side elevation, then the length of the line occurring between 9 and 12, and add for the increased length in the hip or valley according to judgment. Referring to the plan, it will be seen that this line represents both a hip and a valley, and that the two differ materially in length. By applying the rule that we have already described and figuring the length of the hip and valley in this case its usefulness will be clearly demonstrated.

In Fig. 47 we have a roof between the valleys and side-hip portions of which are triangles similar to those described in Fig. 45, but reversed in position. Those in Fig. 47 are so located that the base is at the eaves, while in Fig. 45 the base is uppermost, being against the ridge. In Fig. 47 the ridge is of the same hight as shown in elevation; and the length of 1, 12, 6 and 7 is the same at the eaves as shown by plan. Taking 12 of roof-plan as an example, on account of the triangles 10 and 11 being located with the base at the eaves, 12 must be a different shape from 6 or 7. The length 7 at eaves can be obtained from plan or end elevation, the hight being *a c* of side elevation, shown by shape 7. The length of shape 12′ at eaves can also be obtained from plan or elevation, the hight being derived from *m n* of end elevation. The length *g′ k′* of shape 7′ at eaves can be obtained from plan or end elevation, the hight being *a′ c′* of side elevation. The length *b′ h* of shape 12′ at the eaves can also be obtained from plan or elevation, the hight *m′ n″* being derived from *m n* of end elevation. If we desired the length of valley we would take the line *b d* of plan for the base of the triangle, as E B, and the hight of the roof for the altitude, as E D; then D B would be the length of valley. In side elevation *a b′* shows the valley line of 9, and it might be thought that as D B is the length of valley that by extending *d c′* and *b′ a′*, as shown by D C and B A, the lengths being equal, that D C A B would be the shape of part of roof shown by 9 in elevation. By looking on plan we see that 11 joins 9, and we might get the shape of 11 by drawing the line *o p′* parallel to A C, then extending E A so *p′ r′* would equal *p r* of plan, and that *p′ r′ o* would be the shape of 11, *p′ o* being equal in length to *d′ k′* of 7′ and *r′ o* to *h n″* of 12. That the shapes thus obtained for 9′ and 11′ are wrong is quite evident.

While D B gives the length of valley, to obtain the shape of 9, *s b′* of side elevation should have been taken for the base of triangle and *b′ d* for the altitude; then by

*Continued from page 102.

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proceeding as above the shapes of 9′ and 11 would have been right. This example illustrates how easy it is to make a mistake if the wrong lines are taken for the base or altitude when drawing triangles. The shape of 7′ is obtained from side and end elevation, g' k' in end elevation, and the altitude s' d'' the same as a' c' of side elevation. The shape 12′ is obtained in a

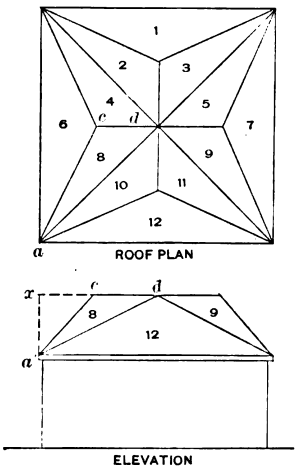


Fig. 45.—Hipped Roof Having Unequal Slopes in Different Portions.

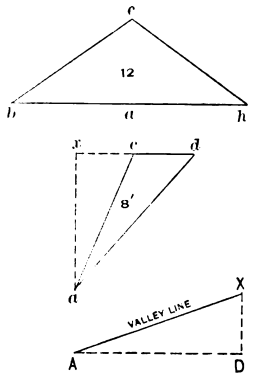


Fig. 46.—Roof Shapes Derived from Fig. 45.

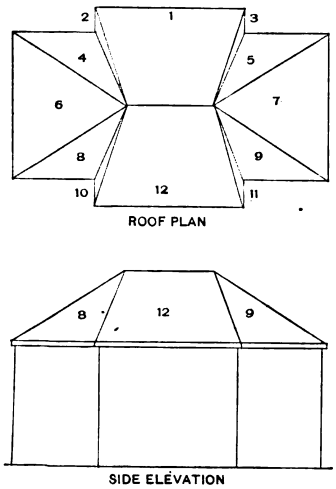


Fig. 49.—Another Form of Pyramidal Roof.

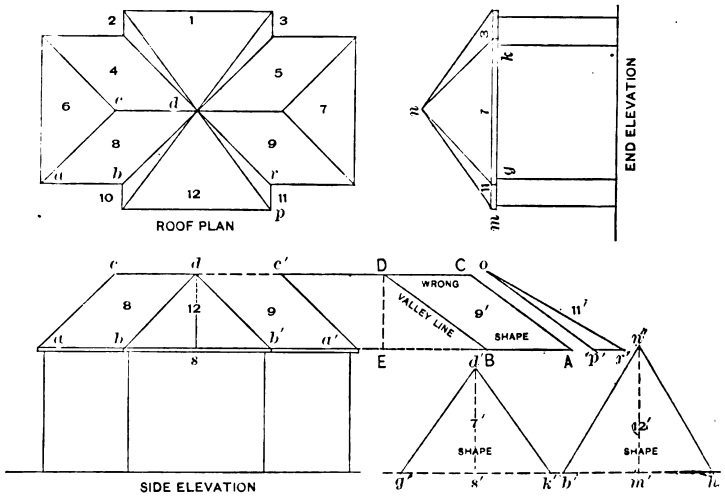


Fig. 47.—Building Roofed Pyramidally, Plan Being Intersecting Parallelograms.

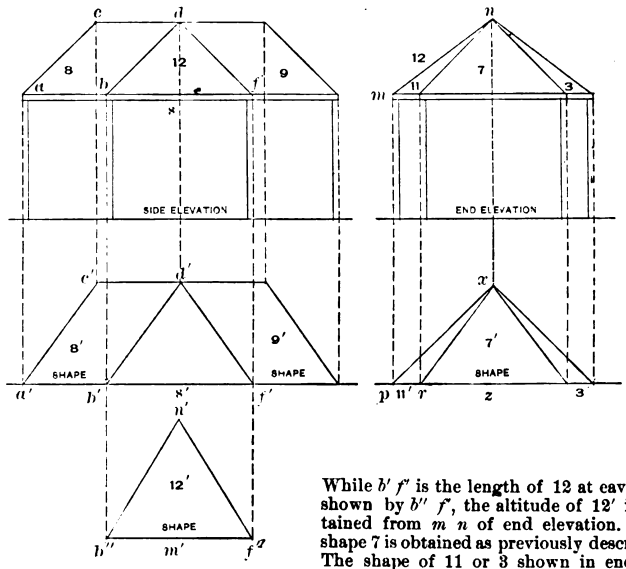
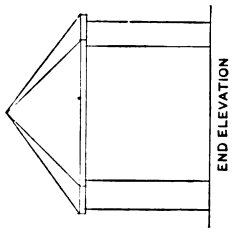


Fig. 48.—Roof Shapes Derived from Fig. 47.



similar manner, the base of triangle, as b' h, being the same as b b' of side elevation and the altitude m' n'' being derived from m n of end elevation.

In Fig. 48 is shown another method of obtaining the roof shapes from the side and end elevations, the elevations being the same as in the previous figures. In this illustration it is plain that in the shape 8′ the length of a' b' at eaves and c' d' at ridge are the same as in side elevation, the hight, as s' d', being equal to a c of side elevation. The shape 9′ is obtained in a similar manner. A mistake might be made by taking b' d' f' for the shape of 12. While b' f' is the length of 12 at eaves, as shown by b'' f'', the altitude of 12′ is obtained from m n of end elevation. The shape 7 is obtained as previously described. The shape of 11 or 3 shown in end elevation, is a triangle whose base can be obtained from end elevation at line of eaves and whose altitude is the same as that of 7′, z x being the same as a c of side elevation and p x the same length as b' n' of 12′, as r x is the same as a' c' or b' d' in shape 8′.

Fig. 49 is another variation of the same general style of roof, and as the shapes are obtained in a similar manner to those in Fig. 47 or 48 an extended description is not necessary. Two sets of triangular shape occur adjacent to the valleys, while a triangle also forms the gable ends of the building similar to the figures which have preceded. The side portions of roof, indicated by 1 and 12, are trapezoids in shape, the rule for calculating which has already been given. From the examples of different-shaped roofs that have been presented it is hoped the reader will be enabled to figure the surface of any roof he may encounter. Having obtained the surface of a given roof it does not follow that the figures indicate the amount of material required. Suppose the roof shown in Fig. 45 was to be covered with tin, and from the plan and elevation the surface of the roof had been obtained. In laying the tin on a roof that has such a number of triangular shapes there is apt to be more or less material wasted—just how much would depend on how the material was

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worked, but in estimating this fact should be taken into consideration and such allowance made as may be necessary so as to cover all contingencies.

India Ink and Its Use.

The question, how can we select good india ink? often presents itself to those who are about to take up the study of mechanical drawing, says a writer in one of our English exchanges. Our object in this article is to answer this question and give some hints in regard to the use of the ink. Our remarks relate only to black ink. In using india ink, it must flow smoothly through the drawing pen, so that an even or unbroken line of any degree of fineness can be drawn; any grit in the ink will cause the lines to be broken, and often give them a ragged appearance, and these annoyances become more marked when an attempt is made to draw fine lines. Hence, in selecting ink, the following tests should be made: Rub the ink on the wetted end of a finger; if it is good ink, it will immediately produce a dense black spot, and while wet it will have a smooth, bordering on an oily feeling; if there is a rough or gritty feeling, the ink should be condemned. When the spot becomes dry, it should have a brilliant luster; a dull appearance indicates a poor quality of ink, which is often worthless.

Lines drawn with good india ink simply lie on the paper, the ink does not eat into it. This property is very desirable, because, if the ink does eat into the paper, neat erasures, when necessary, are impossible. But, to give the ink a practical worth, some adhesive substance is mixed with it during its manufacture. Hence, all india inks possess, to a more or less degree, an adhesive power. Good ink possesses a great adhesive power, and is determined by the following test: Draw a broad black ink line on the paper, and when dry apply the india rubber in the same way as is done in erasing a pencil line. Under this test the line must remain black and continuous, and not show signs of injury. The line under this treatment may lose some of its luster, but this is not objectionable so long as the line remains black. Ink which cannot stand this test should not be used, because it is very annoying to lose or injure some of the lines in cleaning a drawing, which will happen if poor ink has been used.

The next test is with the ink eraser. Erase a part of the line: if this can be done with comparatively very little danger to the paper the ink is good, otherwise it contains some substance which acts chemically on the paper, and therefore the ink is unfit for use. Of course in these tests the best kind of drawing paper should be used.

Good black india ink will form a perfect emulsion; when properly mixed it will not deposit a sediment, and, if allowed to evaporate, it will become more viscid. It may also be remarked that the better grades of ink, when wet, have an odor of musk.

For all line drawings the ink must stand the foregoing tests; if not, disappointments are sure to follow:

For drawings which are to be tinted, the ink must stand another test, which is by no means the least important one; we shall refer to it presently. Of course, in selecting ink it will not always be convenient to make all these tests in the store, but the first-mentioned test can, and should always be made before buying the ink, and, if satistactory, and besides this it has an odor of musk, there is a reasonable assurance that the ink is good. The other tests should be carefully made in the office, and if the ink cannot stand these tests it should be condemned.

For mixing the ink use saucers made for the purpose; they are generally sold in nests containing six, each one forming a cover for the other with the exception of one, which forms a cover for the nest, and when they are placed on top of each other, form a cylindrical pile about 2½ inches in diameter. China dishes are to be preferred to those made of slate, because the former have smoother surfaces upon which the draftsman usually rubs the ink. The reason for this will be presently seen.

To mix the ink, rub the end of the cake on the bottom of the saucer containing the required amount of pure water, until the emulsion has the required density. The density should be such as to produce very black lines; these lines will gradually have a luster when dry, provided the ink is good; the less the luster the less the density of the ink. In a general way, it may be said that the degree of luster of the line when dry indicates the degree of density. If the density is too great, the ink will not flow freely from the pen, which, of course, is an objection.

If the surface of the saucer upon which the ink is rubbed is rough, it will act like a file, and the emulsion will contain small parts of solid ink, which are very annoying in inking, as they will also prevent a free flow of ink through the pen.

For drawings which are to be tinted or shaded with the brush, emulsion of ink should not be of so great a density as that used for simple line work; the density should be such as to produce lines without a lustre, so that they will not wash out or blot when the wet brush is passed over them. This leads us to the last important test of india ink.

Draw on paper a medium fine ink line, and when dry pass over it a wet artist brush; if the line does not wash out or blot the ink is good, otherwise it should never be used for drawings which are to be shaded; in fact, any ink that will not stand a wet brush under the given conditions should not be used for any kind of drawing. The test line should not be a broad line, or line with a luster, because such lines, even if drawn with the best kind of ink, are liable to wash out, or blot more or less when touched with a wet brush. All that is needed is that fine lines should not wash out, for in brush-shaded drawings all lines, excepting the shade lines, should be fine and comparatively light in color. The shade lines should be put in after the drawing has been shaded.

In preparing the ink for shading with the brush, the cake of ink should be rubbed on the end of a wet finger, and this in turn should be rubbed on the bottom of the saucer; the cake should never be dipped in the water. The reason for this precaution is to avoid a deposit of flakes or solid ink in the water, which, if not avoided, will lodge on the brush, cause a spot on the drawing, and in some cases may effectually ruin the appearance of the drawing. In fact, this latter mode of mixing ink should in any case be preferred to that of rubbing the ink on the bottom of the saucer, because immersing and keeping the ink in water until sufficient quantity has been mixed will soften the cake, cause it to crack and throw off solid particles and flake in the water to the great detriment of the easy flow of the ink through the pen. Yet mixing ink is very irksome to the draughtsman, consequently the quickest instead of the best way is often employed. After a sufficient quantity of ink has been mixed, the cake should be wiped dry with a soft piece of paper, and not with a rag, because, using the latter, some of its fibers may adhere to the cake, and when the cake is again used these fibers will collect in the water, to the great annoyance of the draughtsman.

Cleanliness is of the greatest importance; the dish must be clean, the water pure, and the ink free from dust; and the ink, when mixed, must be kept covered, not only to prevent the dust from flying into it, but also to prevent its evaporation, which will soon cause the ink to become too thick, and unfit for use.

In making a tracing, trouble is often experienced with the flies eating the ink lines. To avoid this trouble as much as possible, we have found it to be advantageous to use only fresh-mixed ink, and have often rubbed up fresh ink twice a day. Yet even with this precaution, the trouble will not be wholly avoided, therefore the tracing should be kept covered as much as possible.

The best of ink is not exactly waterproof, consequently, if the lines on tracing cloth come in contact with a moist hand, they are liable to smutch; the moisture will also injure the surface of the tracing cloth. Good draughtsmen avoid touching a tracing with moist hands, and keep the tracing well covered, excepting that portion on which they are at work.

We do not recommend liquid ink sold in bottles; we have the same opinion of it as expressed by Professor MacCord in his book on "Practical Hints for Draughtsmen." The bottles, when properly cleaned, are good, which is more than can be said of the contents. Some draughtsmen speak highly of certain kinds of liquid ink, but we have failed to find any giving results as satisfactory as can be obtained with good india ink properly mixed.

Ordinary writing ink should never be used for mechanical drawing. It is injurious to the drawing pen, eats into the paper, so that neat erasures are impossible, and does not give that pleasant appearance to the drawing as india ink will do.

The Architect's Clerk.

BY MISS M. A. CONROY.

It chanced on a beautiful, bright summer day,
Young Dennis McFadden took Kitty O'Shea
For a sail down the harbor. Good natured was he,
And never grudged spending when out on a spree.

Now, Kitty was roguish and just a bit sly,
While Dennis, though manly, was yet very shy;
And when Kitty, said "Dennis, what thrade are you in?"
Poor Dennis told lies and thought it small sin.

So says he, "Shure I'll not kape that same in the dark;
If ye must know me thrade, I'm an architect's clark."
Now, this sounded grand, and so thought Mistress Kate;
When he asked for her hand he had not long to wait.

Soon after, as Kitty, her "afternoon out,"
Was leisurely walking and strolling about,
She spied her brave Dennis, with mortar and hod;
The rounds of a ladder he fearlessly trod.

Kitt. loved him no less that his calling was low,
But felt rather sad at his cheating her so,
And she called, sweet and clear (he felt ready to sink),
"Have a care, Dinny darlin', ye might spill the ink."

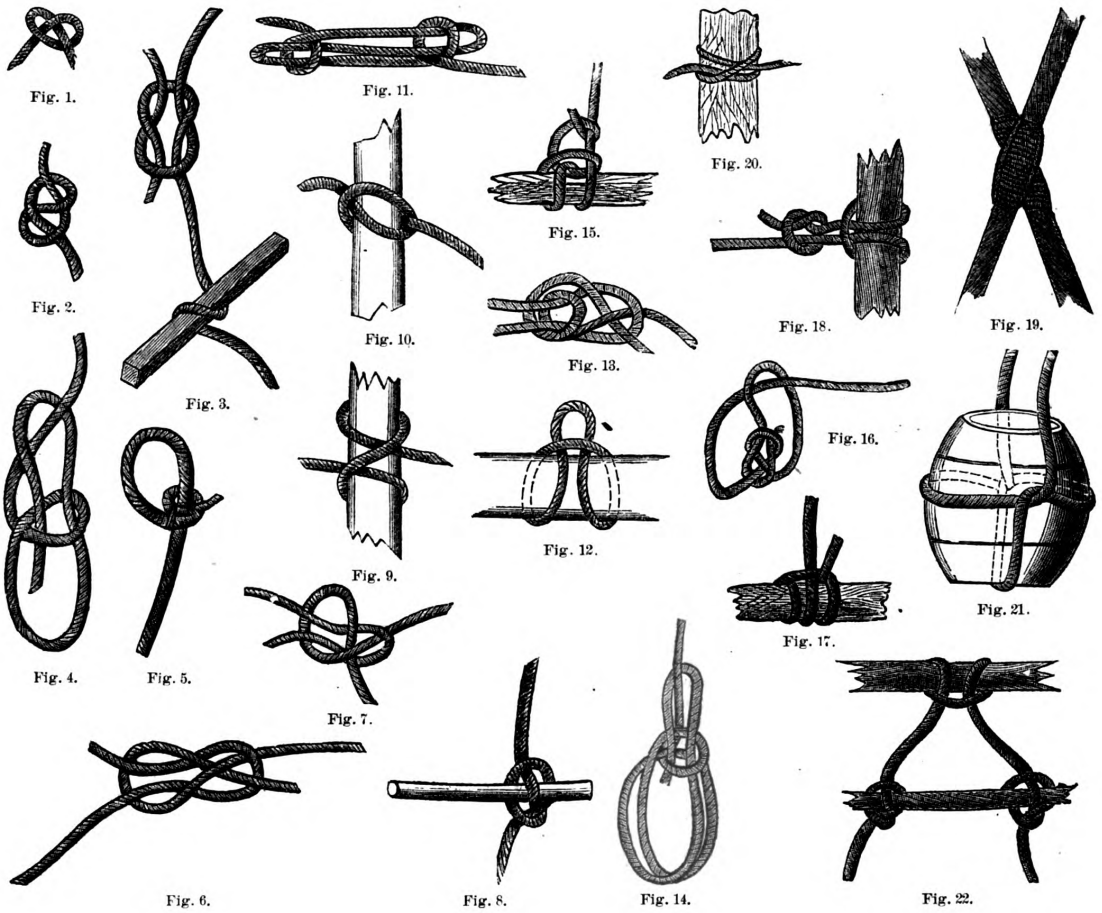
—*The Western Architect and Building News.*

A GLAZED SKYLIGHT, so constructed and arranged that leakage will be entirely overcome and that the bars and lights may be readily secured together without the use of nuts, bolts, screws and other similar fastening device, forms the basis of a patent lately granted to Neil Campbell, of Jersey City, N. J. Attention is also called to the fact that danger of breaking glass in securing it in position is wholly overcome.

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SCAFFOLD KNOTS AND HITCHES.

CARPENTERS and builders are frequently called upon in the execution of work to erect scaffoldings of various kinds, in which they employ ropes to a greater or less extent, and a knowledge of the manner of scientifically constructing knots and hitches cannot fail to prove valuable. In the accompanying illustrations we show a number of scaffold knots which can be employed to advantage for the purposes named. Fig. 1 shows what is known as a thumb or over-hand knot, and its use is to tie at the end of a rope to prevent it open-



Scaffold Knots and Hitches.

ing out. Fig. 2 is called a figure-of-eight knot, and its use is to prevent the running end of a fall passing through the sheaves of a block. Fig. 3 is a packing stitch hitch. Fig. 4 is a bowline knot, which will not run up or tighten. Fig. 5 is what is known as an inside clinch and is used for fastening the cable to ring of anchor, also the standing end of the gin fall to the lower block. Fig. 6 is a common or sheet bend, sometimes called single bend; also a weaver's knot, and is used in joining two ropes or securing a rope through an eye-splice. Fig. 7 shows the same kind of a knot as that indicated in Fig. 6, but is hauled nearly taut. Fig. 8 shows a woolding stick hitch Fig. 9 represents a clove hitch for making fast the bight of a rope to any object. Fig. 10 is a half hitch, and is made by passing the running end of a rope around the standing part, and bringing it up through the bight or loop part Fig. 11 shows what is known as a sheepshank, or dogshank, and is employed for the purpose of shortening a long rope without cutting or injuring it. Fig. 12 shows what is known as a bale sling, and forms a loop to pass over the hook of lifting tackle. Fig. 13 is a double bend. An addition is made to the single bend, when a small rope is bent on to a larger by passing the end a second time around the bight of the rope. Fig. 14 is a double butt or barrel sling placed horizontally. Fig. 15 shows a fisherman's bend, for spar or scaffold poles. Fig. 16 is a running bowline knot. This gives a running loop which will readily tighten up. Fig. 17 is what is known as a magnus hitch for timber. Fig. 18 is a lark's head, and is employed as a fastening to a running knot. Fig. 19 is a Portuguese knot, made by several turns of a small rope around two shear legs, hauled taught and interlaced at the ends. Fig. 20 is a builder's knot, used by workmen in securing building materials. When tied it cannot become undone, owing to the great friction between the parts. Fig. 21 shows a butt or barrell sling when lifted endwise. Fig. 22 is known as a drag rope or lever hitch. An extended description is unnecessary, as the illustrations are very clear.

A VALUABLE and interesting pamphlet, entitled "The Ventilation of Buildings," has recently been sent us by the author, Alfred R. Wolff, M.E. Mr. Wolff is a recognized authority in several branches of engineering, and has given much attention to ventilation and kindred topics. The pamphlet before us opens with a general consideration of the question of ventilation, the subject being presented in a way that will interest and instruct the ordinary reader. Rules and tables concerning the flow of air and the ventilation of buildings follow the introductory portion, while at the close the several methods of heating are considered in their bearing upon the question of ventilation. The pamphlet, though a brief one, shows the result of careful work, and the formulas presented are of a simple sort, and can be readily applied.

A RECKLESS INVENTOR of a "fire escape," consisting of an aluminum steel tape, dropped himself 200 feet over the rocks at Niagara Falls and landed safely.

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CORRESPONDENCE.

Steel Square Notation by Means of Vulgar Fractions.

From FRED LASCY, *San Francisco, Cal.*—The magnitude of a right angled triangle is often shown by means of a vulgar fraction containing both legs of the r-a-t, arranged according to an invariable law. We may write any angle:

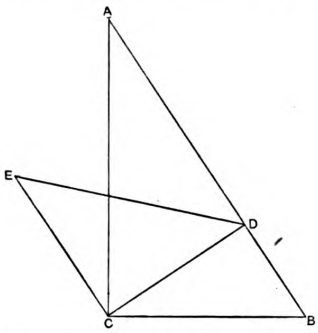
$$= \frac{\text{leg opposite to vertex}}{\text{leg which cuts vertex}}$$

Referring to the diagram,

$$\text{angle } a = \frac{c\ b}{c\ a} = \frac{dc}{d\ a} \quad \text{angle } b = \frac{c\ a}{c\ b} = \frac{d\ c}{d\ b}$$

$$\text{angle } e = \frac{c\ d}{c\ e}$$

These fractions indicate at a glance the manner of laying off these angles by means of a steel square on a line. On one arm place the numerator of the fraction; on the other arm place the divisor of the fraction. Always mark along the arm which represents the divisor, or leg which cuts the vertex, and thus form the required acute angle. Briefly stated, always mark the lower part of the fraction. Any vulgar fraction may have both its parts either multiplied or divided by the same number without altering its value.



Sketch Accompanying Letter from Mr. Lascy.

For example: A regular hipped roof has its common rafters equal to 216.3 inches, of which $\frac{\text{rise}}{\text{run}} = \frac{120}{180} =$.

Required to show the bevels for the purlins where they meet over the hip.

$$\text{Top face bevel} = \frac{\text{rafter}}{\text{run}} = \frac{10.8}{9}$$

$$\text{Down face bevel} = \frac{\text{rafter}}{\text{rise}} = \frac{10.8}{6}$$

All the other required bevels may be written from given data.

Example: A square spout slopes with all four faces equally oblique to the horizon. The two upper faces form a ridge of which

$$\frac{\text{rise}}{\text{run}} = \frac{c\ a}{c\ b} = \frac{96}{144} = \frac{8}{12}$$

The sloping spout may butt at both ends against vertical planes. It may butt at both ends against horizontal planes.

Required acute face bevels for ends in both cases. It is more convenient to use smaller fraction.

Ridge at both top and bottom $= (12^2 + 8^2)^{\frac{1}{2}} = 14.4\ (2)\ \frac{1}{2} = 1.4142$.

In the first case acute face bevel

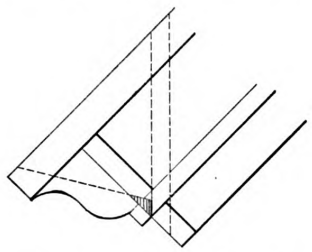
$$= \frac{\text{run}(2)^{\frac{1}{2}}}{\text{rise}} = \frac{17}{8}$$

In the second case acute face bevel

$$= \frac{\text{rise}\ (2)}{\text{run}} = \frac{11.3}{12}$$

To show the shape of one-fourth the diamond hole formed at both ends we must place at right angles to each other: In the first case, ridge and run. In the second case, ridge and rise. In the diagram or cardboard triangle, *d c e*, with two equal legs, must stand upright on plane of paper and on *d c*.

When so upright, shapes of bevels and diamonds are before us ready for use.



Rake Intersecting Level Molding.—Fig. 1.—Sketch Showing Cornice With Rafters Cut Square.

From these cardboard bevels are deduced, by proportion of similar triangles, the bevels given in the text, which are to be preferred because they do not require any diagram. These bevels may be tested by means of a square block of wood with all four faces equally oblique to the horizon, placed in a miter box and cut according to the angle between the ridge of the spout and the plane against which it butts.

Rake Molding Intersecting a Level Molding.

From M. B. C., *Moreland, Ill.*—With regard to the inquiry of "J. N. B.," Burlington, Pa., which appeared in the November number of *Carpentry and Building*, it appears to be the general conclusion that a rake and level molding for the same size and profile cannot be mitered together so as to member. Well, let us see. In the first place we will draw a cornice having the ends of rafters cut square as shown in Fig. 1 of the sketches which I inclose. Every carpenter knows that a molding of any size or shape will miter round a cornice having its fascia square with rafter. Now draw the dotted lines showing the position of fascia when plumb and I think it will readily be seen that the position of the molding has not been changed; only the position of fascia. If a machine mold is used then the level mold will stand on the point of its fillet. If the mold is hand-made the bevel can

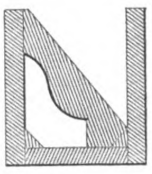
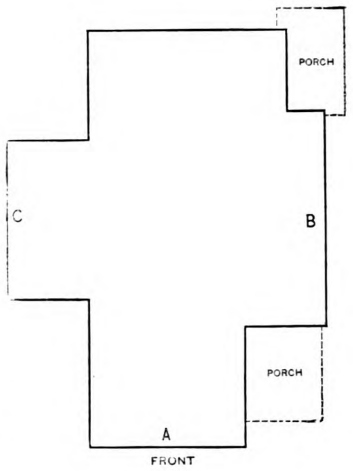


Fig. 2.—Mold in Miter Box.

be worked on the back of the fillet as shown in Fig. 1. In the miter box, Fig. 2, corner pieces are placed and the bevel on back fillet placed against them, as shown. Then cut through the mold as in any miter box. This can be demonstrated by taking a square box and drawing a line of any given angle across an end and a level across one side; nail two pieces of molding together to miter square; place one piece on the level line and the other on the pitch line on the end of the box and I think that it will be readily seen that it can be done.

Problem in Roofing.

From F. D. R., *Decatur, Ill.*—I inclose the plan of a house, for which I desire to learn from the readers of *Carpentry and Building* the style of roof that will look



Sketch Submitted by "F. D. R."

best upon it. I desire to have a gable at A and C and a hip at B. The roof to be half pitch at A and C and the house is to have a square cornice.

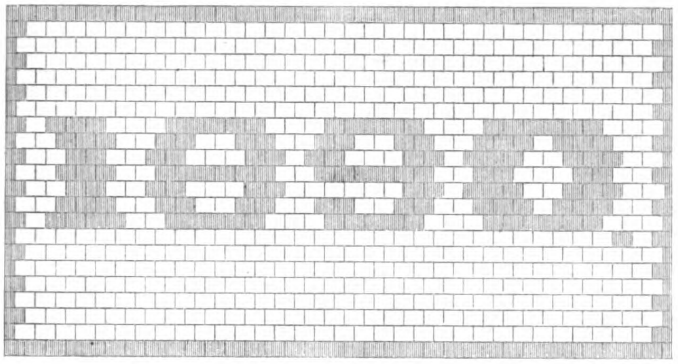
Slate Roofing.

From L. S. B., *Waynesburgh, Ohio.*—Instead of there being an apparent tendency to supersede slate for roofing purposes with some other material, it is almost universally employed in this section of the country for the covering of buildings. One reason for this undoubtedly will be a surprise to slaters in the East. Nevertheless, it is a fact that one of the reasons why so much slate is used in Ohio is because of its cheapness. Slate has been put on and finished in good style as low as $4.50 per square. The usual price, however, is $5 per square for No. 1 sea-green slate, surface of roof measured and no extras. The cutting of prices has caused the business of slate-roofing to bring in very small profits. Nearly every cross-road has a tinshop and all tinners do slate-roofing. As a rule, they put on just about enough slate to cut the price and give a legitimate slate-roofer trouble. Happily, however, that disagreeable feature of the business will, I think, have to disappear, as an association has been formed, having for its object the protection of its members from contractors, consumers and persons not regularly engaged in the slate-roofing trade. A scale of prices has been made in fairness to persons owning buildings and to the roofer. A reasonable compensation alone is charged for work, and taken altogether, the object of the association is, in my opinion, most commendable, and one that is sure to prove successful. The association is known as the Slate Roofers' Protective Association, of Ohio.

Of late there has been a tendency to figure or color up a slate roof in a more elaborate style than was formerly the case; for instance, in a sea-green roof a design is worked in with black, or it may be black figured with green. The most striking

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contrast we have used was a sea-green body for the roof with a red border and the year worked with red in the center. As being of possible interest to readers of *Carpentry and Building*, I send a card as we handed it to our workmen. Every slate is marked on the card and all the workmen had to do was to refer to it when every piece would come right. The marking should be done at the shop, as with the card there is no delay in laying on slate. The workman can go along with the roof as readily as if it was plain. We have noticed slaters use a plastering lath at the end of the eave when laying the first or eave course. This was done in order to get the projection the right width. In my estimation this is a very inconvenient and tedious way. First find where the back of the slate will come at both ends of the building. When you have determined the projection you desire to give, then "line" for row clear across the building. One operation gives the edge for the entire row.



Slate Roofing.—Treatment of a Roof as Suggested by "L. S. B."

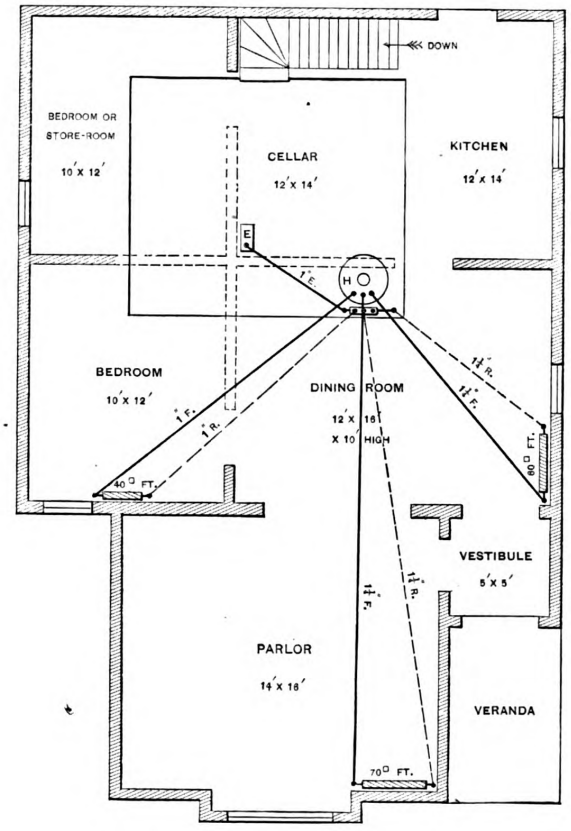
In flashing chimneys Portland cement may be used and painted the color of the slate, which makes a strong and very pretty finish. Nails should never be driven through the flashing into the chimney for the reason that the wood-work of the roof will settle more than the brick or stone in the chimney or walls and cause the flashing, if nailed, to tear up the slate. This may be entirely overcome by flashing and using Portland cement in the manner described in a recent letter of mine. Two-inch ridge roll is invariably used for finishing the comb and hips. Ten cents per foot is the price charged for it, yet rather than finish with slate and putty, a slater could almost afford to use it and get no pay, as the care to be taken and time consumed in cutting small pieces would more than compensate for the expense of the roll. One trouble with which the slater has to contend in doing country work is the persistency with which he will be requested to drive slate on an old building and have only the old lath to nail to. It is impossible to do good work under such circumstances. If all slaters would refuse to do it then the trouble would end. The old lath might possibly be used for a picket fence, but it is good for nothing else. The eager desire for work, however, gets the upper hand, and in order to accommodate his "Rural Lordship" we must put up with sore thumbs and suffer the loss of broken slate, as well as time wasted. This matter is one which will receive treatment at the hands of the Slate Roofers' Protective Association of Ohio. A fault often found and one that has a great tendency to condemn slate on a building having tin valleys around it and put on by an inexperienced workman, is in not allowing the valley to run up under the slate far enough. As a rule when one comes to examine a leaky roof, concerning which complaint has been made of the walls being damp, &c., it will be found that the valley tin is flush, or not more than an inch above the cornice plate board, whereas it should be not less than 4 inches above that line. Six inches would do no harm. If the 20-inch way of the sheet is not wide enough, put it together the 28-inch way. In either case, solder the tin on both sides, of course charging for extra work. It will not pay the tinner to slight the valleys.

Note.—We have made an engraving of the card sent us by our correspondent, and publish it in connection with his letter. There are a number of figures and directions upon the margin of the card which are not shown in the engraving. Each row of slate is numbered across the top as well as down the sides. Along the lower margin of the card are such directions as "length of rafters, 17 feet, 4 inches;" roof, 33 feet, 6 inches long;" "size of slate, 12 x 22," "total number of slate required, 637;" "number of feet in roof, 680 feet 6½ inches." An inspection of the engraving presented above will give our readers some idea of the effect produced by the treatment of a roof as suggested.

Heating System for a Small Dwelling.

From J. B., *Winnipeg, Man.*—Will you kindly inform a reader about the best method of heating a small cottage? I have just completed a small five-room cottage for myself, and I intend to heat it by steam or hot water. What I want to know is which is the best system and the cheapest and best heater that I can get? I do not intend to put it in this year, as the season is so far advanced; but I shall be able to do all the work in connection with it myself during the summer, and so save considerable expense.

Answer.—The particulars given by our correspondent in the sketch and in his letter are too general to permit a detailed reply. For this cottage heating by hot water is apparently more preferable, for this method, it appears, is more generally adopted in Canada. In such a small apparatus, if steam is used, the water line in boiler requires more attention than the water line in the expansion tank of a hot water apparatus. Attention to the water supply of such a hot water apparatus is only required every two or three weeks, according to the size of the expansion tank; whereas in a steam apparatus the water line should be noticed daily, and neglect of attention to it might cause serious damage to the small steam boiler. This difference of attention to the water supply is noticeable whether the water is

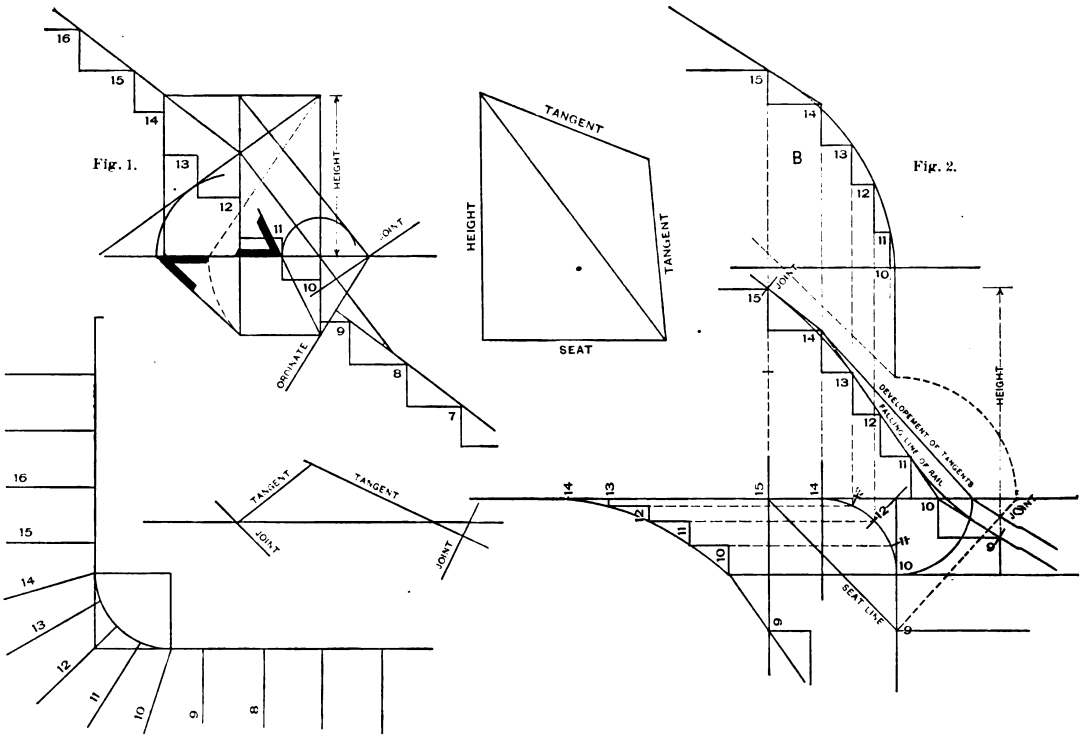


Heating System for a Small Dwelling.

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automatically supplied or put in by pail into either apparatus. On the cut made from our correspondent's sketch the sizes of the three hot water radiators are given, as well as the sizes of the flow and return pipes. The surfaces are only approximate, for they are of the capacity used in climates where zero is sometimes reached by the thermometer. The flow and return pipes should incline upward to the radiator. The expansion tank E should be near the ceiling of the story on which the radiators are placed or a little higher—that is, in attic, if so desired. It should be opened and have a capacity of about 5 gallons. The water can be supplied through this tank either from the town pipes or by pail. An overflow pipe should be led from the tank to discharge into sink in kitchen or other convenient place, where its opening will be exposed to view. With regard to the selection of the "cheapest and best heater," it is a matter in which it will be well for our correspondent to use his own judgment, based as far as possible on the experience of others with such heaters. There are a great many to select from, and many have equal points of merit. Our correspondent will find it of interest to read over the various claims made by the manufacturers of these heaters in their catalogues and pamphlets.

differs with "F. P. C." as to the position of the risers in the problem laid down, but if "F. P. C." would dispense with his tangents and make the rail to follow the stairs by using a falling mold and proper easings, I think the ramps would not be abrupt, as he seems to imagine. I have in diagram No. 2 laid down the same plan with elevations and development of both falling line of rail and falling line of tangents. The dotted lines are the development of tangents from joint to joint, which is not made at the springing but over risers 9 and 15. By so doing we get rid of the abrupt ramps that "F. P. C's" tangents would give, and would require no thicker stuff. The elevation at A shows no abruptness in the easement and at B it is the same. The two odd balusters, of course, cannot be avoided. A correct system of handrailing is one which will make the rail rigorously follow the stairs nosing on the falling line. Tangents can then be used, but not always to make joints square from. It will be seen in the diagram presented that the joints will not be square from the face of the plank. The drawing is not complete, but enough of it is given to show that the tangent system is not the best to apply to it. In diagram No. 1, the readers of *Carpentry and Building* will, no doubt, recognize Mr. Riddell's system and his good and reliable method of getting around the corner; but there are systems and systems—good, better, best. Should Mr. Sinclair, of Australia, publish a book on handrailing, I shall expect to see something away ahead of anything which has yet appeared. For simplicity, however, the American authors will continue to lead. Accuracy is not attempted. They have not the time.



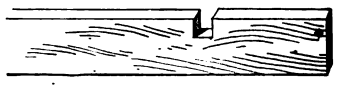
Diagrams Accompanying Letter of "W. G. P."

Problem in Handrailing.

From W. G. P., *Toronto*, Canada.—In the March number of *Carpentry and Building*, a reply is given by "F. P. C.," Lincoln, Neb., to the inquiry of "J. C.," Cedar Rapids, Iowa. In his letter "F. P. C." says that the plan outlined is "the most simple, the shortest, and the most easy of application" for solving the problem. I am not finding fault with it, but I am of the same opinion as Mr. Garvock, of Ottawa, and that is, that the system of tangents is not the best system for all kinds of handrails. I am suprised at Mr. Monckton's holding such lax views as he seems to do in his letter published in the January number. I notice that "J. C."

A Convenient Door Holder.

From G. W. M., *Newark, N. J.*—I notice in a recent issue of *Carpentry and Building* letters from correspondents giving their method of making devices to hold doors while planing to fit and putting on the butts. I send a sketch of a method which I employ with satisfactory results. I take a piece of plank or board a trifle longer than the width between the jambs of the door to be hung, and cut a jog for the door as shown in the sketch. I then put it down snug between the



Convenient Door Holder, as Suggested by "G. W. M."

jambs, a suitable hight from the floor, and just back of the stops and rabbet for the door. In this position it can remain while fitting the door. Raise one end of the door on the saddle and the other end on a block to bring it level, and "no grit" will get on the edges to dull the plane irons.

Hip-Roof Framing.

From C. E. S., *Tacoma, Wash.*—If the subject of roof framing has not been exhausted, I would be glad to learn some of the whys and wherefores of hip-roof framing. We are told by several, if not all authors, how to obtain mitre cuts of hips and jack rafters by applying a certain combination of figures on the blade and tongue of the square. To make myself understood I give the rule for cutting mitre of hip "length on blade, run on tongue, blade gives cut." Now, I know t does, but why. If some of the readers of *Carpentry and Building* would explain why these figures give the cut and at the same time present a geometrical demonstration it would greatly interest a number of the readers of *Carpentry and Building* in this section of the country. I have never seen an exposition of that style of framing, which we here call broken back, hip and valley-roof framing. I would like very much to see a discussion of this subject

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by some who have had plenty of experience in framing such work where the pitches are equal and also where the pitches vary. How is the valley cut, also the jacks? I should like to see particulars published with geometrical demonstration.

Framing a Barn.

From J. R. P., *McMurray Post Office, Pa.*—I have been a reader of *Carpentry and Building* ever since it started and am very much pleased with it. I notice a number of plans showing the framing of barns, and as the subject is one which interests me, will be noticed, are 4 x 6 inches, and the braces of the same size, framed inside past the girders.

From E. P., *Hanover, Mich.*—I have noticed for several months past various plans of barn framing which have interested me to such an extent that I send a few drawings showing the method of framing which I consider better than any of those yet published. The end beams should be reinforced by a 6 x 8 inch stick about 30 feet long, bolted on to the inside, as I have shown in Fig. 1 of the sketches. The rafters may be in two pieces, lapped easily be thrown under and over the beam until too high to fill, when it may be thrown on the scaffold and pitched from there until the bay is full. It seems to be the idea now-a-days to construct barns, and all other buildings, as near like shells as possible, in consequence of which we hear of numerous cyclones Fig. 3 of the sketches shows a side elevation of a barn framing according to my idea, while Fig. 2 is an end view. As "J. K. T.," whose letter appeared in the December number, invites criticism on his barn frame, I will say that I should hardly think that it would require much of a cyclone to burst it up. The idea of tying a barn 36 feet wide, together

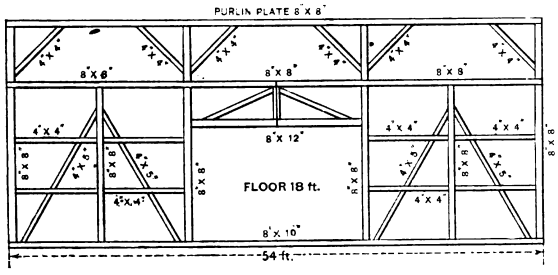


Fig. 1.—Side Elevation of Barn.

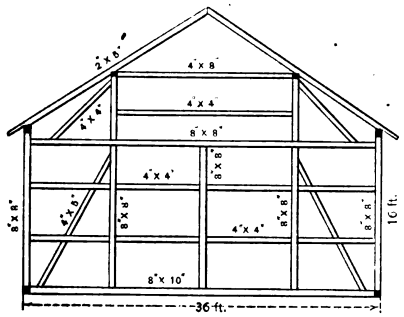


Fig. 2.—End View.

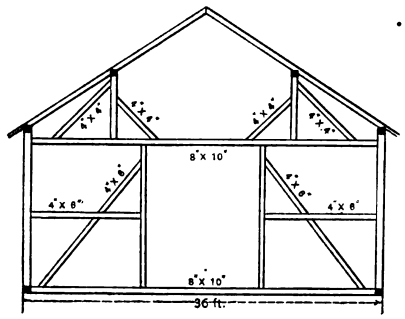


Fig 3..—Side Bent.

Diagrams Submitted by "J. R. P."

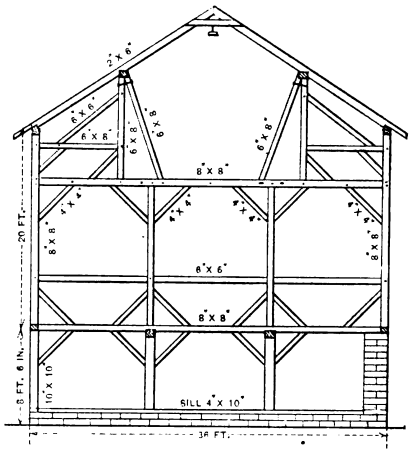


Fig. 2.—End View of Barn.



Fig. 1.—Re-enforced Beam.

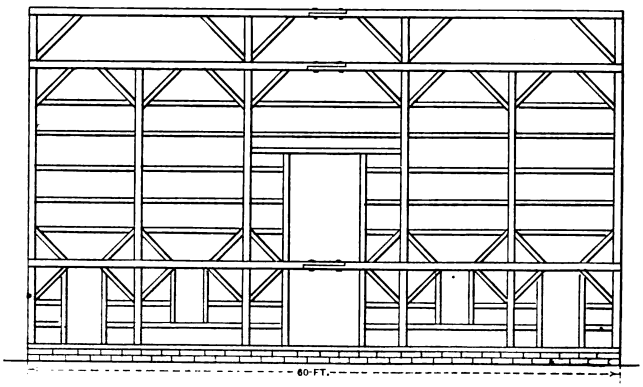


Fig. 3.—Side Elevation.

Sketches Sent in by "E. P."

Framing a Barn.

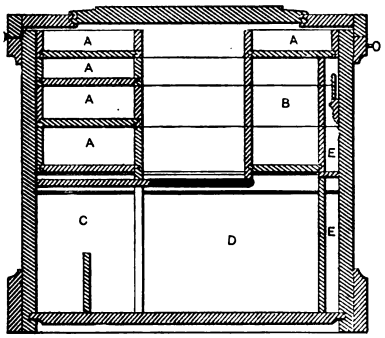
I take the liberty of sending a few rough sketches, showing my method of framing barns. I frame in long braces, 18 feet inside of stringers, and spike the stringers where they cross. The plans which I inclose will, I think, explain themselves. Referring to the sketches, Fig. 1 shows the side view of a barn 36 x 54 feet in size. It is drawn for 16 feet to square, which is the way we usually build barns out here. Fig. 2 represents an end view of the barn, while Fig. 3 represents a bent on the side of the floor. The girders, it at the purlins, spiked together and also well spiked to the purlin plate. The roof boards should be put on with joints well broken and well nailed, and then there will be no necessity for the plate brace rods shown by "F. K.," in his letter published in the March number. I should think they would be a great deal in the way when it came to storing hay and grain. My plan gives two scaffolds over the driveway, and there is ample room between the purlin work for the passage of a hay carrier. If grain in bundles is being housed it can with an occasional 2 x 8 inch and 2 x 6 inch, nailed on, is to my mind, very poor construction.

Convenient Tool Chest.

From F. B. C., *Jersey City, N. J.*—In reply to "R. G. M.," I send the following sketch of a tool chest, which I consider a very good one. The chest is 24 inches high, 25 feet wide and 39 inches long. The compartments marked A in the sketch are tills, and are arranged to slide in the usual

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way—lifting out. B is a sliding tray for saws arranged to lift out in the same manner as the tills. C is a space to hold molding plans. D is for bench planes and other heavy tools. E E a space for packing squares, the larger of which rest in cleats on the side of the chest, the other



Sketch of Tool Chest, Accompanying Communication from "F. B. C."

blades sticking through slits cut in the ¼-inch strip dividing the space. The smaller ones are simply stuck through the strip. A sliding lid is arranged between the lower till A and the compartment C, which is used to divide the space between the tills from space D. The former may then be used for drawings.

Figuring Lumber Bills.

From CONSTANT READER, *Freeport, Ill.*—Will some of the contractors and builders who are readers of *Carpentry and Building* give me the first principles of figuring the lumber bill of a house, the dimensions of which are 22 x 34 and 16 x 20, 18 feet high? The house has an octagon bay window 9 feet high, which is also the hight of the first story. The roof is one-half pitch. I would also like to know the amount of labor required to do the work at $2.50 per day; also the quantity of nails. I should also be glad to have methods for obtaining the estimates of the work, the method of painting two-coat work, &c.

Length of Jack Rafters.

From D. J., *Calgary, N. W. T.*—In answer to "H. W.," of Lebanon, Pa., in the April issue, I would submit the following: Draw a right angled triangle representing the pitch of the roof, and having its base one foot long. Mark it off into inches, and through these points draw lines parallel with the vertical side and cutting the hypotenuse. In this way every inch will be proportionally longer on the hypotenuse, as the whole rafter is longer than the horizontal portion of the building over which it sits. Now, mark off on a stick, the length of this hypotenuse, which the correspondent is to use as his unit of measurement—namely, 12 inches. Then mark off on the plan, if he has one (a free hand drawing will do), the distance from the corner or end of the plate to where the rafter rests on it. These distances will be the runs of the several rafters, and which, measured off with the new rule (the hypotenuse) upon the timber, are the lengths required. The correspondent should, of course, make due allowance for half the thickness of the hip rafter, which is the same on each one. I think this method will be readily understood when it is considered that the hip rafter makes an angle of 45 degrees with the plate. The run is always equal to the distance from the foot of the rafter to the end of the plate.

Hints on Wall Decoration.

We take the following hints on wall decoration from a recent number of *House Painting and Decorating:*

The requisite preparation of walls before paper-hanging varies according to the apartments. If it is a newly built house, it will be necessary to ascertain that the walls are thoroughly dry, and should damp be observed in any part after a sufficient time has elapsed for the mortar and stonework to dry, means must be adopted either to cure the defect or to keep the damp back from the paper when it is hung. If this is not done the damp will disfigure the paper, which it will mildew and cause to come off the wall. Very often damp-proof paper will for a long time effectually resist the damp, but thin sheet lead must be resorted to where the first proves insufficient. Many walls will be better with a coat of thin size before commencing to hang the paper, and in the best rooms, where good paper is meant to be hung, it would be advisable to first hang lining paper. This gives a smooth foundation to work upon, and an expensive paper is not then likely to be stained from the back from any cause. Where a room is meant to be repapered, all the loose paper must be torn down and defects in the walls made good by pasting on brown paper, while crevices requiring to be stopped round doors, windows, fireplaces or cupbords must be made good with plaster. When bedrooms require repapering, it is sometimes advisable, and it may be also the wish of the occupier, to have the whole of the paper stripped off, which is certainly best from a sanitary point of view. In that case the washing down brush and some warm water will soon effect the desired end. Where walls are in a very bad condition it is oftentimes best to plug them, and put up battens upon which canvas can be tightly stretched, tacked and sized. Be careful not to put the battens too wide apart, or the canvas may strain and get loose. We have adopted this method with an incurable damp wall with good results.

Ill-proportioned apartments—that is to say, rooms which are too high or too low—require special treatment at the hands of the decorator to produce a satisfactory result. Should a tall room have a paper in which the pattern is arranged in vertical lines, or a low room have a wall pattern arranged in horizontal lines, it is needless to remark that such an utter disregard of proportion will tend to emphasize the architectural defects. In the case of a room being too high for its floor space, the proper thing to do is to provide the wall with both frieze and dado and to make both of exceptional depth. Where a low dado has already been provided by the builder, it would be proper to add to its hight by placing a bold border, 18 inches or more in width, right above the molding. The horizontal lines ought to be accented as much as possible by choosing a paper in which the design has a decided tendency to a horizontal arrangement, which gives the effect of lowering the too high ceiling. The wall space proper is surmounted by a deep frieze. If the doors and windows are so high that a deep frieze seems impossible, it is better to ignore their hight and allow them to merge into the frieze. The longitudinal moldings in the cornice should be emphasized with color as much as possible. This method of decorating the wall will mitigate to a large extent the ungainly hight of the room. Sofas and other oblong pieces of furniture will naturally be placed where they will do the most good, and portières and window curtains decorated with broad horizontal bands can be chosen with advantage.

Where a room is low studded, the opposite method of treatment should be adopted. It is a good plan to cover the walls with a series of high narrow panels, the field of which ought to have the pattern disposed in vertical lines, The dado must be very low and the frieze very narrow, which treatment will give an apparent increase of hight to a room. No horizontal bands should be allowed on the portières or curtains, which should hang in straight folds. The sideboard should be chosen for its high panels, and a high narrow bookcase will be a proper accompaniment thereto. In decorating apartments in the manner described vertical lines will give a much greater emphasis than the horizontal treatment.

NEW PUBLICATIONS.

THE CITY RESIDENCE; Its Design and Construction. By W. B. Tuthill, A.M. 183 pages. 287 illustrations. Published by William T. Comstock. Price, $2.50.

This work, as its title indicates, treats upon the construction and design of houses to be erected in large cities and towns, and covers the dwelling-house, the tenement-house, and the apartment-house. As the literature of this particular branch of architecture is confined within somewhat narrow limitations, this addition will be regarded with interest by those engaged in the building trades. The work is divided into 14 chapters, some of which cover masonwork, ironwork, carpenters' work, stairs, plastering, sheet metal work, mortars and concretes, stone working, elevation and painting. The author is well-known to our readers from his works on Practical Lessons in Architectural Drawing and Interiors and Interior Details.

SPON'S TABLES AND MEMORANDA FOR ENGINEERS. By J. F. Hurst. Tenth edition. New York. E. & F. N. Spon. 2½ x 1¾ inches. 135 pp. 40 cents.

This is a gem. Here a large volume is packed into miniature size. In clear, diamond type. Engineers, superintendents, contractors and workers in the principal trades have in it nearly all the data needed for rapid calculations of material, labor and prices. One's thumb, if a large one, will cover this handy volume, which can be carried thousands of miles as easily as a postage stamp. There are many valuable formulas in these pages, for careful computations. Every military officer, surveyor, prospector, artisan, traveler and employer should have it in his vest pocket.

EVERYBODY'S HAND-BOOK OF ELECTRICITY With Glossary of Electrical Terms and Tables for Incandescent Wiring. Illustrated. By Edward Frevert. Lynn, Mass., Bubier Publishing Company. 25 cents.

For the 250,000 persons said to be employed in the manufacture of electrical inventions there should be hand-books like this as accessible as the innumerable guides to railroad travelers. The utilization of electricity has been rapid and marvelous, like the force itself. It is estimated that in this country alone $600,000,000 are already invested in electrical contrivances. In cheapening motive power it is producing an economic revolution, the effects of which in the next 20 years can hardly be conceived. This hand-book gives a description, in simple and comprehensible language, of the history of this force in human uses since its discovery at the beginning of the seventeenth century. It explains the general principles of a dynamo electric machine, and then by brief statements and clear illustrations gives one a distinct idea of the various inventions of dynamos, motors, railways, batteries and the mechanical processes in their construction, to which electricity has been applied.

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PLUMBING OF A LARGE BUILDING.

IN THIS CITY, on lower Broadway, there is a structure which is very aptly called the Tower Building. It extends from Broadway to New street, a distance of 170 feet, its frontage on the former thoroughfare being 21 feet and on the latter 42 feet. On its 13 floors are some 120 offices and other apartments, each of which is fitted up with the most modern plumbing appliances and conveniences. The plumbing throughout is done in the very best manner by the well-known firm of sanitary plumbers, James Muir, Sons & Co., 27 East Twentieth street, New York.

In the first floor, which is the cellar floor on the Broadway end, the boilers which supply the steam for pumping, lighting and heating purposes are placed. The cellar supply tank is built up above it contains eight offices with wash-basins in each and one slop sink in back hall. The fourth to ninth floors inclusive have each nine offices with wash-basins in each room, and one slop sink on each floor, while the tenth to twelfth floors inclusive have each eleven rooms with wash-basins in each and one slop sink on each floor. On the thirteenth floor are the architects' offices, one other office each with wash-basin, the janitor's apartments consisting of four rooms with basin, kitchen sink, wash-tubs, bath and closet, and the main toilet-room with floor and walls of marble and fitted with eighteen closets, three urinals and two wash-basins. The architect's office in the tower being on the same level as the roof on which is placed the water-tank, is furnished with a hand-pump the slop sinks are imported earthenware, with flushing rim, supplied from a small copper-lined cistern over each, and operated by a chain and pull. Over each sink are hot and cold water draw-cocks, supplied direct from tank pressure for drawing water for cleaning purposes. There is no wood work inclosing or surrounding the connections of fixtures, all work being open and accessible. Lead pipes are used to make the connections between the fixtures and the Y fittings, and the points of these connections are of brass soldered nipples and thimbles. To use these large number of fixtures some twenty-three (23) vertical lines of pipes, about one hundred and thirty (130) feet high, are necessary. The positions of these pipes are shown on plan Fig. 1. There is the 5-inch diameter

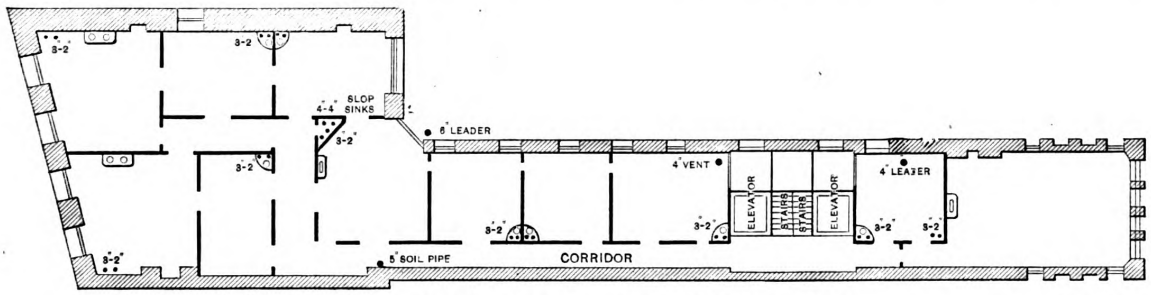


Fig. 1.—Floor Plan Showing Location of Vertical Lines of Pipes.

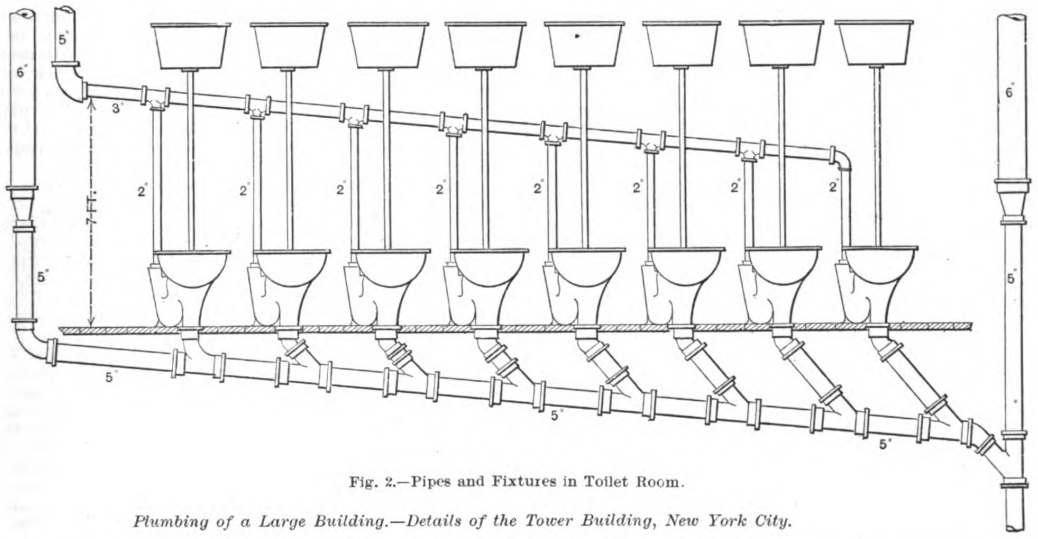


Fig. 2.—Pipes and Fixtures in Toilet Room.

Plumbing of a Large Building.—Details of the Tower Building, New York City.

floor of cellar. It is connected with the water mains in New street and in Broadway, and each connection is fitted with a gate-valve and ball-cock. The overflow discharges on the roof and tell-tale pipe from tank on roof discharge into this tank, thus avoiding any waste of water. The New street end of this floor is divided nto six offices and two toilet-rooms. Each office is fitted with a wash-basin. The toilet-room for ladies is near the center of the building and contains four closets and one wash-basin. The other toilet-room is beneath the New street entrance and has four closets, two wash-basins, one slop sink and two urinals. The second floor to which the principal entrance from New street leads has eight offices with wash-basins in each. The Broadway entrance is on the third floor; to draw water from the tank to a sink of imperial porcelain.

There are in all some one hundred and sixteen (116) wash-basins, twenty-seven (27) closets, eleven (11) slop sinks and five (5) urinals. The wash-basins, oval in shape and of imported earthenware, are in slabs of Tennessee marble, with marble platform and wainscoting. The cocks are of the wheel-handle, self-closing pattern, nickel plated. The traps are of polished brass, with Mott's unique wastes. Each fixture has an air chamber of brass handsomely polished, and a separate valve on each fixture shuts off the water pressure without interfering with the rest of the system. The closets are "Inodoro," washout imported, all earthenware, with copper-lined cisterns and chain and pull, with open seat supported on brass brackets; and cast iron drain pipe from the closets on thirteenth floor, in main toilet room. This pipe is ventilated by being increased in size as it goes through the roof. There are 4-inch diameter waste and ventilating pipes from the slop sinks. Vent line is wrought iron and waste is cast iron. The two ventilating pipes from the toilet room on first floor are each 4-inch diameter, and of wrought iron. The wash basins require nine (9) vertical lines of waste and ventilating pipes, the former 3 inches and the latter 2 inches in diameter, each of wrought iron, with fittings of the Durham pattern.

In addition to these pipes there are the 6-inch diameter copper leader and one 4-inch diameter cast iron leader from the roof. There are also the pipes from water-tank, namely, the supply-pipe, the distributing pipes, the overflow and telltale-

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pipes, all of which are of galvanized iron. The closets have 2-inch wrought iron ventilating-pipes to 4-inch main ventilating-pipes. In the main toilet-room on thirteenth floor, the 2-inch ventilating-pipes are connected to 3-inch wrought iron ventilating-pipes with Durham fittings, which are about 7 feet above each row of closets; these pipes are enlarged to 5 and 6 inches in diameter where they pass through the roof. The elevation, Fig. 2, illustrates the general arrangement of the pipes and closets in this toilet-room. In the cellar there is an 8-inch sewer brought in from New street, taking in all the different lines of fixtures and a fresh-air inlet is provided from sidewalk. All iron pipes are of extra heavy material and braced with iron hangers and bands. The water-tank on roof is divided into two compartments controlled by valves, so that either compartment can be emptied for cleansing purposes while the other continues in use. These long lines of pipes, some 130 feet high, were subjected to a water test. The branches were stopped up close to the fixtures and the vertical lines were filled with water to the top, thus obtaining at the base of a 130 feet high column of water a pressure of 56 pounds to the square inch. All joints and pipes were found perfectly tight under the application of the severe test described above.

BRICK AND ITS EARLY MANUFACTURE.

IN A LATE issue of *The Clay Worker*, Prof. R. T. Brown presents the following interesting particulars, relative to brick and its early manufacture:

When in his transition from the savage to the civilized state man had passed the condition of a nomadic herdsman, and, abandoning his tent, he proposed to make for himself a permanent home, he would naturally look about him for the building material. With his rude tools of flint, he could work stone into the propor shape more readily than wood, but on the broad plains where he had pastured his flocks, stone could not always be obtained. He had no doubt observed that clay, on drying, became hard, and the suggestion would naturally arise, that if he put it into the proper shape while soft, and suffered the sun-heat to bake it, he had a building material that required no tools to prepare it, and so long as he protected it from rain it would remain permanent. This was, very naturally, the first and oldest form of brick, and, perhaps, was not the invention of any race or age, as we find the use of adobes connected with the early stages of every nation that has made any considerable advance toward civilization. The vestiges of a prehistoric age in almost every country show evidences of the use of unburned brick in the construction of the earliest human habitations. Not only in western Asia, in Egypt and in Ethiopia, do we find the remains of these primitive dwellings, but on this western continent, in Mexico and Central America, unburned brick was originally, and continues to be, the principal building material used for ordinary dwellings. In the rainless regions of Peru the nations, according to Prescot, had carried the art of making adobes to a wonderful degree of perfection. It is not at all improbable that the prehistoric race who built the earth-works and mounds of the Mississippi Valley understood the art of making brick, though like other Aboriginal Americans they had not mastered the mystery of burning them.

This idea was suggested to me many years ago while examining a mound in the White Water Valley, in Eastern Indiana. The mound was on terrace, or second bottom land, composed of a sandy loam, resting on coarse gravel 2 or 3 feet below. The mound was about 20 feet high and composed of strong clay, evidently brought from a hill half a mile distant, for there was no clay nearer. Now why did the builders prefer to bring clay half a mile rather than to use the earth in the immediate vicinity, if they did not mold the clay? But if it had been molded, the rains and frosts of centuries had reduced the clay to its original form.

Who discovered the secret of burning brick, or how it was discovered, will, perhaps, forever remain buried beneath the accumulated centuries. There is an Arabian legend which says some man built a house of sun-dried brick, and kindled his fire to cook his food against one of the walls. After practicing this for some time he discovered that the bricks thus exposed to the heat had undergone a remarkable charge in color, hardness and permanence. But aside from the legend, it is evident that the discovery was accidental, for no man, from studying the sensible properties of clay could have come to a correct conclusion as to the effect of a high heat on properly prepared clay.

From the Bible account of the tower builders in Shinar, as well as from the oldest Assyrian tablets, it is evident that the method of rendering clay indestructible by a high heat was well understood 4000 years ago, but we have no hint as to how the heat was applied, or what kind of furnaces were used. It appears, however, that in the early ages burned brick was used only for special purposes. The great wall of Babylon, the most stupendous brickwork that the world has ever seen, had only a veneering of burned brick, 2 or 3 feet thick on the outside, the interior being filled in with unburned brick, the whole being protected by a waterproof covering of concrete.

The idea of an adobe wall was brought to its highest perfection in the rebuilding of Rome after the great fire of Nero. The walls were built of sun-dried brick laid in Roman cement, and hard burned brick, about 12 inches long, 6 inches wide and 1½ inches thick, were attached to the outside by being pressed firmly against a coat of evenly spread stucco while it was yet soft. In some of the ruins of ancient Rome these tile-like bricks are found adhering so firmly that the brick will break before the attachment will give way.

Much of the superior excellence of ancient brick was owing to their being perfectly dried before they were burned. Pliney tells us that the Greeks would not allow brick to be used till they had been dried five years, but this probably refers to adobes.

Brickmaking revived in Europe about the middle of the sixteenth century, Holland taking the lead. Nearly all the permanent buildings in the modern cities of Europe, and in this country as well, are built of brick.

It is a fact worthy of a passing notice, that from the day of the Assyrian brickmaker, down through the ages, nearly to the middle of the present century, the ancient method of making brick can be obtained in every country.

In the early years of this century all the brick in use was made of clay tempered by treading with horses or oxen. About 1830 the pug mill appeared in the Western brick yards; how long it had been used previously in the East, I am not informed, but it was the first innovation on the ancient method of preparing clay for molding. From this, the next advance was to fill the molds as the clay was delivered from the pug mill, automatically. In 1839 a patent was granted to Jesse Reeder, of Cincinnati, to mold brick from untempered clay, by pressure. More than a million of brick made on this machine were used in 1840 in constructing a tunnel for the Whitewater Canal, at North Bend, Ohio. These remain in a good state of preservation to the present. In 1847, Nathan Sawyer obtained a patent for making bricks from dry clay, and about the same time Woodworth and Morven got a patent for molding brick on the same principle, but by a different application of power. From this beginning, machines for manufacturing and kilns for burning brick have multiplied with astonishing rapidity.

These brick machines are now so numerous that we cannot even catalogue them. They may, however, be grouped in four classes: those which make dry pressed brick, semi-dry, stiff tempered clay, and soft mud brick. Many brick presses, both for dry and semi-dry clay, have proved failures from overlooking the fact that clay in every form is an inelastic substance and will resist a sudden pressure, however strong, while it will yield to a continuous pressure, though much feebler. The stiff clay machines operate on the principle of molding drain tile, the tempered clay being forced through a die in a continuous stream and cut into the proper length of brick by an automatic arrangement. Machines are now so far advanced toward perfection that, at the present price of labor, hand-made brick cannot compete with those made by the better class of machines.

Numerous improvements have been made in the matter of burning brick, both in the kind of fuel and shape of kiln. Formerly brick was burned exclusively in clamps and wood was the only fuel used. Now permanent, and often continuous kilns are used, coal, crude petroleum or natural gas is generally substituted for wood.

It is a law in all industries, that when an article is manufactured by machinery it becomes a commercial commodity at once. It was predicted that brick, from its great weight, and consequently expensive transportation, would not follow this law, but we are already demonstrating the fallacy of this prediction. Brick can now be made by machinery, burned by natural gas and freighted by rail 300 miles and sold cheaper than hand-made brick at the point of sale. Such is the present condition of the brick manufacture—what will be its future? In a matter that has progressed with the rapidity that brickmaking has in the last 40 years, it will be hazardous to venture a definite answer to that question. The restless activity of invention on this subject is evidence that, in the public apprehension, perfection has not yet been reached in brick machinery, but what additional step shall reach that point, we dare not predict. But the advancing price of lumber, and the scarcity of reliable building stone, warrants us in saying that we are nearing the time when all private, and most public buildings, will be made of brick. An inexhaustible supply of the raw material, with improved machinery, will make brick the cheapest building material, as it is the best.

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BENDING WOOD TO CIRCULAR OR OTHER CURVED SHAPES.

BY PERMISSION of the author we are enabled to present to our readers the accompanying diagrams and explanations relative to bending wood to curved shapes taken from the second edition of a new work on stairbuilding by James H. Monckton. We publish the matter as likely to prove of interest to our readers, taken in connection with the article on sweep-work, by Owen B. Maginnis, which appeared in our issue for June last year.

Figs. 1 and 2. Bending Wood by Saw-kerfing.—This method of bending is the weakest practiced, but owing to the fact that it is thought to be least expensive is frequently adopted. To find the correct distance between saw-kerfs for any required radius of curvature, select a piece of stuff of suitable length and equal to the thinkness of the material to be bent; as at Fig. 1. Let A B equal the thickness of stuff, and A C the radius of the required curve; make a saw-kerf at B O, leaving a thin veneer A O uncut, nail the cut piece at S K, and move it from C to D, or just enough to close the saw-kerf at B; then C D being the distance moved will also be the exact space between each saw-kerf. The same gaged thickness of veneer A O must be kept, and the same saw used for the work to be done, as were used in the trial at Fig. 1.

Fig. 2. The Construction of a Circular Form over which the saw-kerfed material as above explained is shown, bent in position.—E F G is the plank rib (made of three pieces) of which two or more are required, according to the work to be done. H J L are the staves which are nailed to the ribs and so complete the circular form. N M is a veneer laid over the form first, upon which is bent and glued the prepared saw-kerfed material P Q R; this must be left on the form until the glue is perfectly dry. The piece of saw-kerfed work P Q R, should be drawn tight to the veneer and the form by means of hand screws, as given by one example T U, with curved blocks, V W.

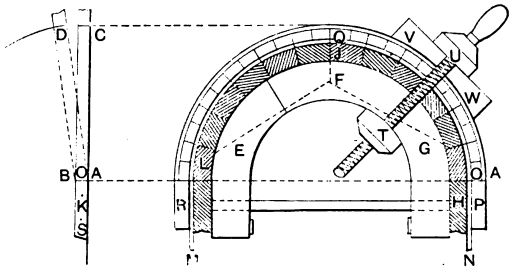
Fig. 3. Bending Wood and Keying.—This form is in plan the same as Fig. 2, except that the rib E F G is not curved at its lower edge. Shaping the lower edge this way is done for the convenient use of hand screws in the manner shown at Fig. 2.

By this method of bending, the wood is removed from the back of the stuff, as at X X X, &c, leaving the thickness of a veneer at the face; then after bending, the grooves X X X are filled with tightly fitted strips of wood (glued in) called keys, as at S S S, &c. It greatly adds to the strength of this bent keyed work to glue on three strips of veneer—one at each edge of the keyed stuff, and one in the middle. The glue should be perfectly dry before the work is removed from the form. The spaces between the keys may be determined by the same method as that used to find the spaces between saw-kerfs.

Fig. 4. Bending a Veneer Facing and filling out the thickness with staves.—The wood is removed wholly from the back of the stuff between the points required, leaving a veneer facing which is bent over the form and then staves Z Z Z, &c., are fitted and glued on, as shown in this drawing.

Fig. 5. Laminated Work.—Bending several thicknesses of veneer together is defined as laminated work. The whole of the veneers required should be heated and bent over the form together and secured in place; then releasing and applying glue to one-half, put it back in position again, and proceed with the other half in the same way, pressing and binding solidly the whole together and to the surface of the form. To ascertain what thickness of white pine will bear bending without injuring its elasticity, multiply the radius of curvature in feet by the decimal 0.05 and the product will be the thickness in inches. For example, multiply a 4 feet radius of curvature by the desimal given—4′.0″ × 0.05 = 0.20, equal to two-tenths or one-fifth of an inch thickness, that would bend without fracture.

Fig. 6. Bending Stair-strings.—This drawing shows the construction of an ordinary quarter circle form with the correct position of a stair-string bent over it;



Figs. 1 and 2.—Bending Wood by Saw Kerfing.

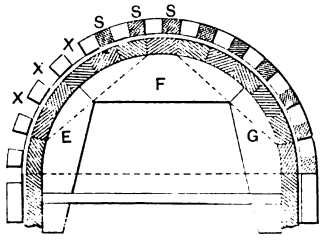


Fig. 3.—Bending Wood and Keying.

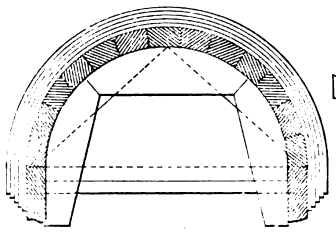


Fig. 5.—Laminated Work.

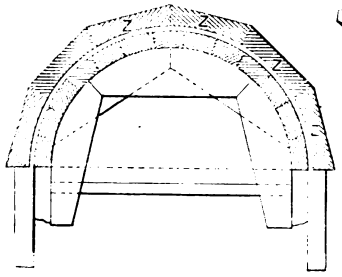


Fig. 4.—Bending a Veneer Facing.

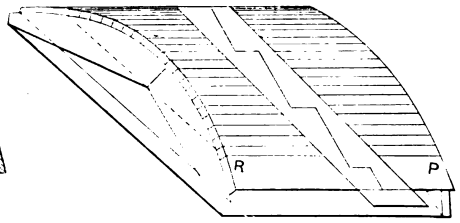


Fig. 6.—Bending Stair Strings.

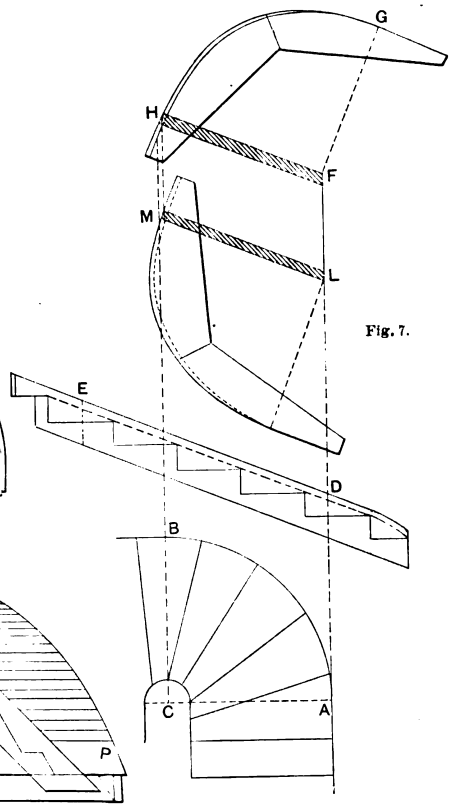


Fig. 7.

Figs. 7 and 8.—Form for Bending Quarter Circle Winding Stair Strings.

Bending Wood to Circular or Other Curved Shapes.

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the ribs of this form are quarter circles and are set parallel to each other and at right angles to the chord line R P.

Figs. 7 and 8. Construction of a Form for Bending Quarter Circle Winding Stair Strings, the ribs to be set on an angle parallel to the inclination of such strings. —There are two advantages claimed for forms built in this way—one is, a saving of stuff; the other, economy of space.

Fig. 8.—Plan of a quarter turn of winders with a circular wall string. D E, the circular wall string, as laid out from the plan A B. At Fig. 7, L M and F H is the position of the ribs parallel to D E, the inclination of the circular string; F G equals C A of Fig. 8—less the thickness of stave—and is the semi-minor axis, and F H becomes the semi-major axis of an ellipse, as the shape of the rib when placed on the oblique line F H becomes a quarter ellipse. The ribs have to be beveled on the edge to range with the lines L F and M H, as shown

TILE AND BRICKMAKING IN ENGLAND.

THE FOLLOWING description of the process of brick and tile manufacture as usually conducted in the vicinity of London is taken from an exchange. The earth was dug up in the autumn, and suffered to remain in a heap until the next spring, which, by pulverizing the more tenacious particles, greatly assists the operation of mixing and tempering In making up this heap for the season the soil and ashes or sand are laid in alternate layers or strata, each stratum containing such a thickness as the stiffness of the soil may admit or require. In tempering the earth much judgment is required as to the quantity of sand to be thrown into the mass, for too much renders the bricks heavy and brittle, and too little leaves them liable to shrink and crack in the burning. The addition of sea coal ashes, as practiced about London, not only makes it work easy, but saves fuel, as when the mixture is afterward sufficiently heated these bricks are chiefly burned by the fuel contained in the clay. When the brick-making season arrives the heap is dug up, the stony particles carefully removed, and the mass properly tempered by a thorough incorporation and intermixture of the materials, with the addition of as little water as possible, so as to form a tough, viscous paste.

In order more effectually and regularly to mix the loam and ashes it is now generally performed in a sort of mill, named a pug mill. This consists of a large tub or tun, fixed perpendicularly in the ground, and having an upright bar fitted with knives placed obliquely. The upright bar is turned by a horizontal lever, to which a horse is attached, and the soil being put in at the top is, by the revolution of the knives, forced through a hole in the side of the tub near the bottom, whence it is removed to the mold table, which is placed under a movable shed, and is strewed with dry sand. A girl rolls out a lump somewhat larger than the mold will contain. The molder receives this lump from the girl, throws it into his mold previously dipped in dry sand, and with a flat, smooth stick about 8 inches long, kept for the purpose in a pan of water, he strikes off the surplus of the soil; he then turns the brick out of the mold upon a thin board rather larger than the brick, upon which it is removed by a boy, who places it upon a light barrow of peculiar construction, which being loaded with a certain number of bricks, they are sprinkled with sand and wheeled to the "hacks." The hacks for drying are each wide enough for two bricks to be placed edgewise across, with a passage between the heads for the admission of the air; to facilitate the circulation of which the bricks are usually laid in an angular direction. The hacks usually carry eight bricks high; the bottom bricks at the ends are usually old ones. In showery weather the hacks must be carefully covered with wheat or rye straw, unless the sheds or roofs be built over the hacks, as is done in some parts of the country, but in London this is impracticable from the great extent of the grounds. In fine weather the bricks will be ready for turning in a few days, in doing which they are reset more open than at first, and in six or eight days more they will be ready for burning.

In the vicinity of London bricks are commonly burned in clamps. In building the clamps the bricks are laid after the manner of arches in the kilns, with a vacancy between every two bricks for the fire to play through. The flue is about the width of a brick, carried straight up on both sides for about three feet; it is then nearly filled with dry "bavins" or wood, on which is laid a covering of sea coal and cinders (or, as they are termed, breeze); the arch is then overspanned, and layers of breeze are strewed over the clamp, as well as between the rows of bricks. When the clamp is about six feet wide, another flue is made in every respect similar to the first. This is repeated at every distance of six feet throughout the clamp, which, when completed, is surrounded with old bricks, if there be any on the ground; if not, with some of the driest unbaked ones, reserved for the purpose; on the top of all a layer of thick breeze is laid. The wood is then kindled, which sets fire to the coal, and when all is consumed, which will be in about twenty or thirty days if the weather be tolerable, the bricks are concluded to be sufficiently burned. To prevent the fire burning too furiously, the mouths of the flues are stopped with old bricks, and the outside of the whole clamp plastered with clay, and against any side particularly exposed to the rain, &c., screens are laid, made of reeds worked into frames about six feet high, and of a width to permit of being moved about with ease. This was the mode of manufacturing the ordinary descriptions of bricks, but the superior sort, termed washed malins or marls, are tempered with greater care and attention. For this purpose a circular recess was built about 4 feet high, and from 10 to 12 feet diameter, paved at bottom, with a horse-wheel placed in its center, from which a beam extends to the outside for the horse to turn it by. The earth is then raised to a level with the top of the recess, and forms a platform for the horse to walk upon. Contiguous to the recess a well is formed for supplying the recess with water, which is raised by a pump worked by a horse-wheel. A harrow made to fit the interior of the recess, thick set with long iron teeth and well loaded, is chained to the beam of the wheel to which the horse is harnessed.

The soil prepared in the heap in the usual manner is brought in barrows and distributed regularly round the recess, a quantity of chalk being added, and a certain portion of water; and the horse, being set in motion, drags the harrow, which forces its way into the soil, admits the water into it, and, by tearing and separating the particles, not only mixes the ingredients, but also affords an opportunity for stones and other heavy matters to fall to the bottom. Fresh clay, chalk and water continue to be added until the recess is full. On one side of the recess, and as near as possible, several hollow square pits are prepared about 18 inches or 2 feet deep. The soil reduced to a kind of liquid paste, is discharged from the recess by a sluice and conveyed by wooden troughs to the pits. In these pits the fluid soil diffuses itself, settling of an equal thickness, and remains until wanted for use, the superfluous moisture being drained or evaporated away by exposure to the atmosphere. The remainder of the process is the same as for the common sort of bricks. In the country bricks are mostly burned in kilns, whereby much waste is prevented, less fuel is consumed, and the bricks are the more expeditiously burned. A kiln is usually 13 feet long, by 10 feet 6 inches wide, and about 12 feet high, and will burn 20,000 bricks at a time. The walls are about 14 inches square and incline inward toward the top. The bricks are set on flat arches, having holes left between them resembling lattice work. The bricks being set in the kiln and covered with pieces of broken bricks or tiles, some wood is put in and kindled to dry them gradually. This is continued till the bricks are pretty dry, which is known by the smoke turning from a darkish to a transparent color. The burning then takes place, and is affected by putting in brushwood, furze, heath, faggots, &c., but before these are put in, the mouths of the kiln are stopped with pieces of brick called shinlog, piled one upon another, and closed over with wet brick-earth. This shinlog is carried just high enough to leave room sufficient to thrust in a faggot at a time. The fire is then made up, and continued till the arches assume a whitish appearance and the flames appear through the top of the kiln, upon which the fire is slackened, and the kiln cooled by degrees. This process is continued, alternately heating and slackening, till the bricks are thoroughly burned, which is usually in the space of 48 hours.

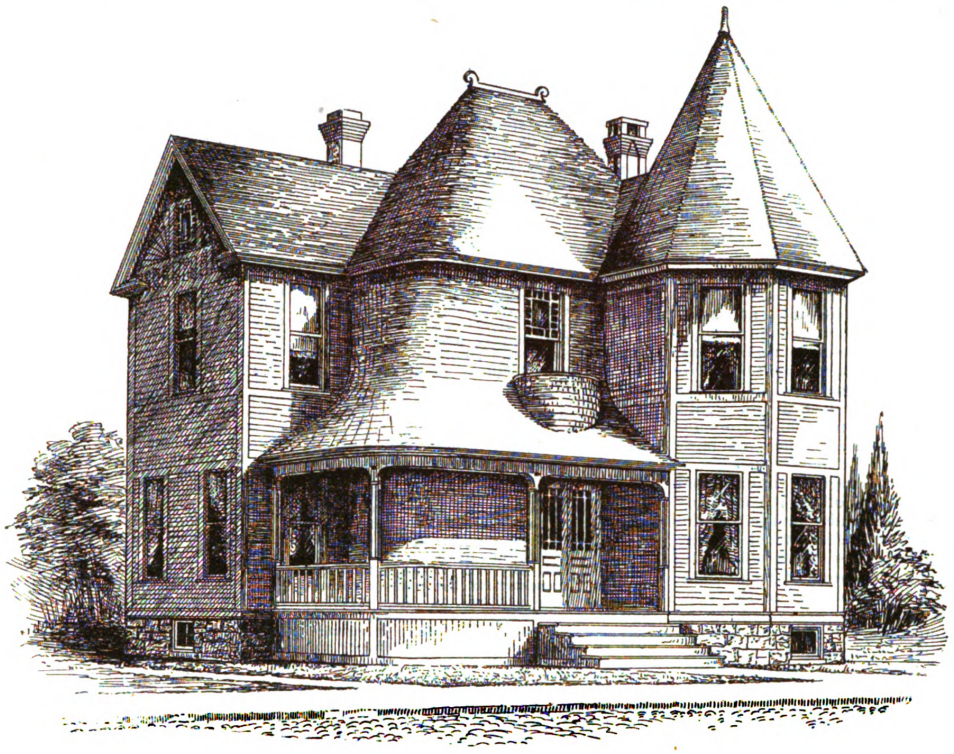
THE DREXEL INDUSTRIAL INSTITUTE, of Philadelphia, has been put under contract and will be completed in September, 1890, when the schools will be organized. The building will be chiefly of a light buff brick planned to accommodate 2000 pupils, and will cost about $500,000. Mr. Drexel intends to provide an endowment fund of about $1,000,000 to support the work of the institution, making his gift $1,500,000, as originally contemplated.

L. L. SAGENDORPH, of Philadelphia, Pa., has been granted a patent for still another improved form of metallic roofing. The invention provides means for connecting and anchoring roofing plates to the sheeting by means of a slot formed in the downward extension of the seam cap and a shouldered cleat, the narrow tongue portion of the cleat resting in the slot while the shoulders of the cleat rest against the roofing sheet at each side of the slot. At one side of the metallic roofing plate is a vertical flange, while at the other side is a seam cap, the latter being provided with a slot in its downward extension as stated. The roofing cleat is provided with a narrow tongue extension and shoulders and is so bent that the shoulders fall below the apex of the cleat.

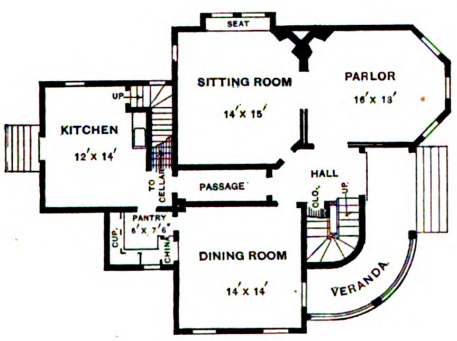
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DESIGN FOR SUBURBAN RESIDENCE.

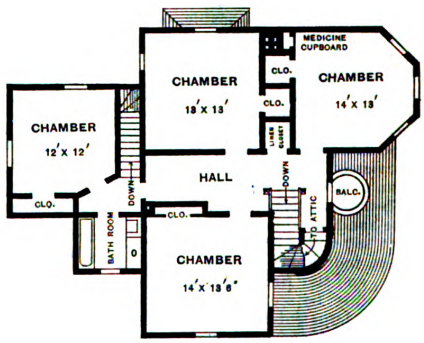
THE ILLUSTRATION upon this page represent the perspective view and floor plans of a suburban residence designed by Smith & Robinson, architects, of Altoona, Pa. The arrangement of rooms, it will be observed, is somewhat peculiar, while the design possesses features which render the study of interest to those engaged in the building trades. One of the features, it will be observed from an inspection of the floor plans, the latter apartment, stair hall, balcony and circular porch. The peculiar arrangement of rooms permits the parlor and dining room on the first floor and two sleeping rooms on the second floor to face the street. Ample closet room is provided, a linen closet on the second floor opening out from the main hall. The servant's room may be isolated from the rest of the house if desired, by locking the door at the head of the stairs. The hight of the first story is 10 feet and the second story 9 feet 6 inches. The house is weather boarded except in the round portion which is covered with shingles. The architects estimate the cost with cellar under kitchen only and without plumbing at about $3000, and with the cellar under the whole house, natural pine finish and plumbing, at about $3500.



Perspective View.



First Floor.



Second Floor.

Scale 1-16 Incl. to the Foot.

Design for Suburban Residence. Smith & Robinson, Architects, Altoona, Pa.

A NEW FORM OF PIPE for water service has just been put on the European market by Wilhelm Seume, of Dresden and Prague. According to the *Gesundheits Ingenieur* the pipes are made of glass, about 0.2 inch thick, and have an asphalt coating about 0.4 inch thick, with fine gravel on the outside. The purpose of the asphalt coating is to prevent fracture of the pipes. The latter are designed to supplant wooden, earthenware, or cement pipes, and also lead and iron service pipes, the advantages claimed for them being thorough resistance against moisture and against the action of acids and alkalies.

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BONDS ON BUILDERS' CONTRACTS.

THE PRACTICE of demanding bonds of a builder when signing a contract for the carrying out of work has been increasing to a marked degree during the last dozen years, and as a consequence the builder has found it more and more difficult and embarrassing to secure these bonds in the usual manner, that is, by asking some friend or friends to become his sureties. In many cases persons who have in the past readily acceded to the wishes of those who were in need of bondsmen, either as a matter of friendship or because they in turn might desire a similar accommodation, have now come to the conclusion that such methods are not "good business," and decline to place themselves under such responsibility. That it would be possible to arrange some method of giving bonds, which would be a matter of business pure and simple, became a conviction in the minds of some of the leading spirits of the National Association of Builders, and the more the subject was investigated the more feasible it appeared. Indeed, it improved so much upon closer study that it was quite evident a company established by builders, managed by builders, and sanctioned and assisted by the National Association of Builders would have a superiority of position entirely unreachable by any other company of business men.

The peculiar advantage may be expressed in a few words, as follows: A company which is to give bonds for the faithful completion of contracts entered into by builders, will be far more acceptable to the owner if it be composed of men whose business and experience is of the same character as that of the party making the contract, and when the National Association's peculiar advantages are also combined, the owner feels as if he could hardly have anything more satisfactory and secure. It is, in effect, substantially every builder in the country "backing up" the particular contract being entered into. Another benefit to follow from this method of giving bonds for builders by builders, will surely be in the weeding out of irresponsible contractors. The builders themselves being the ones to examine the condition prior to becoming surety and thoroughly fitted to know whether the contract is a proper one; whether based upon estimates that can be carried out; whether or not the conditions are reasonable, or the amount so low that the contract cannot be fulfilled except by fraud or subjecting dealers and others to probable loss, then the bond will be declined, and the contractors not being able to obtain their sureties will be obliged to take a back seat while the more responsible and competent contractor will be advanced as it is his right to be.

The plan as prepared and adopted at the St. Paul convention is herewith presented, and in the hands of the committee named, it is safe to say will result in benefit and value to the individual builder, the local Exchanges, and the National Association.

It will readily be seen that the launching of such a large enterprise as this is a great undertaking, and much care must be given to every step taken. Therefore, while builders naturally will be impatient for the consummation of their hopes in this direction, they must bear in mind that the task delegated to the committee is far from an easy one, and that the object is worthy of the most careful and patient work. The report of the committee, as adopted at the convention, is as follows:

REPORT OF COMMITTEE ON BUILDERS' SURETY COMPANY.

Your committee, appointed at the last convention to encourage the establishment of a company for the purpose of giving securities on builders' estimates and contracts, desire to report:

That they find that several trust companies, already formed, have incorporated this idea in their business—are advertising it as an essential feature—and have asked the indorsement of the local organization of builders in the cities where they exist. This indorsement has been refused on account of their system not being, in the opinion of our local organizations, what is desired.

We find that these companies require a "back bond," and are thus asking and receiving pay without assuming any risk. In addition to this, they are very limited in their scope, and must, necessarily always be so, as they are local in their character, and have no means of securing proper and reliable information over the wide area comprehended in the affiliation of the National Association, and any company to receive the valuable aid and assistance of this body should be national in its character and capacity.

A NEW COMPANY.

Your committee also find that a new company is in prospect of being formed upon the proper basis, viz., giving security for a stipulated charge without asking for a back bond. The promoters of this company have encountered many obstacles, the chief of which being to secure the support and co-operation of builders themselves. To obtain this support they have come to the conclusion that, in organizing and operating, it will be absolutely necessary for them to adopt such plans and methods as will commend the company to the favorable opinion of the National Association and all its affiliated bodies. This proposed company seemed to your committee to offer opportunity for encouragement in the line of the order of the last convention under which they were appointed, and they have accordingly entered into consultation with its promoters, who, by the way, are all builders, and have proposed certain methods, which, if approved by this body, will no doubt form the basis of a company for the purpose named, which shall be national in its character, shall be under the guidance of this association, shall give each filial body a share in management and profits, and shall be in theory and fact a builders' surety company, managed by and composed exclusively of builders.

It has been evident from the start that the National Association was not itself a body competent to enter into financial relations with any enterprise of this character, and yet the peculiar connection which it holds with its filial bodies provides it with an opportunity to assist in the operation of such a company, so comprehensive and superior, so entirely unattainable by any other association or combination, that your committee have never for a moment been dismayed by the difficulties of their task, but being stimulated by the great benefits to accrue to the individual builder, to the filial bodies and to the National Association (the connecting link which makes all possible), have determined to seek persistently for a feasible method of utilizing the opportunity and finally setting this valuable machinery in operation.

Your committee does not claim for the plan now presented, complete perfection in all its details, but does believe that it offers the principal features of a practical method by which the undertaking may be properly encouraged and supported through the National Association to the definite financial benefit of individual filial bodies, as well as of the central body, thus serving as a powerful factor in consolidating and strengthening us in our efforts for the general betterment of our condition, for which primarily and finally this organization was formed.

THE PLAN OUTLINED.

The plan which the committee offers and asks the association to adopt is as follows:

The National Association to say to the promoters of this enterprise: We will aid and assist in the establishment and operation of this company, will open up the avenues which we control and offer every advantage which our connection with many widely separated local associations of builders affords, provided the following general propositions are assented to as substantially the basis upon which the company shall be organized and operated, these propositions to be subject to modifications by the committee in charge, said modifications not to impair the general intent and purpose therein and herein set forth.

1. The title of the company to substantially cover the fact that it is a Builders' National Insurance, Security and Guaranty Company, and that it is under the patronage and direction of the National Association of Builders.

2. Its stock to be limited to, say 250,000 shares, at a par value of, say, $4 per share.

3. These shares of stock to be issued only to members (either active or honorary) of bodies affiliated with the National Association, and, if found practicable, to the said filial bodies themselves, thus insuring a holding composed of contractors in the various building trades or persons engaged in similar pursuits.

4. At least 100,000 shares to be held in trust to allow for apportionment as follows:

Each filial body of the National Association which maintains its connection therewith by payment of the yearly dues required by that body, to be allowed and apportioned on the books of the company, stock at the rate of five shares for each member of the said filial body, as shown by their payment of per capita assessment to the National Association, the same to be adjusted annually.

This apportionment to be without payment of the value of the stock by the said filial bodies, but the certificates of said stock to be held in trust for their benefit.

Dividends accruing on the stock thus apportioned to filial bodies to be paid over to them through the national treasurer.

5. Filial bodies in good standing, which are so incorporated as to permit them to hold personal property, to be permitted to purchase and hold stock, if any be available, in addition to that apportioned as above mentioned, limited in extent to an equal number of shares to those so apportioned, upon condition that said shares be non-transferable, and that upon failure to maintain their standing in the National Association, they to relinquish the said shares to the said company at a price not greater than that paid for the same.

6. The board of directors of the company to always include the directors of the National Association named at each annual convention by the filial bodies, as their representative.

7. The officers of the company to always be members, present or past, of filial bodies of the National Association.

8. There to be a central department of the company for the general conduct of its business under the direct management of its president, general secretary and treasurer; there to be also departments with definite territory and jurisdiction, each managed under the general laws and rules of the company through a vice-president as head of the department.

9. In the arrangement of rates of premium to parties applying for insurance or bonds, an appreciable difference to be made in favor of those who may be members of filial bodies.

10. The books and affairs of the company to be open at any and all times to the inspection of a regular standing committee of the National Association appointed annually for that purpose.

ADVANTAGES.

Your committee thus roughly states the principal points which it deems necessary should be secured to the National Association and to filial bodies thereof, in return for the vast advantage which any company formed for this purpose would receive through the opportunity to utilize the relations and connections which we have established between associations of builders and their members all over the country. But it is well aware that the development of the scheme which these propositions include is a matter which will involve careful study and skillful treatment with the aid of expert advice of the highest character before the establishment of the proposed company can become a fixed fact. It, therefore, further asks the association to continue the committee which has undertaken the matter thus far, as a "standing committee" of the association, for the purpose of securing the establishment of this company on the lines now proposed and otherwise regulating its method of organization, so that the best interests of the National Association, its filial bodies and their members may be preserved.

In concluding their report your committee wish to say that with deeper investigation of this problem its members have become more thoroughly than ever convinced that immense benefits are to accrue to all, from the setting up of a company of this kind, under the guidance and direction of the National Association, with the great opportunities which it alone can offer.

Beside the principal business which was first suggested, that is, giving sureties or bonds on estimates and contracts freeing the individual from the embarrassing necessity of importuning his friends to go on his bonds, which in itself is worthy of all that has been said, returning as it surely will, very handsome dividends from this alone, your committee can readily see that it will be perfectly competent also for this company to secure a charter so

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that insurance on builders' risks, as well as risks of accident to workmen or the public, will be comprehended in its field of operation, it may act also as a trustee and guarantor between owner and builder. Builders, through a company thus established, will be enabled to insure themselves and each other, and receive the profits themselves which now fall into the hands, either of foreign corporations, or corporations in which the builder reaps little or none of the financial benefit.

THE OPPORTUNITY.

To the eyes of the committee the opportunity is inconceivably great; it belongs to us more than to any others. We happen to be thrown, through the connection established by our central body, into a position where we can handle such business with a facility and certainty that no outsiders can possibly obtain. We furnish the whole apparatus for perfect operation through experience in the business of building, through our existing organizations and the ready channel of information they offer; and besides this, in case of any failure of individuals to carry out their contracts, instead of being obliged to go to outsiders to repair the breach, we, being builders, can repair it ourselves at a minimum cost, and sometimes can turn even an apparent loss into an actual profit.

Your committee commend this matter to the convention as one of the most complete and satisfactory of undertakings, one that they believe will surely result in vast benefits—benefits appreciable in the easier conduct of the contractors' business, in the security of the public, in the strengthening of the national and all filial bodies, financially and every way.

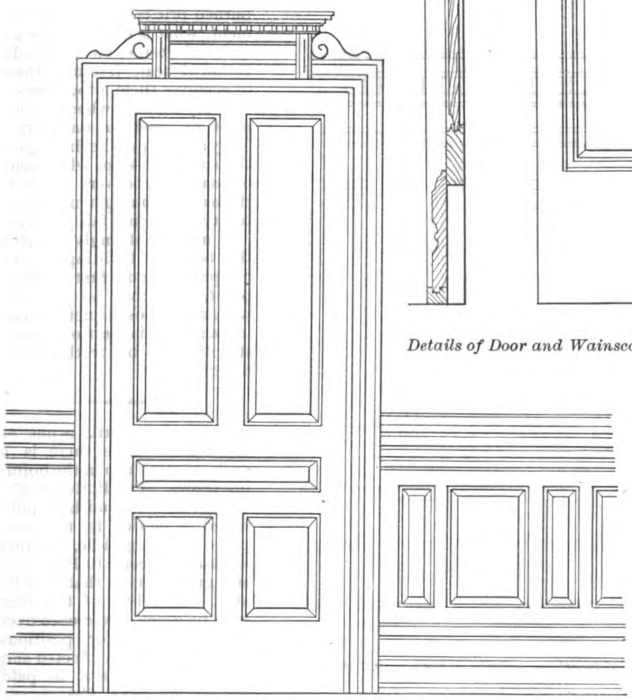
If this report be approved by the convention your committee ask the adoption of the following resolution:

Resolved, That the Committee on Builders' Surety Company be and is hereby continued as a standing committee, and is instructed to secure, as soon as possible, the establishment of a company based upon the general plan and conditions outlined in this report. Respectfully submtted,

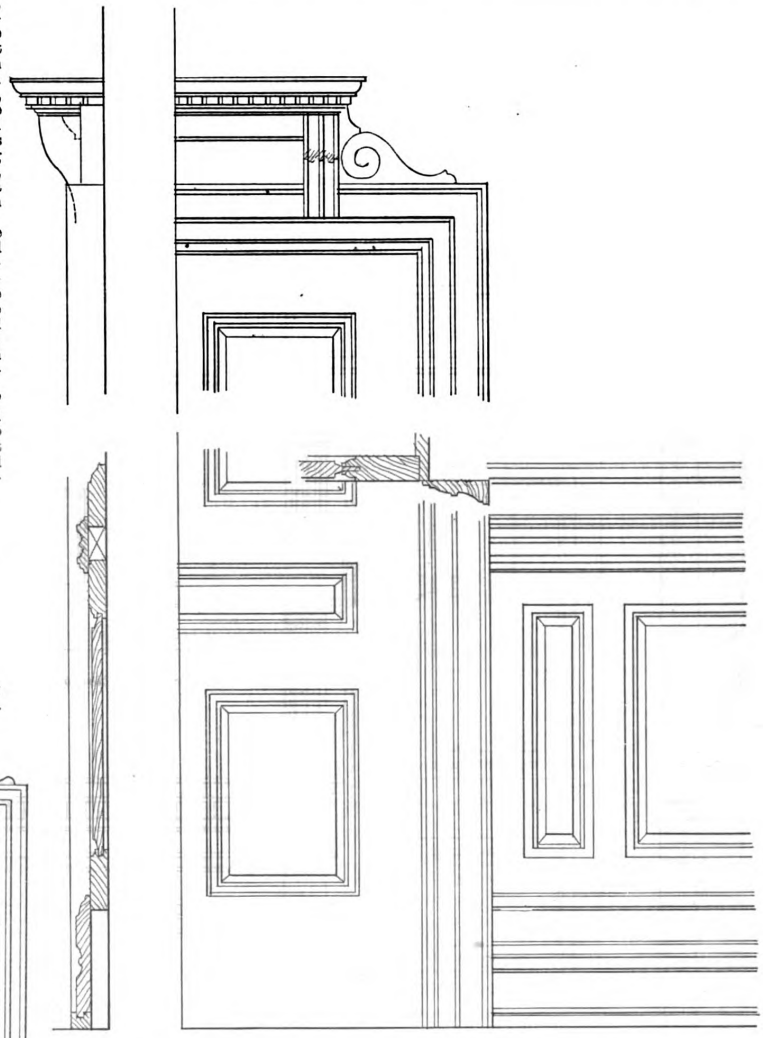
A. MCALLISTER, Chairman;
GEORGE C. PRUSSING,
J. MILTON BLAIR,
EDWARD E. SCRIBNER,
JOHN J. TUCKER,
JOHN S. STEVENS,
WILLIAM H. SAYWARD,
} Committee.

Designs for Doors.

The increasing attention which is being given by architects and builders to the interior finish of buildings, and the tendency to finish first-class work in the natural wood, renders the designs of doors presented on this and the opposite page of more than usual interest. The author of the design is Mr. C. W. Sumner, of Buffalo, N. Y. Upon one page is shown the elevation and details of one style of door finish, while on the opposite page is presented the elevation and details of another style. The drawings are made to scale and are so clear and distinct as to enable any carpenter to execute the work. The designs are neat and effective and we present them to our readers in the hope that they may afford valuable hints to those called upon to execute jobs involving interior finish.



Dining Room Finish.—Finish of Door and Wainscotting.—Scale, ½ Inch to the Foot.—C. W. Sumner, Buffalo, N. Y.



Details of Door and Wainscotting, with Section through Same.—Scale, 1 Inch to the Foot.

Fire-Proof Construction.

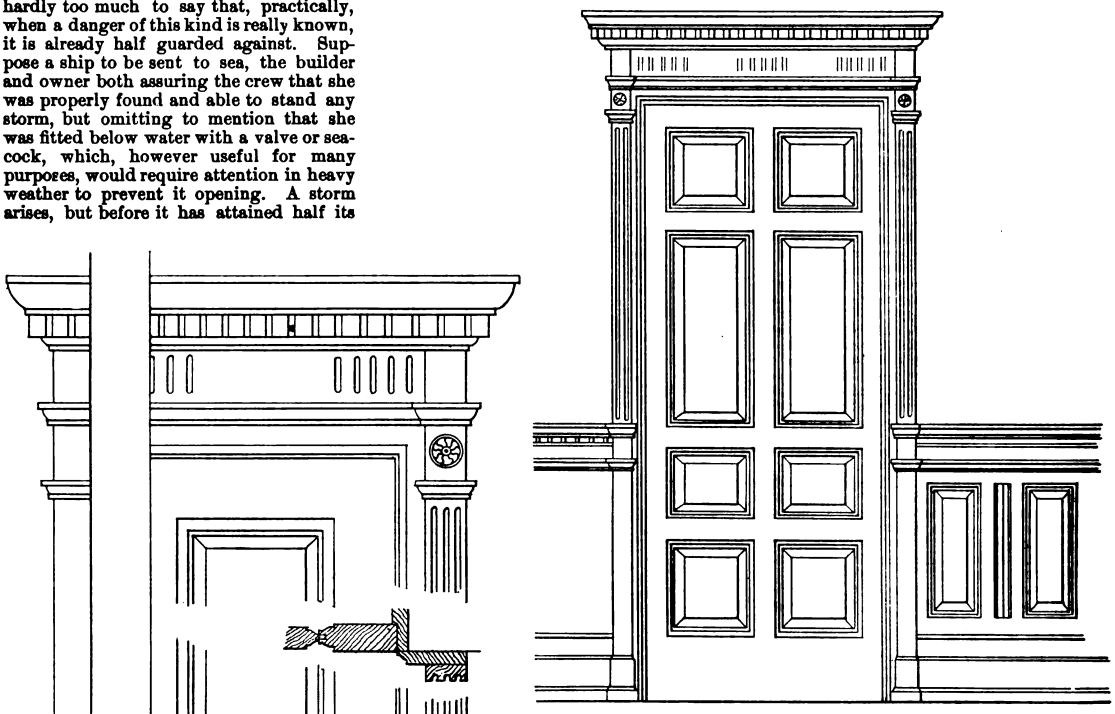
It would be no particular humiliation to an architect or builder to have to inform his client that he has been obliged, for economy, for convenience, or for whatever other satisfactory reason he may wish to assign, says E. M. Shaw, to use stone and iron in the construction of the building; that these materials look well and afford many advantages for the transaction of business; that they may probably last a long time and in the end prove very economical. There are, however, inseparable from their use, two dangers which should be ever present to the occupier's mind and which should be guarded against in every possible way, the one frequent in occurrence, but generally moderate in extent, the other happily rare in occurrence; but, when it does occur, in the last degree serious, and sometimes altogether overwhelming. The first is the danger of a shock, the second, that of sudden change of temperature; and if these points can only be impressed on those who build and those who occupy buildings this article will have done its work. Nothing is

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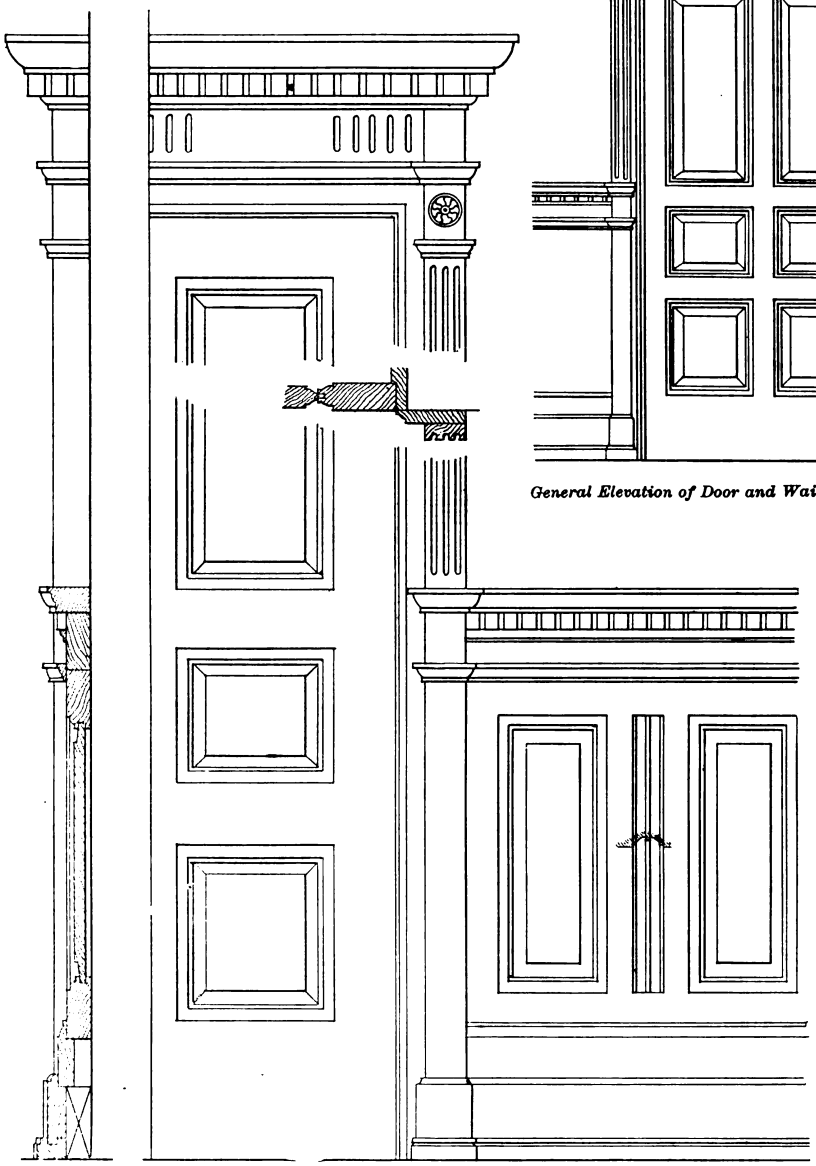
needed but for those who have the knowledge to tell the simple uncontrovertible truth to those who cannot know it without being told, neither deceiving themselves nor using language of a dubious kind, or of any kind which can be twisted into a meaning likely to deceive others. If this be done the danger will be thoroughly recognized and understood, and it is hardly too much to say that, practically, when a danger of this kind is really known, it is already half guarded against. Suppose a ship to be sent to sea, the builder and owner both assuring the crew that she was properly found and able to stand any storm, but omitting to mention that she was fitted below water with a valve or seacock, which, however useful for many purposes, would require attention in heavy weather to prevent it opening. A storm arises, but before it has attained half its hight the vessel founders and many lives and much property are lost. Who is responsible for such a loss? The builder and owner may say that they have told the truth, as the vessel was properly found; but the crew may naturally retort that they demur even to this, as they did not get an opportunity of testing it; that they had been told but half the truth, and that if they had only known the whole, they could have effectually guarded against the danger, and would certainly have had no fears or anxiety whatever on the subject.

It is earnestly to be hoped that the time is approaching when the constructors and owners of buildings destined to carry large quantities of heavy goods, will recognize the responsibility to warn the occupiers, and those who labor under them, of all dangers which are inseparable from the use of such materials and form of construction as are adopted, and not attempt, after a disaster, to screen themselves under the plea, which may sometimes be used, but never with real fairness, that the building did not yield to the effects of fire. Even where the walls are made of sound well-burned bricks laid in best cement, what is their use if some material inside, on the application of heat, fractures them or removes them altogether at the very moment when they are most required to stand firm? They are only as the findings of the supposed ship, which may or may not be very good in themselves, but get no opportunity of being fairly tested.

It must be strongly asserted that before a building can be fire-proof it must first be heat-proof, and that no building with any exposed metal forming an essential part of its construction can be truthfully so designated.



General Elevation of Door and Wainscotting.—Scale, ¼ Inch to the Foot.



Dining-Room Finish.—Section and Details of Door and Wainscotting.—Scale, 1 Inch to the Foot.

PORTLAND, ORE., is one of the cities where there is a strike of workmen in the building trades. The Builders' Exchange of Portland have published a notice in the local press inviting idle, skilled workmen to come to Portland, and guaranteeing that all who avail themselves of the offer will be given preference over all applicants for positions open. The trades affected and the prices that will be paid are as follows: Carpenters, $3 to $4 for 9 hours; painters, $3 and upward for 9 hours; plumbers, $4 for 9 hours; plasterers, $5 for 8 hours; bricklayers, $6 for 9 hours; cornice makers and roofers, $3.50 for 9 hours; tinners, $3 for 9 hours, and hod carriers, $3.50 for 9 hours.

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THE NATIONAL ASSOCIATION OF MASTER BUILDERS.

BY W. H. SAYWARD.

THE REASONS for the development of the National idea among builders in the various cities of the United States are varied and far-reaching, and to attempt to give them all in the scope of a short article is exceedingly difficult. The idea has prevailed to a certain extent that this National organization was undertaken on account of the development of organizations of workmen in the building trades, and on account of arbitrary action on their part. While this may have been one element among the many which produced the National Association, it was by no means the most important one; and though its pressure was immediate and urgent, it still would not have warranted the amount of thought and labor which are necessary for the erection of a National Association. Builders as a class are more similar in their requirements than possibly any other profession or calling, and the various branches comprehended under the one generic term "building" are intimately blended with each other and dependent each upon the other in daily contact in the one common calling. The conditions surrounding the builders' profession are also identical all over the country, and indeed may virtually be considered as practically the same in every country; therefore it was conceived to be very possible that a common benefit would accrue by the uniting of builders in a central organization, which would develop into definite form methods and customs for general observance which had previously become very diverse, even though the demands and conditions were entirely similar.

BUILDERS' METHODS.

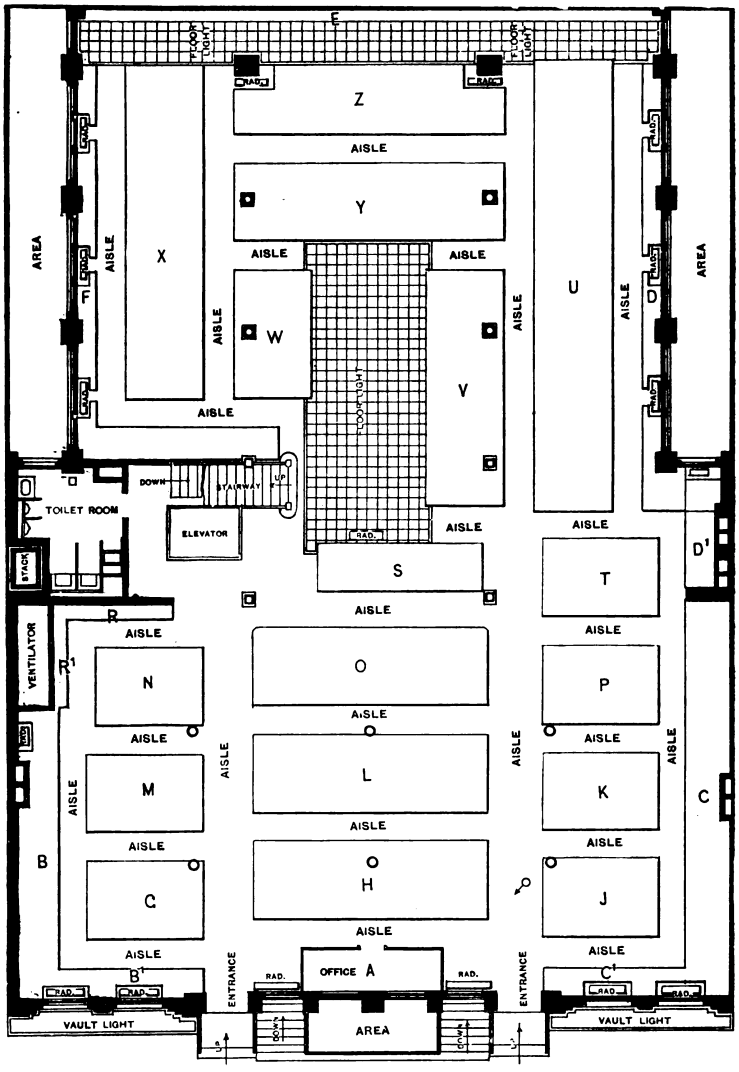
This conclusion being reached, the only other point necessary for consideration prior to atempting an organization of this character was this: Are the practices and methods at present common among builders in the various cities of the country of such a character as to warrant a general attempt at reform?

A careful and systematic investigation based upon this theory soon developed the fact that reforms were very much needed; for although the business of building in all its ramifications was, to say the least, as vast in its amount as that of any one other industry in existence, there was virtually no harmony of action among those who were carrying it on, and no definitely established practice even in any one particular locality. The various communities of builders in the principal cities of the country were all working in ignorance of the principles and action of each other, and this ignorance caused frequent and disastrous discord. The attitude assumed by builders of one city were often so diametrically opposed to the attitude of their brother builders in neighboring cities that the effort of either group to sustain any particular principle became neutralized.

The true relation of the builder toward the owner and architect was found to be almost invariably poorly understood, and the practices and methods prevailing were almost as many and as diverse as the number of architects and owners. The practice of one office would perhaps be entirely distinct from the practice of the nearest neighbor, while the practices of the whole as a class had become abnormally developed upon the side of the owner, the interests of the builder and contractor being as a whole substantially ignored. This condition of things was largely attributable to the negligence of the building fraternity, they never having taken pains enough to formulate a general policy, each individual accommodating himself to the circumstances and conditions which in each case were presented to him, rather than uniting with his fellows of the same calling in creating a general practice more consistent and beneficial for the interests of the whole class.

UNIFORMITY OF WAGES.

It was also readily discovered that relations of builders with each other, either as general contractors or as contractors in the various branches of building, were sadly in need of a change for the better to bring about some definite and recognized system for the establishment of just and equitable practices. In this connection it was apparent that the rapid facility of connection between the various parts of the country, which enables contractors in the building trades to carry on business in many places formerly too remote for action, made the



Master Builders' Exchange Philadelphia.—(See Article page 148.)—Floor Plan of Permanent Exhibition Department.—The Arrow indicates Position of Camera for View on page 150.

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establishment of identical usages and customs extremely desirable in order that fair competition and just relations might prevail for themselves and others with whom they would naturally become competitors.

NEGOTIATIONS WITH LABOR.

In addition to these fundamental reasons for establishing a congress of builders, it was plainly seen that the vexing questions arising under the agitation which has prevailed for the last decade, under the comprehensive title "The labor problem," would be met upon broader grounds through such an instrumentality, and more quickly result in a satisfactory and peaceful solution through the ready comparison of views and experience, and the formation of a general policy in this direction, which should or might underlie the action of the builders in their separate environment. Accompanying these principal needs for united action was an array of minor matters which do not require particular reference, but which formed a background of importance and demonstrated the extent of possible effort for such an organization. The conclusion was quickly reached, therefore, that the magnitude of the interests involved and the manifest need for improvement was sufficient warrant for the establishment of a National Association, and the experience of the first three years of its existence demonstrates that no mistake was made in the undertaking. It is, perhaps, unnecessary to say that in this, as in other organized effort, progress has been slower than the enthusiasm of its promoters anticipated, yet the gains made are already so substantial that the result already obtained by uniting the builders all over the country in a comprehensive and definite effort has been worth all of the trouble and expense involved.

PURPOSES OF THE NATIONAL ASSOCIATION.

It may be well to concisely restate the purpose of the National Association and its methods of work, referring particularly to some of the important matters that have been already undertaken, and which are in progress of establishment. In the first place it should be stated that it was decided that representation in the National Association should be obtained only by local organizations of builders, and when possible by organizations representing collectively the different branches of trade rather than by individuals selected at random and who would only represent their personal views, and the association was organized upon this basis. The purpose of the National Association may then be stated to be to provide opportunity for constant, systematic and thorough consideration of any and all subjects of importance to the building fraternity by men of experience selected by and representing organized bodies of the building fraternity in all parts of the country, and, through comparison of the customs, practices and conditions of many places, to devise common methods for the general betterment, thus blending local issues into national ones, and securing the aid and assistance of many individuals in many localities in establishing needed reforms. Its purpose may be broadly stated to be to systematize and unify the customs and practices of builders in their relations to each other as well as in their relations to the community at large, to accurately define and specify the rights of builders as such in all points of contact with others, and to secure that strength for the maintenance of better methods which cannot fail to result from harmonious and cumulative action.

METHODS OF WORK.

It proposes to work for these ends in the following manner: The central body is to hold yearly conventions for consultation, to which each affiliated body is to send representatives or delegates. At these conventions the various questions of importance which are constantly in need of attention, as well as those that may arise during the year, will receive the consideration of builders from many and various sections of the country, and the conclusions reached (which cannot fail to be of great significance and weight on account of the widespread character of the representation) will be conveyed to filial bodies in the form of "recommendations," which they will be urged to follow, to the end that the customs among builders all over the country may be substantially the same, and their action upon any important measure consistent and uniform.

The policy thus outlined at yearly conventions as the best upon general principles will be constantly fostered by the officers and committees elected or appointed, and every effort made by them to encourage, aid and assist filial bodies in carrying them out. The Executive Board is particularly charged with the duty of securing the affiliation of associations of builders not already joined in the work, and in organizing such bodies in cities or towns where none have previously existed in order that there may be as wide and complete an influence established as possible.

This statement, though brief and fairly concise, covers a field of possible work, the magnitude of which must be plainly apparent. Reference to a few of the most important matters thus far undertaken will be sufficient to demonstrate the value and need of the wisest counsels, the most patient attention and persistent endeavor to secure the hoped for results, and will at the same time show that the work undertaken cannot be so well and perfectly accomplished by any other agency than this central organization, with its filial bodies spread all over the country, through whom its general policy and purpose, its measures and reforms are to be systematically and persistently agitated and finally secured. It must not be forgotten that the readjustment sought for cannot be and ought not to be hurriedly obtained. However crying the evil, or however shiftless the condition, it has secured its footing through long neglect, and it will be an equally slow process to reform it.

THE APPRENTICE QUESTION.

The apprenticeship question, for instance, has fallen into a state of decay, through the failure of those whose interest has been most at stake to study the problem and prepare a way of escape. It has now been taken up in earnest, and the first designs made for a structure that, to be more enduring and satisfying than the old one, must be cautiously and carefully tested at every step. It is a great undertaking to substitute an entirely new method for producing the necessary supply of mechanics to fill the constantly occurring vacancies in the ranks, but the proposition has been well presented, the right parties have taken the matter in hand, and beneficent results are sure to follow, beneficent alike to employer and employee, as well as to the world at large. It has been frequently said that the necessity for wise and consistent handling of the apprenticeship question was warrant enough for the existence of the National Association of Builders, and while this may be undeniably true, it is equally true that many other matters of importance claim its attention and demand its peculiar and especial services, for which no substitute can be devised.

FORM OF CONTRACT.

One of the first reforms undertaken has been the establishment of a "standard form of contract," it being very evident that uniformity in this important matter was greatly needed. The assistance and co-operation of the National Association of Architects was invited, and after proper consideration was cheerfully given, and a form was established through the good offices of a "joint committee," which form is growing in favor from month to month and from year to year. It has been pronounced by high legal authority as a very perfect document for its purposes, and the fact of its uniformity has made it a most important departure and a benefit already of incalculable value. The joint committee which framed it has been continued for the purpose of consultation upon important interests that may be brought to its attention, and with power to revise and improve the form when in their judgment it may seem advisable so to do. The creation of this document, which gives definite and uniform security to the interests of both owner and contractor, cannot be overestimated, and in that alone the National Association has demonstrated its capacity for serving, not only its own membership, but the community at large.

BUILDERS' SURETY COMPANY.

Another important undertaking, which is at present in the early stages of development, is the establishment of a company under the patronage and direction of the National Association, for the purpose of giving sureties or bonds on builders' contracts. The custom of giving bonds for the faithful completion of contracts has been a growing one for some years past, and contractors have been obliged in such cases to depend largely upon their friends for such accommodation, but under the privileges of this company such bonds will be given by a National Builders' Surety Company, which virtually means all the builders of the country guarantee-

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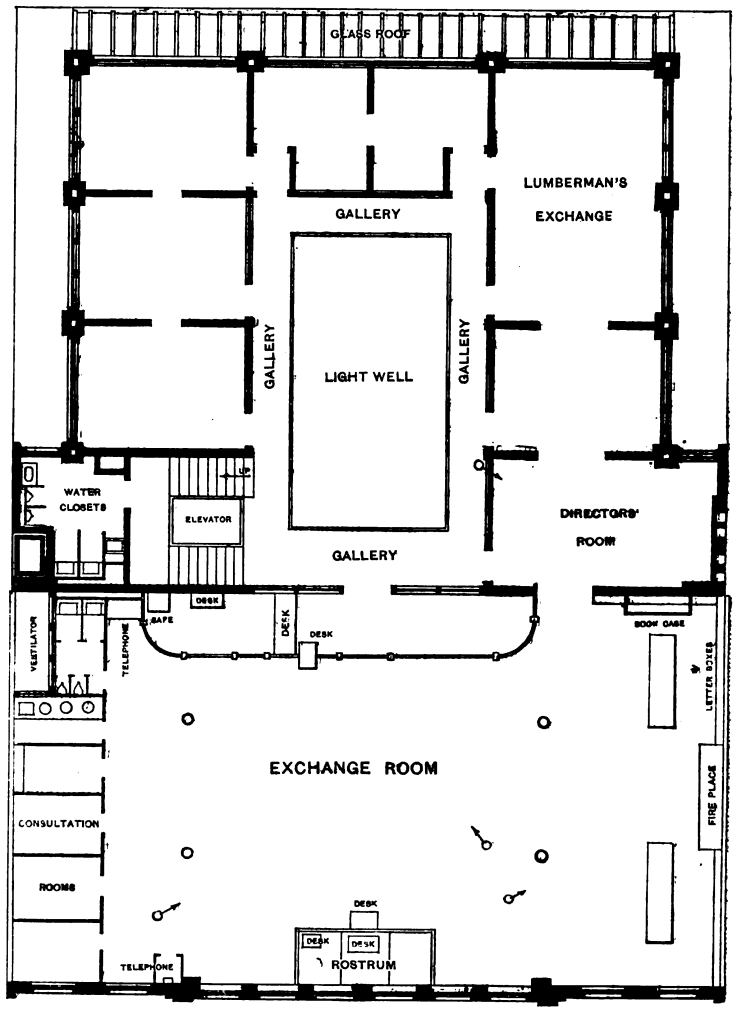
ing each individual contract upon which bonds are required. The facilities which exist for undertaking such guarantee by the membership of the National Association is superior to that of any private company, and the reach and efficiency of such a company is simply enormous.

Further opportunity is to be given in these columns to illustrate and define the various channels in which the concentrated intelligence, experience and ability of the builders of the United States may be utilized, and it would be well, therefore, to consider this article as but partial in its treatment and to close the present statement as follows:

The reason for the existence of the National Association of Builders lies in the need of consultation among those in a common calling, to establish fraternal feeling, and create harmony, as a precedent and accompaniment to strength. Its possibilities for usefulness cannot be stated, limited or overestimated. With education and development and unity as its watchword, and patience and perseverance as its tools and weapons, it may safely promise to secure and defend its members from carelessness within and foes without.

Practical Arbitration.

Whenever there is a dispute between employers and workmen, no matter what the line of business may be, there is an attempt made at settlement by arbitration. Sometimes it is successful, but more frequently it is not; and then follows a strike or a lockout, as the case may be, the struggle being prolonged usually until one or the other of the contestants has suffered so much as to be compelled to yield. Arbitration, as commonly attempted, fails, not because arbitration is not the right thing, but because the special application of it is not made in the right way, or because the management of it is not in the hands of the right men. We therefore use the term practical arbitration in the sense of indicating something that is appropriate to the case, adequate for the purpose and effective in use. It is hardly to be supposed that two persons, two classes of people, or two interests of any kind, which have lived so far apart as to know each other so little that getting into a dispute about some matters or other is the natural course of events, are in the best condition for arbitration when the crisis comes, or that under these conditions the opposing interests are likely to be well served by the friendly mediation of disinterested persons On the other hand, it will be admitted that the more intimate the knowledge that each of the persons or classes of people has of the other's affairs, the easier it will be to arrange difficulties when they arise, if indeed they come up at all. Practical arbitration, then, means also preparation for the settlement of disputes long before the evidence that differences exist has made its appearance. A plan which embodies this idea, and which it is believed is only the forerunner of others of the same kind to be introduced into the building trades everywhere, has recently been adopted in the freestone trade in Boston. As many of our readers know, there has been a dispute between employers and workmen in this line in and about Boston for many months past which now is happily settled. The solution that has been discovered is that of the workmen who are disposed to be reasonable to abandon their old organization and form a new one, the cornerstone of which is the provision for a joint committee of employers and journeymen to settle all disputes. A similar provision is made in the by-laws of the Contractors' Association. The new organization among the workmen is known as the Journeymen's Progressive Stone Cutters' Association. Before presenting the rules of the organization it is only fair to state that in arranging details and bringing about the adoption of this plan by both parties, Mr. W. H. Sayward, secretary of the Master Builders' Association, has been an indefatigable worker, and that to him more than to any other one man is due what promises to be a step forward in the peaceable settlement of labor troubles. The agreement in full is as follows:



Master Builders' Exchange Philadelphia.—(See page 143.)—Second Floor Plan, showing Exchange Room, Offices, etc.—The Arrows indicate Positions of Camera for the Views on pages 145, 147, and 149.

The Freestone Contractors' Association of New England, and the Journeymen's Progressive Stonecutters' Association of the City of Boston and vicinity, being about to enter into an agreement for mutual benefit, do hereby severally and jointly assent to the following propositions as a

DECLARATION OF PRINCIPLES.

1. It is possible and desirable to unite in establishing a method by which the interests of workmen and the interests of employers may each receive just consideration, and through which the relations of each to the other may be harmoniously adjusted.

2. To secure the establishment of such a method it is absolutely necessary that there be associations of employers and associations of workmen, to act as authoritative bodies in the premises, in order that the action taken may represent as fairly as possible the collective interests of both parties, and in order that the practices recommended may through them be more generally adopted.

3. No association entitled to recognition as an authoritative body should either in its form of organization, or through its by-laws, rules or practices, attempt to independently and arbitrarily control or influence the action of others, but recognizing the rights of others, should adopt measures that will lead to joint consideration and joint action in all methods of mutual concern.

4. Associations established on the principles herein expressed should be heartily encouraged, all persons eligible thereto should be urged to join, and every legitimate effort made to convince them that it is their duty to unite with their fellows in all honorable methods for the establishment and maintenance of just and proper practices among themselves and in their relations to others, and contractors should decline to employ workmen who will not join associations thus equitably established.

Being of one mind on the foregoing propositions, the two organizations do hereby enter into the following

AGREEMENT.

For the purpose of establishing a method of peacefully settling all questions of mutual concern, we, The Freestone Contractors' Association of New England, and The Journeymen's

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Progressive Stonecutters' Association of the City of Boston and vicinity, agree that no such question shall be conclusively acted upon by either body independently, but shall be referred for settlement to a joint committee, which committee shall consist of an equal number of representatives from each association.

The parties hereto agree to abide by the findings of this committee on all matters of mutual concern referred to it by either party. It is understood and agreed by both parties that in no event shall strikes or lockouts be permitted, but all differences shall be submitted to the Joint Committee, and work shall proceed without stoppage or embarrassment. The Joint Committee above referred to is hereby created and established and the following rules adopted for its guidance:

RULES OF JOINT COMMITTEE.

1. This committee shall consist of not less than six members, equally divided between the associations represented, and no action shall be taken by the committee unless the full number of each delegation be present.
2. The members of this committee shall be appointed by their respective associations not later than the 14th of December of each year. Vacancies occurring in either delegation to be filled by remaining members of such delegation.
3. The duty of this committee shall be to consider such matters of mutual interest to the employers and the workmen as may be regularly referred to it by either of the parties to this agreement, transmitting its conclusions thereon to each association for its government.
4. A regular meeting of the committee shall be held not later than the third Monday in December of each year, at which the special business shall be the fixing of the hours of labor and the rate of wages for the ensuing year. At this meeting also a code of practice to be observed by workmen and employers shall be adopted covering all points upon which the interests of the two parties come in contact.
5. Special meetings shall be held when either of the parties hereto desire to submit any question to the committee for settlement.
6. For the proper conduct of business a chairman shall be chosen at each meeting, but he shall preside only for the meeting at which he is so chosen. The duty of the chairman shall be that usually incumbent on a presiding officer.
7. A clerk shall be chosen at the annual meeting to serve during the year. His duty shall be to keep true and accurate record of the meetings, transmit all findings to the associations interested, and attend to the usual duties of the office.
8. In voting, a majority of the committee shall rule. In case of a tie vote an umpire, selected according to rule 9, shall cast the deciding vote.
9. In case this joint committee should fail to agree upon any point submitted to vote an umpire shall be chosen by the committee, preferably a judge of some of the higher courts in New England, if the matter in consideration be important enough to demand such a selection, but in any event some disinterested person in no way connected with the building trades, and his vote shall be considered final and binding.
10. No amendments shall be made to this rule except by concurrent vote of both parties.

A BUILDERS' EXCHANGE.

First and Second Prize Essays in our "Builders' Exchange Competition."

FIRST FRIZE ESSAY.

BY WM. J. FRYER.

What advantages accrue to the members of a Builders' Exchange? Briefly answered they are: First, convenience and facility for transacting business. Second, an extended opportunity to learn of what work is in the market to be estimated upon. Third, a knowledge of the demand and supply of labor and the ruling rates of wages. Fourth, an acquaintance with materials through the samples exhibited, including specialties used in construction. Fifth, entertainment and instruction for the members and their families, by lectures given on the arts and other subjects directly appertaining to their daily business and living.

WHO COMPOSE AN EXCHANGE.

It goes without saying almost that the persons who go to make up the membership of a Builders' Exchange are men engaged in the erection of buildings, masons, carpenters, stone men and iron men. But how various are the ramifications of these trades, how many other and distinct lines of business must work together in producing a building in its entirety is quite astonishing when considered in detail, and who therefore are also eligible to membership.

A mason contractor sublets his work to several branch contractors, and obtains his materials from several separate supply men. In enumerating excavators, blue stone men, granite men, marble men, brick men, sand men, plasterers, the list is not half gone over; besides, he employs his own stone masons, bricklayers, laborers and other help.

A carpenter contractor also sublets portions of his work, and buys from various supply men. A list consisting of framers, stair-builders, timber dealers, lumbermen, sash and door manufacturers, roofers, painters, does not by any means enumerate the whole, besides the employment of journeymen carpenters and other help. An alphabetical list of the trades having a direct connection with buildings would be long and be tiresome reading, but every building must have plumbing, gas fixtures, furnaces or other heating appliances, mantels, dumb-waiters or elevators—where, indeed, does the enumeration stop?

Now, these trades must work in together and at the right time. The employers on any one building must frequently see each other and give and take directions. The mason will be ready for a tier of beams on a certain day; the carpenter not only wants to know that fact but the mason wants the carpenters' assurance that the beams will be put on. The carpenter contractor needs to notify his framer. The iron man needs to be notified to set up the interior columns on that particular story. Innumerable are the similar cases.

How are these men to see each other? It is a dreadful waste of time going around to the different shops and manufactories to communicate these orders, and too often the right man to see is absent when a call is made at their places of business. The Builders' Exchange is at once the remedy against delays and the means for securing expedition in all building transactions. At the Exchange, during the noon hours of every week day, builders and those engaged in carrying on business in connection with building operations congregate for obvious purposes. Should one man fail to see another whom he hoped to meet there, he drops a brief request for an appointment for the following day at a usual hour, the note going into the letter box supplied for each and every subscriber to the Exchange.

HOW TO ESTABLISH AN EXCHANGE.

Having outlined the business advantages of an Exchange and briefly stated what class of persons should be brought into membership, let it now be supposed that no such organization exists in a thriving populous city. In what manner and on what basis can a Builders' Exchange be established? A moving spirit calls a meeting of a few prominent master builders. They respond. A circular call is issued for a general meeting of all the various tradesmen. The numbers and enthusiasm of those who attend that meeting will astonish the prime movers. A committee on organization is appointed to report at a future meeting. The committee send and get—for the asking—printed copies of the constitution and by-laws from Builders' Exchanges in several of the older cities; they adopt portions from one and portions from another of these pamphlets, and make up a constitution and by-laws to their entire liking. As a matter of course what they prepare will be acceptable when their report is presented to the general meeting. Whether the Exchange should be an incorporated body is also a question for the committee to decide. In almost every State simple and effective laws invite such bodies to put themselves under the operation and control of law, and it is advisable so to do. It is not an expensive or complicated matter to file articles of association and obtain a charter, and thus become an incorporated body, with all the usual rights, powers and liabilities that appertain to social, business or manufacturing companies.

LOCATION AND KIND OF BUILDING NEEDED.

Assuming all this to have been done, the election of officers follows. It will be an honor to be president or treasurer, or one of the managers or trustees of such a body. Then comes the question of a permanent location for the Exchange, whether to lease suitable quarters or to buy a building. The latter course should be decided on at the very outstart. Whatever is to be paid on the property should be made up by an issue of bonds, the interest on same to be paid from the annual dues of the members. The annual dues must be placed at a figure that will cover all the running expenses of the Exchange, including interest on mortgage, interest on bonds and sufficient in addition, when added to other sources of income, to create a sinking fund for the redemption of the bonds and the eventual payment of the mortgage.

Two floors of the building will be required for Exchange purposes. The remainder can be rented for members' offices or other uses. A store building will be the best for the purpose, the ground floor being roomy and deep and well lighted, to be used as the general room. The second floor should be used for a permanent exhibition of building materials and appliances, the floor space, the wall space and shelf space for exhibits being charged for at moderate rates. A portion of the second floor should be divided up into small private offices for the general use of the members, where they can retire and transact any private business.

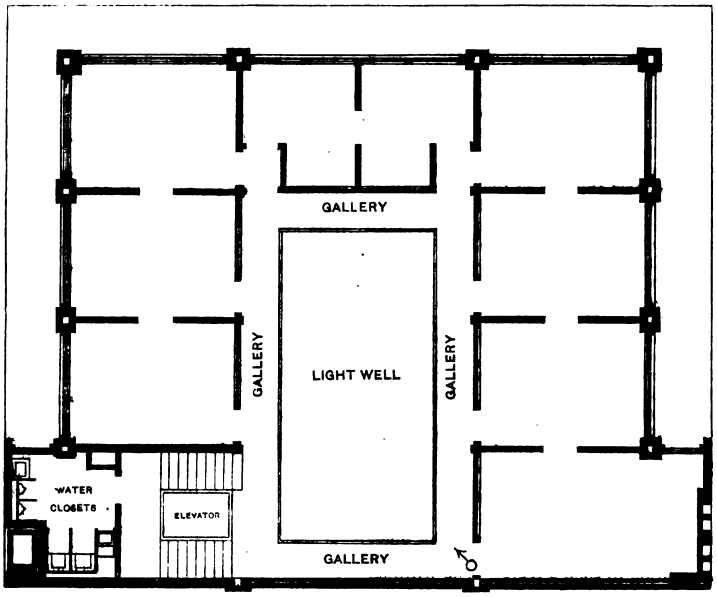
On the ground floor, and preferably at the rear of the same, offices should be provided for the use of the president, secretary, managers and other officers of the Exchange. The main room should be furnished with plenty of chairs; two or three spaces should be railed off, with a desk

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and a chair or two in each; stand-up desks in the center of the room or along the walls for convenient use, and a liberal supply of pens, ink and paper always in readiness.

A janitor, to give his entire time to the care of the rooms of the Exchange, must be employed and suitably paid. During the active hours of the Exchange he should be stationed at the entrance door, to answer such questions as may be put to him, and to find any member present that a visitor may want to see.

On the main floor as many letter boxes should be provided as there are members, each box being liberal in size and distinctly numbered and plainly marked with the name of the member to whom its use is assigned. The janitor must see to the receiving of mail matter from the post office delivery and distribute the mail so received to the proper boxes, and mail such matter as the members deposit in the proper place.



Master Builders' Exchange, Philadelphia.—Third Floor Plan.—Arrow shows the Position of Camera for View on page 143.

THE PURPOSES FOR WHICH AN EXCHANGE MAY BE USED.

The Exchange rooms should be kept open all day long, but the active hours should purposely be kept short, from 12 m. to 2 p. m., in order that the attendance can be concentrated, and thus secure one of the very greatest advantages—the opportunity for men to meet men at a stated time and place.

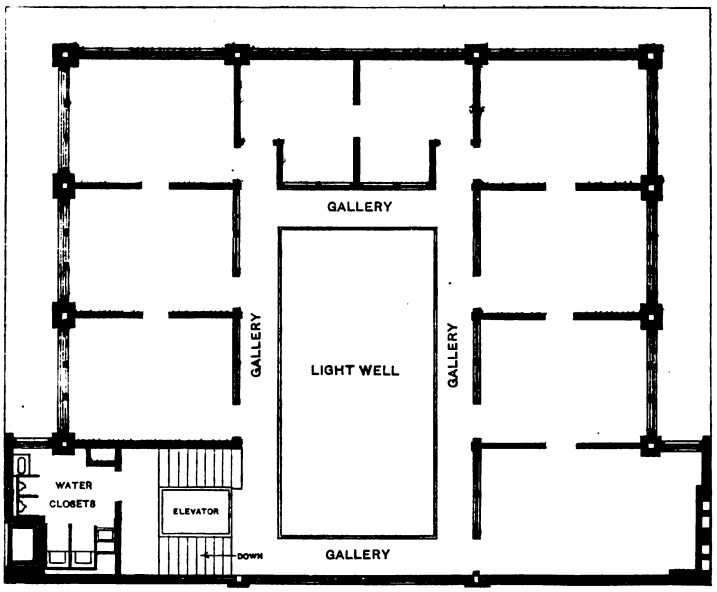
Allusion has been made to the advantage and convenience offered to a contractor to meet his sub-contractors and material supply men, during the progress of his building, through the medium of an Exchange as a place of common attendance. It must not be overlooked that it is quite as important for such contractor to meet these very men before he gets his contract, while he is estimating on the work, as he must get sub-bids and prices for various articles. To attend the exchange at the noon hours will be found not an inconvenient duty. Nearly every builder has to go to the business center of the city once a day, to an architect's office, perhaps, or to a bank or to make a call upon an owner. The Exchange building should therefore be located not far from the business center, but need not be where property is the most expensive. A wise selection, however, should be made with a view of reaping an increase in value in purchasing the property.

Architects, when they find that their builders can generally be found at the Exchange at the noon hours, will find it most convenient to send messages to them there. The privileges of the floor of the Exchange should be extended to all architects in good standing. Builders, by coming in contact with each other, will lose much of their natural asperity and jealousy. They will find that their neighbors are not such bad fellows after all. They will have opportunity to counsel with each other on labor questions, and when strikes occur can stand shoulder to shoulder together. The Exchange, as a body, should not interfere with the workings of natural laws, or make combinations to control wages or products. Its constitution should expressly provide that each member shall be free to employ whomsoever he sees fit, and for whatever compensation he may deem best; and also to sell his products at any price, and on any terms he may please. In no way should individual liberty be abridged or restricted by Exchange action.

The Exchange, as a body, can in many ways be of public service. Politics must be kept out, but there are many matters arising in every city where Democrats and Republicans can meet on the common ground of the public good; questions of taxation, assessments, public improvements, such as sewering and paving of streets, laying out of parks, building of docks, laws relating to the construction of buildings—a host of questions where the expressed wishes of a united body of builders would be most potent and exceedingly proper to emanate from them. They could thwart rascality in public contracts and do much toward good municipal government, at the same time being always liberal as to public expenditures in all that will advance the growth and prosperity of their city.

To the Exchanges throughout the country it is becoming quite the common practice to send plans for United States public buildings to be erected in their respective localities, with an invitation that bids be submitted by members, it being assumed that most, if not all, the reputable builders are members of the Exchange wherever such exists. Thus, not only is competitive work opened up to the members, but membership is looked upon as a badge of good standing. An Exchange naturally excludes from its membership men of evil repute and endeavors to gather in all eligible persons of good character.

The Exchange can give entertainment and instruction to its members, as well as add to its treasury receipts, by providing a weekly lecture during the winter season on subjects that relate to buildings. All through this country are men qualified and ready to lecture on architecture, on construction of buildings, on sanitary and health matters in connection with buildings, on laws regulating the construction of buildings, on the method and system of buildings in foreign countries. Such lectures would be instructive and edifying to all persons engaged in the building trades, but would add money to the treas-



Plan of Fourth Floor, showing Arrangement of Offices for Tenants.

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ury of the Exchange from the sale of tickets to the general public.

LITERATURE AND USEFUL INFORMATION.

The Exchange, without endeavoring to gather together a library, in the ordinary sense of that term, should have in accessible shape all the current architectural and building publications of this country and of England, at least. It should obtain and classify trade catalogues and price-lists for rapid and easy reference.

Then there is the National Association of Builders, in reality a union of Exchanges, and whose intention is to take into the fold all Exchanges as fast as they come into existence. The fundamental object of the National Association is to foster and protect the interests of all concerned in the erection and construction of buildings, to acquire, preserve and disseminate valuable information connected with building trades, and to establish uniformity and harmony of action among builders throughout the country by promulgating and advocating through the Exchanges such general systems as will not conflict with local customs and interests. These intentions, when carried out through the representatives from the different Exchanges, each organized Exchange being entitled to one delegate at large, and one delegate in addition for each 50 members or fractional part thereof, must result in placing before every individual member of the Exchange much valuable information and useful knowledge that could not be obtained from any other source, and ,by securing uniformity in the wording of contracts, by a uniformity in the system of apprenticeship, by securing a uniformity of lien laws, by a uniform system of employing labor by the hour instead of by the day, by endeavoring to prevent strikes, lockouts and other disturbances, in all these things the direct interests of the members of the Exchanges are to be benefitted, protected and advanced, and at the same time the interests of all employees in the building trades are to be correspondingly benefited.

ARBITRATION COMMITTEE.

Within the Exchange should be an Arbitration Committee, to be elected annually and to serve whenever called upon in business matters of dispute between members who may agree to abide by the decision of such committee. An Arbitration Committee will also be found useful in settling difficulties between masters and men, for by far the greater number of workmen recognize the fact that employers are better friends to the mechanic than labor agitators.

No one can look with disfavor on a Builders' Exchange, organized in the way that such Exchanges invariably are. Indeed a Builders' Exchange is a needed institution in every city of considerable size in this country, and are a direct advantage not only to the individual members thereof, but to the city itself in which any such Exchange is located.

SECOND PRIZE ESSAY.

BY WM. F. BERAN.

A Builders' Exchange is a voluntary association of employers, comprising those engaged in all the various avocations necessary to the erection of buildings, and should number in its membership every trade, from the excavator who strikes the first pick into the ground to the manufacturer who furnishes the key with which to close the completed house. Every man who furnishes aught that goes into the structure has business with the general contractor or superintendent, and it is of vast importance to each sub-contractor to be sure of a time and place where he can expect, with a degree of certainty, to meet the contractor and receive his instructions, as well as to consult with other mechanics whose material must be wrought in conformity with his own.

PRINCIPAL OBJECT.

Thus, the prime object of a modern Builders' Exchange is to save time. In this respect it is in consonance with the day we live in, when thought and hand are all alive in devising machinery to produce in one day the work of former weeks. In a real live Exchange, whose members grasp this main feature, more effective work is done in the 60 minutes of "change hour" than formerly could have been done in a day's time by driving from office to office after those with whom we have business. And to effect this object the first requisite is to infuse into the membership, the necessity of being promptly on hand, even though one member may know of no especial business for him; no one can tell but that other members may want him, and possibly come solely to see him. Just how to impress this necessary truth on the mind of every member, so that it will have force sufficient to bring each one to the Exchange is the problem not perfectly solved. It is the experience with all new Exchanges that much labor and thought is required before their members can be brought from their former method to make proper use of the valuable privileges an Exchange offers.

SELECTION OF MEMBERSHIP.

One method is in the selection of the membership, and this involves the question of who should be esteemed a valuable acquisition to such a body. The cardinal principles which should guide in this selection seem to be good standing in the community, good credit and active, energetic conduct in business. The first two are almost essential to success in any building trade, and the last will be found in one whose time being fully occupied will value the Exchange as a means of saving it. By credit and good standing in the community is not meant that a man merely pays his debts because he can be compelled to do so, but rather because he recognizes that by promptly and honorably meeting his obligations he is enabled to purchase his materials at the lowest cost, and so quote lower prices on his own product than a time purchaser could do, which is of too great value to be lightly trifled with. Exchanges of this kind are not supposed to look at a man's moral or social relations, except in so far as they affect his business standing. But too much care cannot be exercised in examining into an application before the applicant is admitted to membership. Too often in newly organized Exchanges it has happened that in the anxiety to obtain a large membership persons have been admitted who have brought discredit on the entire body. The quality and not the mere number should be looked after. This should be carefully watched, especially in the early years of an Exchange, and the names of all applicants should be publicly posted in the meeting room of the exchange, and members encouraged to assist the officers in excluding objectionable persons. But no petty jealousy or personal dislike should be allowed to prevent an otherwise desirable firm or person trom uniting with the association.

MAIN FEATURES OF AN EXCHANGE.

Besides the saving of time other advantages naturally follow. A body of intelligent men cannot meet day after day with others interested in the same general class of business without forming acquaintances; without conversing on new methods, new machinery and processes for labor saving, or economical management. Again, the social feature is not one to be despised. How often do we think and say harsh things of a competitor with whom we have no personal acquaintance; and who has not found by experience that "he isn't such a devil of a fellow after all."

Another and more valuable feature is the additional character and weight such an association gives to the building fraternity in general. When an organization of this kind presents a petition or protest, for or against any project, it goes as the united expression of an intelligent body, and not as the opinion of one man. When this association finds laws burdensome to the building interests, or perhaps too lax in their application, or not sufficiently restrictive to compel a reasonable degree of safety in such work as their members are doing, how much more effective is the power of a substantial organization to that of an individual protest. The various committees can be selected from experts on the subjects to be treated, and in almost every Exchange men can be found better informed on the various branches of business than can be readily gotten together outside.

GOVERNMENT.

The government of Exchanges should be as free from restrictions on the independence of its members as possible, but it should never be forgotten that every member owes a duty to the association further than that of paying dues or fees, and as the individual members should be impressed with this responsibility, so should they be given a voice in the selection of their officers and directors. In all Exchanges, so far as we are informed, the government rests on the American practice of majority vote. By this rule the officers are elected for annual terms, and the Board of Directors for a like time. This is in some cases varied in the election of the Board of Directors, by electing a stated number for varying terms, so that after the formation of the original board only a limited number, usually one-third of the whole, are elected at each annual meeting. This variation has a number of points of advantage, as it prevents any very radical change of management, such as might be brought about by temporary enthusiasm for an individual or project. In all Exchanges the president is purely an executive officer, having no authority or power to bind the association without the consent of the Board of Directors. And by this arrangement any question affecting the welfare of the Exchange must be discussed by a large and presumably intelligent portion of the membership. In some Exchanges two classes of members are allowed, the corporate and the non-corporate. The former class is restricted in number, but enjoys greater privileges than the non-corporate. Thus the non-corporate class have no vote on many subjects that are of vital importance to the general good, and in all meetings a member of this class is liable to have his vote challenged should he not be perfectly informed as to the exact limits of his membership. This double classification has almost invariably been a fruitful source of irritation wherever it has been adopted, and it seems strange that it is still used by new Exchanges. The original reason for adopting it was to insure the control of the association to the mechanical firms, in contradistinction to the material men. But the same object is readily attained by other means, and this very unpleasant feature eliminated. The uniform class of membership, where each one has an equal voice and equal right to be heard on all questions, seems to be the more independent method.

HOW AN EXCHANGE SHOULD BE SUPPORTED.

Exchanges are supported by initiation fees and annual dues or assessments, and the amount of them is usually fixed by the directors previous to the annual meeting, and there submitted for the approval of

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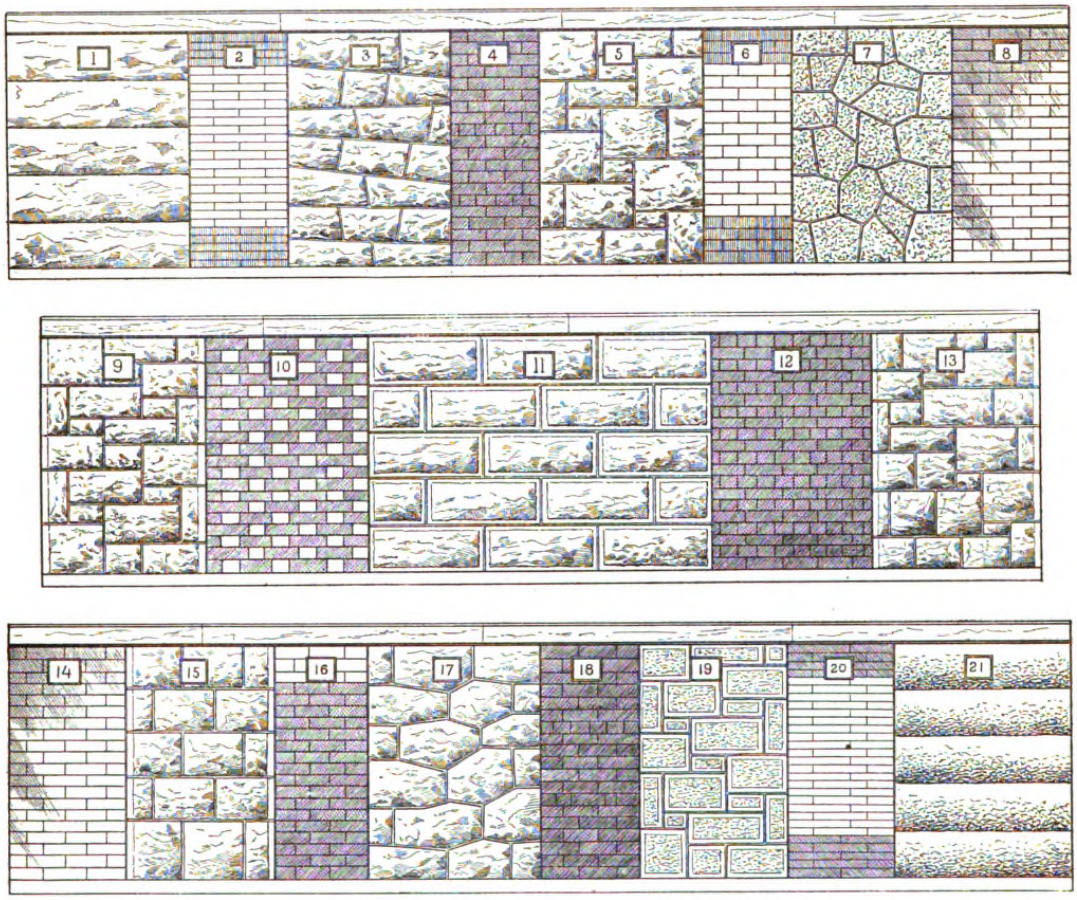
the entire body. The amount necessary to defray the regular current expenses should be shown, and a liberal allowance made for unforeseen but necessary outlays. An Exchange should never be allowed to close the year with a deficit in the treasury. Besides these allowances in every yearly assessment there should be imposed a regular tax or amount over and above the necessary expense items, to form a nucleus or capital to meet any unusual expense. This accumulation of a sinking fund has a great moral effect on the membership, for it tends to diffuse confidence in the stability of the organization, and every man who feels a pride in the association will be more willing to build it up to still further prosperity. Besides there are many men in every community who would be of great strength to the Exchange, but who are unwilling to lend their names and influence until they are thoroughly assured of the success of the project.

BUSINESS TO BE TRANSACTED WITH MEMBERS AS AGAINST OUTSIDERS.

One other practice has been found very useful, and, indeed, it would seem to be only just and right, and that is, members of an Exchange should feel it a duty, so far as can be done, not merely to transact their business on the Exchange, but should give a decided preference to fellow members over those who refuse to join. In many cases this very custom has been the means of showing valuable firms the benefit of the association. In the sharp competition for business, many men deem it a useless expenditure of money to join these associations, and this is a direct appeal to their pockets, in such a manner as no more forcible way can be found. It is not necessary to pay more for your goods, for in every Exchange are the very men who are there for the purpose of selling and contracting, but many members are unwilling to recognize the duty incumbent on them to make their contracts with those who have joined hands with them in order to facilitate each his own business.

LOCATION AND ARRANGEMENT OF BUILDING.

So much for some of the points of government and usefulness of the organization. Much could be said on all of these and a thousand other points of interest, but one most important thing must still be added. The location of the place of meeting is of too much consequence to be passed over. Every Exchange should be placed convenient to the banking center and the public buildings, for about these seem to congregate the men with whom the builders transact a large share of their business. The rooms should comprise a general meeting room, an office for the secretary, and, if possible, several good consulting rooms, where members could expose their plans for various contractors to make their estimates, and which could be made temporary offices for the use of members. Of course all conveniences should be at hand both for writing and for telegraph or telephone service. In short these Exchanges should be supplied with every convenience the best equipped office could boast. Too long have mechanics contented themselves in miserable offices in one corner of dusty shops. Here in the Exchange should everything be clean, tidy, and of the best. Light, comfort and every convenience should be insisted upon. No dark, cheerless corner, but rooms suitable to the size of the membership, on good thoroughfares and well furnished, so that when a member has occasion to invite any man to meet him he can feel the assurance that his surroundings do him no discredit. Where these necessities can be obtained, and each and every member brought to appreciate and use them, there will only remain the wondering question, "How did we ever do without our Exchange?"



Master Builders' Exchange Philadelphia.—(See page 143)—Diagrams representing Specimen Sections of Stone-work, Brick-work, etc. Erected to illustrate Materials and Workmanship.

Styles of Architecture.

My objection to Gothic as a style, says J. D. Waring, is that it requires too much ornament to set it off to advantage; that it is too expensive on this account, and unfitted for buildings where regularity is required; that it is too pictorial; and that the state of the arts with which it was connected—painting and sculpture—is so rude and crude that we cannot willingly revive it, and yet that we cannot well apply actually good works of this nature without depriving it of some of its principal charms. In the Norman I find none of the first-mentioned drawbacks; its massiveness, plainness, oneness of effect and imposing regularity cause me to perceive a style fitted for the most solemn, awe-inspiring effects, while at the same time it is rich and beautiful in proportion, as ornament is judiciously applied, but does not admit of Gothic excess. The

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system, however, has never been properly developed—namely, the round arch and exercise of inventive power in composition and ornament; and we see in it only a power to be great. I wish to show that the Norman contains more of the elements of a firm architectural style than the Gothic, for various reasons. In the first place, the round arch is a more perfect and consequently more beautiful form than the pointed arch, which is a composite or broken form; the circle is a complete form in itself, and the form we find in the skull, the rainbow, the planets. I do not think it is prejudice which convinces me that the rainbow, if formed like a pointed arch, would be much less beautiful; it is the form of arch always adopted by the Great Creator; there is an idea of continuity, calmness and power in it which the pointed needs. Then, again, whilst Gothic has gone through a course of decline and bad taste, which it is impossible to free it from, in Norman we have stuff yet to be worked.

Building Laws.

The laws and municipal regulations governing buildings differ in the several States of the Union, and also differ from time to time in any given place. As a rule, the older the community and the larger the city, the more stringing the rules. A very considerable part of the builder's stock in trade, so to speak, is to know just what the law requires and how the law may be complied with in the cheapest and most satisfactory way. Accordingly, he is obliged to keep himself well informed of the law, and concerning the changes made in it from time to time. As already intimated, building laws are progressive. They are framed, altered and amended from time to time to meet emergencies. Hence it is that an examination of ancient building laws very frequently gives an insight into the building construction of the period, the habits of the people of earlier generations, and other circumstances of the ancient life of a city that otherwise would never appear. A short time since our attention was drawn to a review of some of the laws current in ancient times in the city of London, a brief account of which will have interest for our readers. What is presented is taken from a volume entitled "White Book of the City of London," compiled by John Carpenter and Richard Whittington, Mayor, and which dates from 1419. An English contemporary says:

The most important references are found collected under the heading of "Fitz-Elwyne's Assize of Buildings, 1 Richard I," and date from 1189, in which year, and in the mayorality of the said "Fitz-Elwyne," who has the distinction of being the first holder of that dignified office, it was ordained, "by the more discreet men of the city, for the allaying of the contentions that at that time arise between neighbors touching boundaries," first, that "twelve aldermen shall be at the hustings, the said provision and ordinance called an 'assize.'" Any one demanding the intervention of this jury of aldermen must do so in "full hustings," the Mayor forthwith appointing a day within eight days for the trial of the cause. Then follows a paragraph which shows the manner, more forcible than polite, the early citizen had of dealing with infringement of their laws. "If a house, stone wall, drain, rain gutter, or any other edifice shall during the time of petition be built, at the suit of the party petitioning, the culprit shall be forbidden to proceed; and if, notwithstanding, any carpenters, stonemasons, or others shall persist, they shall be sent to prison."

After instructions as to the mode of procedure at such times as the Court of Aldermen was not sitting, "harvest-time, Winchester Fair, or the Fair of St. Bartholomew," we have a list of the provisions and ordinances, the first of which relates to "buildings erected between neighbors." There is a good deal of "go as you please" about this particular enactment. If two neighbors desired to build between themselves a stone wall, "each ought to give 1½ feet of his land," the wall to be "3 feet in thickness, and 16 feet in hight." A rain gutter is also to be constructed "if they wish," at their joint cost; but if this arrangement does not please, each may follow his own sweet will in the matter, and "make a gutter by himself."

From the explicit statement as to the hight of the wall one would naturally suppose 16 feet to be a limit not to be exceeded. Nothing of the kind, for the very next paragraph says, "They may also raise the said wall as high as they please, at their joint cost," a remark which prompts to a query as to the use of the preceding regulation. If, however, one of the parties desired to elevate his wall, while the other was content with the more modest altitude, such a course was permissible so far as one half the structure (the 18 inches aforesaid) was concerned, "without damage to the other."

All this "grandmotherly" legislation reads very strangely nowadays. We still have laws preventing undue encroachment upon the comfort of others, but how should we like to be told our garden walls must not exceed a certain hight or thickness because some one close by had a fancy for an uninterrupted view?

The next is a curious provision. "If any one shall wish to build of stone and his neighbor through poverty cannot, or perchance will not, the latter ought to give to him who so desires, to build, 3 feet of his own land, and the other shall make a wall at his own cost, he who gives the land having one clear half of the wall, and may place his timber thereon and build." There is in this an amount of care and forethought for the poor somewhat at variance with our general idea of the times. Our nineteenth century civilization can scarcely show a more discreet enactment, founded as it is upon a very fair arrangement, the poor man giving his land in exchange for the accommodation of his richer neighbor's building.

Walls and gutters seem to have given our worthy ancestors a good deal of trouble, and some of the laws on the subject are even more curious than those quoted, as, for instance, the following: "If any person shall have his own stone wall upon his own land, his neighbor ought to make a gutter under the eaves of the house situate upon such wall, and to receive in it the water falling from the said house and lead it on his own land." This appears at first sight an arbitrary enactment, but one may learn something of its origin and relevancy by turning to the section which treats of "The Ancient Manner of Building Houses."

In times still more remote than those in which the laws we are quoting were in force, the chief part of the city was built of wood, the houses being covered with straw or stubble. Under these conditions, it is hardly surprising to hear that when one house caught fire the greater part of the city was destroyed, as, for instance, in Stephen's time, when a fire, commencing at London Bridge, not only demolished St. Paul's, but spread to the church of St. Clement Danes. This grievous calamity impelled the citizens to seek a safeguard against a recurrence by rebuilding in stone such solid edifices, frequently having the salutary effect of staying subsequent fires and hindering their spreading to the more inflammable dwellings of the poorer people. In order, therefore, to encourage the citizens to adopt stone as their building material, the law compelling the nearest tenant to provide gutters and such conveniences was passed, and although there may have been grumbling frequently enough on the side of those who dwelt in wooden tenements, they could hardly avoid confessing to a greater sense of security from the close proximity of walls strong and thick enough to stop the progress of the destroying element.

But there are many other rules bearing on the question of rain water and its disposal, from which we may infer that Jupiter Pluvius was as great a power in merry England of the twelth century as in our present, more commonplace, but more comfortable, Tictorian era. So far as one may judge, everybody seemed to be made responsible, not for his own building's overflow, but that of his neighbor—a brotherly and charitable arrangement which, we fear, would hardly commend itself to tenants of the present day. As a further example may be cited the following: "If a person's rain gutter shall discharge itself into that of his neighbor's, or shall run through the middle of his tenement, such neighbor may not stop up such gutter; and even if he pull down that house and think proper to build it anew, he shall be bound to receive upon his own land the water falling therefrom, and carry off the same." The picture of some one else's waste-pipe "running through the middle" of one's house is rather curious.

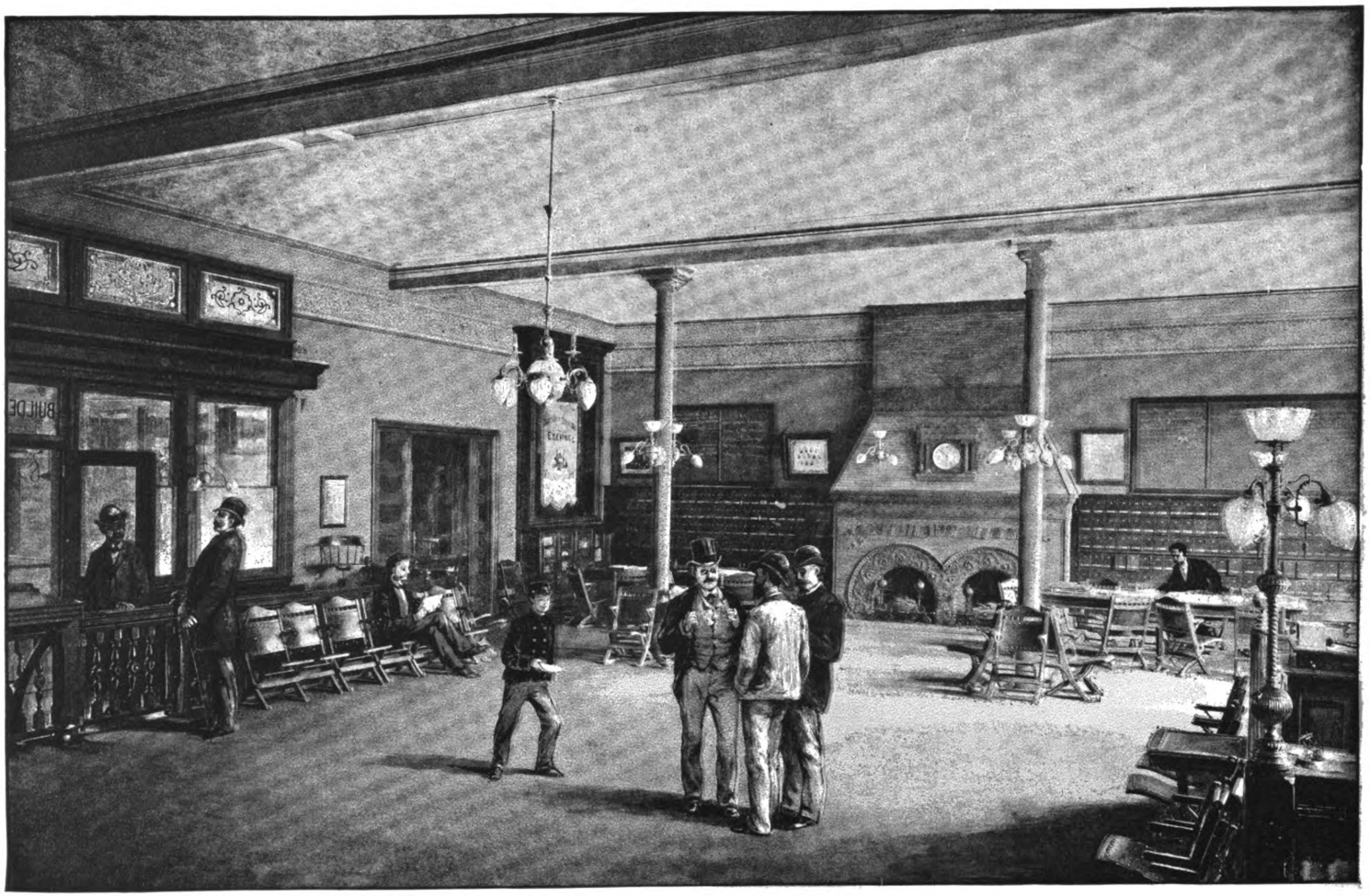
Furnaces or fireplaces were by no means to be erected near partitions, laths or boards; if so, the "scavagers" were to cause the offending grate to be removed or destroyed, receiving in return for the duty the munificent sum of fourpence. These "scavagers" were originally officers whose task it was to take custom upon the scavage—that is to say, the opening out of goods imported. Later the duty was added of seeing that the streets were kept clean, though how the two offices were effectually combined is, to say the least, obscure. The modern word "scavenger" is, of course, derived from this ancient title, though the unsavory work performed nowadays by these individuals fell, in ancient times, to the lot of the rakyer or raker. What the precise duty of the "scavagers" were may be best learnt from the form of the oath they had to take, in which they swear to "diligently oversee the pavements in the ward; that they are well repaired, and not made too high in nuisance of the neighbors; that the ways, streets and lanes are cleansed of all manner of filth, for the decency of the city, and that all chimneys, furnaces and reredoses are of stone," the whole ending with the usual formula, "So, God, You help, and the Saints!"

The expression "reredos," as used here, does not imply the erection at the back of the altar or communion table, but an open firegrate, such as was often placed in the middle of ancient halls. How the same term came to be applied to such dissimilar objects is an interesting query. All projecting portions of a house, called in the old phraseology "pent houses and jetties," were to be sufficiently high for riders on horseback to pass beneath, 9 feet at the least; while stalls were not to project more than 2½ feet, and to be "moveable and flexible," for the convenience of the neighbors. Such, briefly, are a few of the more interesting extracts from this valuable and entertaining collection of records, which comprises in its pages a more vivid and accurate picture of ancient city life than is possessed by any other corporation in the world.

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EXCHANGE ROOM, MASTER BUILDERS' EXCHANGE, PHILADELPHIA.

FOR FLOOR PLANS AND OTHER VIEWS SEE PAGES 135 TO 150.

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MASTER BUILDERS' EXCHANGE, PHILADELPHIA.

THE READER who carefully examines the several floor plans published in the preceding pages, and who examines also the photo views which are reproduced on this and succeeding pages, will naturally wish to understand. First, as to the building itself. It is located on Seventh street, between Market and Arch. It has a depth of 105 feet and a frontage of 75 feet. It was the building, though altered, has not been changed so radically as the back part, but it is the intention of the organization in time to carry it several stories higher, thus giving the Exchange much needed



Master Builders' Exchange, Philadelphia.—View Showing Galleries Around Light Well and Entrances to Rented Offices.

get an excellent idea of the well arranged and carefully adminstered exchange for which the master builders of Philadelphia are responsible. Our description will add comparatively little to the story told by the pictures, for we have been careful, in preparing the engravings, to choose such points of view as will give all that the reader would formerly the office of a gas company. The master builders purchased the property and at once altered the back part of it, carrying the building up in a way to secure, in addition to accommodations for the Exchange, a large amount of office room to be rented out. Galleries are extended around the light well, as shown in the view on page 143. The front part of additional room, and at the same time securing for it a front of imposing architectural appearance, in keeping with the importance of the enterprise for which it stands. The present building has been opened only a few months, the Exchange having been housed during the early period of its existence in another building in a different part of the city. The im-

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provements on the building above described were made under the direction of Wilson Brothers, architects, and by John R. Wiggins, contractor. As will be seen by reference to the floor plans, the entire lower floor of the building has been arranged as an exhibition room. In this has been installed a very full and complete collection of samples of the different materials used in the building business. Of this exhibition an account is given in another column.

THE EXCHANGE.

The Exchange room is on the second floor, facing on Seventh street. Just what the accommodations are can be readily gained from an inspection of the photographic view contained in the supplement plate with this issue, and also by comparison of that view, and others published in the pages following, with the floor plans. The positions occupied by the camera in securing the several views are indicated on the plans by arrows, which will greatly facilitate the reader's understanding the relationship of one to the other. The exchange room is fitted up with everything that can add to the convenience of the members. Offices for the executives of the association are provided; likewise a directors' room, telephone closets, &c., while each of the 300 members has his private box for the depost of his mail and papers. The Exchange room is spacious, well lighted, neatly decorated and most comfortably furnished. Racks containing files of building and other trade papers are at hand, also large tables and desks for use as required, while across one end are a series of consultation rooms in which private business may be transacted, estimates made, or drawings and specifications examined.

TRADE SCHOOL.

The basement of the building, as elsewhere described in this issue, is fitted up for trade school purposes. Here are also located the steam boiler and the machinery of a rapidly running elevator which serves the different floors of the building. The boiler referred to also provides steam heat for the building, the location of the radiators, through certain parts, being indicated upon the engravings. By reference to the several floor plans it will be seen that careful attention has been given to the convenience and comfort of tenants. The location of toilet rooms is clearly indicated. These have ample ventilation and are in immediate proximity to the smokestack from the boiler, thus securing the pipes against any special danger of freezing in cold weather. All the different portions of this building are amply lighted. It will be seen that the walls are built back from the line of the lot sufficiently far to permit of windows on all sides. The basement, in addition to windows opening into the area at the back and along the two sides, is also in part lighted by floor lights under the light well extending through the several upper floors, and also under the skylight, which marks the offset in the building across the westerly end.

AFFILIATED BODIES.

The following associations of master mechanics in Philadelphia meet in the building here described: Stone Cutters' Association; Bricklayers' Company; Master Plasterers' Association; Master Plumbers' Association; Philadelphia Saw and Planing Mill Association; Master Carpenters' Association; Master Painters' Association and Metal Roofers' Association. The Lumberman's Exchange is a permanent tenant, and occupies a room near the westerly end of the building as indicated on the plan of the second floor. A short time since, the use of the Exchange Room, Directors' Room and other facilities of the Exchange were tendered to the Philadelphia Chapter of the American Institute of Architects. It is barely possible that in a short time the building here illustrated and described will be used as a meeting place for architects as well as builders, thus typifying, in a very happy manner, the co-operation of these two important branches of the same general interest.

THE MANAGEMENT.

The officers and committees of the Master Builders' Exchange, Philadelphia, for the current year are as follows:

President, Stacy Reeves.

Vice-presidents, George Watson, Geo. W. Roydhouse, Murrell Dobbins.

Secretary, Wm. Harkness, Jr.

Treasurer, Charles H. Reeves.

Board of Directors, 1891: Stacy Reeves, 1611 Filbert street; Geo. W. Roydhouse, Builders' Exchange; Wm. H. Albertson, 3963 Lancaster avenue; George Watson, 905 Marshall street; Fred. F. Myhlertz, Twenty-second, below Market streets; J. S. Thorrn, 1205 Callowhil, street; Jacob R. Garber, 52 North Thirteenth street; 1892—Franklin M. Harris, 1611 Filbert street; John Kisterbock, 1231 Market street; Chas. P. Bancroft, 1109 Locust street; Maurice Joy, 1727 Chestnut street; John E. Eyanson, 207 South Tenth street; Murrell Dobbins, 110 South Sixth street; Wm. B. Irvine, 529 North Twenty-third street; 1893—William Gray, Thirtieth and Walnut streets; Chas. Gillingham, 1615 North Ninth street; Wm. Harkness, Jr., 247 South Third street; Chas. H. Reeves, 922 North Eighth street; Samuel Hart, 1109 Fairmount avenue; William S. McGinley, 35 South Twenty-third street; Jacob Myers, 1315 Sansom street; ex-presidents, John S. Stevens, 130 North Sixth street; David A. Woelpper, 917 Richmond street.

COMMITTEES.

Finance: Wm. B. Irvine, chairman; Murrell Dobbins, Fred F. Myhlertz.

Legislation: Wm. Harkness, Jr., chairman; Franklin M. Harris, Fred F. Myhlertz.

Arbitration: John Kisterbock, chairman; Geo. Watson, Sam'l Hart, Maurice Joy, John E. Eyanson.

Architects' Plans and Contracts: Jacob Myers, chairman; Wm. Gray, Sam'l Hart, Maurice Joy, W. H. Albertson.

Labor: Wm. Gray, chairman; Geo. W. Roydhouse, Jacob R. Garber.

Printing and Supplies: Wm. H. Albertson, chairman; Murrell Dobbins, Chas. P. Bancroft.

Press and Publication: J. S. Thorn, chairman; Wm. Harkness, Jr., Geo. W. Roydhouse.

Room and Rules: Chas. H. Reeves, chairman; Chas. Gillingham, J. S. Thorn.

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Plastering: John T. O'Brien, A. G. Buvinger, J. Turley Allen.

Stone Cutting: Peter Gray, B. Ridgway, John Atkinson.

Iron Work: Wm. W. Stevens, Wm. S. McGinley, J. Wash. Royer.

Painting: F. F. Black, James C. Taylor, A. B. Barber.

Plumbing: R. H. Watson, Jno. J. Weaver, John E. Eyanson.

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BOSTON, MASS.—The Master Builders' Association of the City of Boston, 164 Devonshire street. Secretary, William H. Sayward.

BROOKLYN, N. Y.—The Mechanics' and Traders' Exchange of the City of Brooklyn, N. Y., 363 Fulton street. Secretary, George C. Cranford.

BUFFALO, N. Y.—The Builders' Association Exchange of the City of Buffalo, N. Y., Rooms 1 and 2 Jewett Building, over 323 and 325 Washington street. Secretary, Edward L. Cook.

CHARLESTON, S. C.—The Master Builders' Association, Exchange Building, East Bay street. Secretary, John E. Keregan, 25 State street.

CHICAGO, ILL. — The Builders' and Traders' Exchange of Chicago, 159 La Salle street. Secretary, James John.

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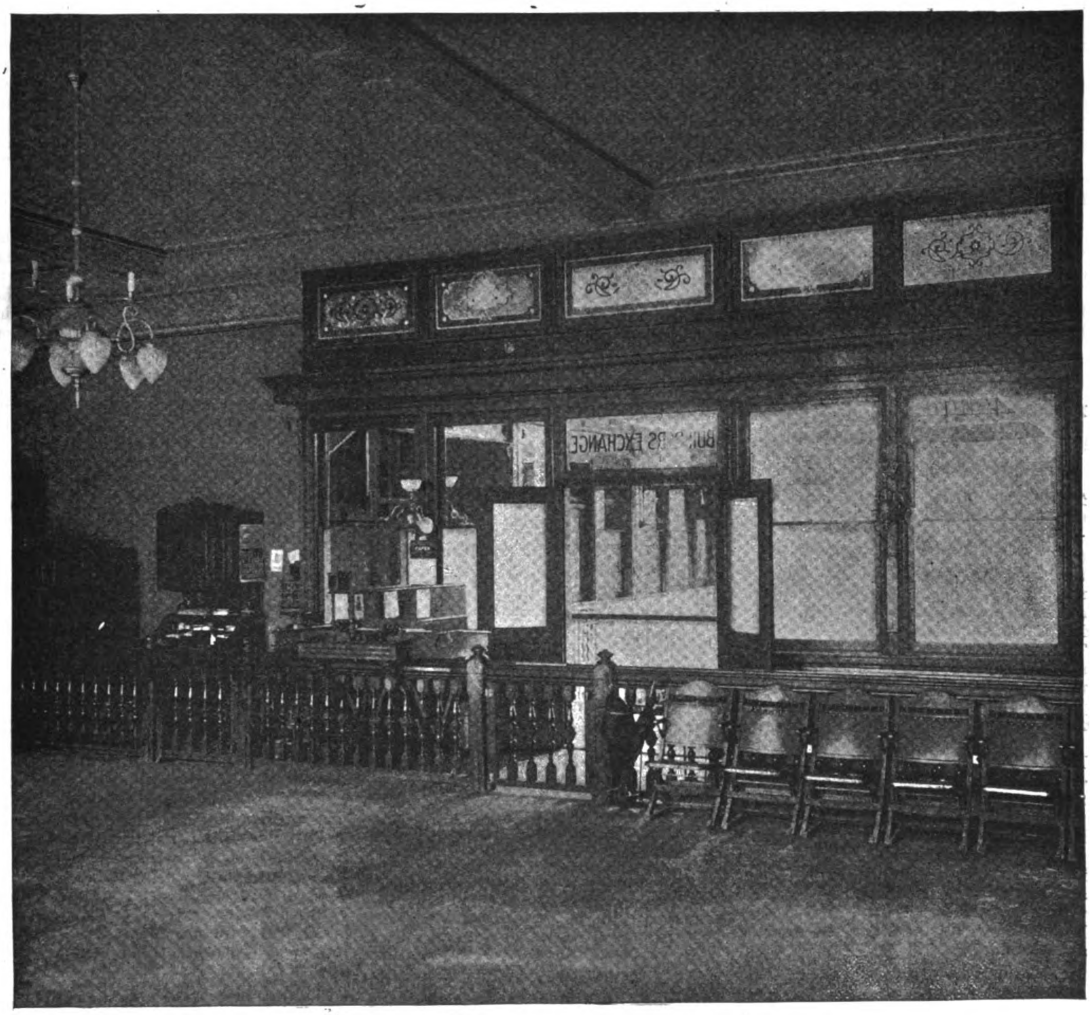
LOUISVILLE, KY.—Builders' and Traders' Exchange of Louisville. Secretary, Geo. W. Schmidt.

LOWELL, MASS.—Master Builders' Exchange of Lowell. Secretary, J. H. Coggeshall.

MILWAUKEE, WIS.—The Builders' and Traders' Exchange of Milwaukee, Wis., No. 1 Grand avenue. Secretary, Richard Smith, 90 Oneida street.

MINNEAPOLIS, MINN.—The Builders' Exchange of Minneapolis, Room 304 Boston Block, Hennepin avenue and Third street. Secretary, F. S. Martin.

NEW YORK, N. Y.—The Mechanics' and Traders' Exchange of the City of New York, 14 Vesey street. Secretary, Edmond A. Vaughan.



Master Builders' Exchange, Philadelphia.—View in Exchange Room, looking toward Entrance, showing Secretary's Desk.

OMAHA, NEB.—Builders' Exchange of Omaha. Secretary, D. J. Collins.

PEORIA, ILL.—Builders' Exchange of Peoria. Secretary, John Downs.

PHILADELPHIA, PA.—The Master Builders' Exchange of the City of Philadelphia, 18, 20, 22, and 24 South Seventh street. Secretary, William Harkness, Jr.

PITTSBURGH, PA.—Builders' Exchange of Pittsburgh. Secretary, E. A. Knox.

PORTLAND, MAINE.—Builders' Ex-

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change of Portland. Secretary, Thos. J. Feeney.

PROVIDENCE, R. I.—The Mechanics' Exchange of the City of Providence, 5 and 9 Custom House street. Secretary, William F. Cady.

ROCHESTER, N. Y.—The Builders' and Building Supply Dealers' Exchange of Rochester, N. Y., 27 East Main street. Secretary, J. H. Grant.

ST. JOSEPH, MO.—The Builders' and Traders' Exchange of St. Joseph, Mo., corner Eighth and Edmond streets. Secretary, James O. Starks.

ST. LOUIS, MO.—The Mechanics' Exchange of the City of St. Louis, Masonic Building, 9 North Seventh street. Secretary, Richard Walsh.

ST. PAUL, MINN.—The Contractors' and Builders' Board of Trade, Board Room, 406 Robert street, Hotel Ryan. Secretary, J. H. Hanson.

SIOUX CITY, IOWA.—The Contractors' and Builders' Association, 521 Fourth street. Secretary, Frank Clark, 406 Nebraska street.

SYRACUSE, N. Y.—The Master Builders' Association of Syracuse, N. Y., 29 North Warren street. Secretary, Daniel O'Brien.

WASHINGTON, D. C.—The Master Builders' Association of the District of Columbia, 419 Tenth street, N. W. Secretary, Thomas J. King, 1022 Twenty-sixth street, N. W.

WHEELING, W. VA.—Builders' Exchange of Wheeling. Secretary, Millard F. Giesey.

WILMINGTON, DEL.—The Builders' Exchange of Wilmington, Del., 605, 607, 609 Market street. Secretary, George C. McCall.

WORCESTER, MASS.—The Mechanics' Exchange of Worcester, Mass., City Hall Building, 3 Front street, Secretary, George Bonchard.

Permanent Exhibition, Master Builders' Exchange, Philadelphia.

The purpose of the enterprise is set forth in the little pamphlet prepared by the committee in charge, as follows: "This exhibition has been devised for the purpose of permanently displaying all kinds of goods and materials—crude or manufactured—new appliances, modes of construction, inventions and devices used in the erection and finish of buildings. The exhibits are classified and arranged in such a manner as to admit of close inspection, whereby a visitor may be enabled to judge of their value as constructive and finishing elements."

The exhibition is in charge of W. W. Morgan, a most efficient and gentlemanly superintendent. How the room is divided and arranged is shown by the floor plan on page 135, while the superintendent's office is shown on page 150.

The exhibition room is divided off into platforms, as shown in the plan above referred to, which are lettered and termed "sections," and on these the exhibits are carefully arranged and classified as follows:

Sec. B^1, C^1, G, J.—Class I.—Stone, all kinds except artificial.

Sec. W, X, Z.—Class II.—Bricks, terra cotta and artificial stone.

Sec. R, Y.—Class III.—Lumber, rough and manufactured.

Sec. P, T.—Class IV.—Wrought and cast iron, plain and ornamental.

Sec. C, D^1, K.—Class V.—Sheet metal work, plain and ornamental.

Sec. L (North).—Class VI.—Roofing slate, tiles, slag, &c.

Sec. M, N.—Class VII.—Plumbing, gas and steam fitting and materials.

Sec. U.—Class VIII.—Heaters, ranges, grates, &c.

Sec. L (South).—Class IX.—Plastering, stucco-work and plaster ornaments.

Sec. F^1, V.—Class X.—Ornamental tiles, fireplaces, mantels, interior decorations.

Sec. E.—Class XI.—Hardware and artistic metal work.

Sec. D, F.—Class XII.—Stained, cut, plate, and ornamental glass.

Sec. O.—Class XIII.—Paints, coloring, varnishes, &c.

Sec. R^1.—Class XIV.—Gas fixtures, electric lighting, bells, tubes, &c.

Sec. H, L, S.—Class XV.—Miscellaneous articles.

STONE AND BRICK WORK.

The most unique display in the room, and one that attracts marked attention at the hands of all visitors, is that arranged along the back of the building, under the wall space designated as Sec. E above. We have reproduced the outlines of it in the cuts on page 141, because they have special interest for all of our readers. The following description is from the little handbook of the exhibition already referred to:

The Exhibition Department of the Exchange, with the co-operation of the Master Stone Cutters' Association and the Bricklayers' Company, has, with great care and at considerable expense, prepared and put in place an exhibit extending across the western end of the exhibition room. This exhibit consists of a wall of stone and brick, covering an area of 58 feet in length by 4½ feet in hight, surmounted by a coping or top course of handsomely polished blue marble 4 inches thick, the whole forming a base for cases containing exhibits of hardware and artistic metal work. The wall is divided into 21 separate adjoining parts, of which 11 are of stone and 10 of brick, each of them of material or workmanship differing from all the others. The variety of standard forms and finishes in the construction of stonework is particularly interesting and instructive.

A placard is placed upon each of the 21 panels and piers comprising the wall. These cards are numbered consecutively from South to North, and on them is printed an explanation of the character of the work, together with the technical name of each illustrated part. This being something to which public attention is particularly directed, on account of it being an entire novelty and a matter of more than usual interest, the several panels and piers are named in detail, as follows:

No. 1, Stone Panel. Coursed work, rock face, dressed beds. Shown in red stone.

No. 2, Brick Pier. Combination of colors. Thin, long Pompeian and Roman. Shown in black, buff and red.

No. 3, Stone Panel. Random range work, rock face. Shown in very light blue limestone.

No. 4, Brick Pier. Straight hard bricks. Laid in red mortar.

No. 5, Stone Panel. Broken range work, rock face. Shown in dark blue stone.

No. 6, Brick Pier. Combination of colors. American enameled brick. Shown in black, blue and buff.

No. 7, Stone Panel. Rubble work, dressed face. Shown in green stone.

No. 8, Brick Pier. Combination of colors. Regular size bricks. Shown in mottled Pompeian. Red mortar.

No. 9, Stone Panel. Broken ashler work, rock face. Shown in light gray limestone.

No. 10, Brick Panel. Flemish bond work (every other brick a black "header"). Shown in hard brick. Struck joints.

No. 11, Stone Panel. Coursed work, rock face, marginal draft. Shown in granite.

No. 12, Brick Panel. English bond work (every other course a "heading course"). Shown—10 bottom courses machine-made pressed bricks and 10 top courses hand-made pressed bricks. Red mortar.

No. 13, Stone Panel. Broken range work, rock face. Shown in light gray limestone.

No. 14, Brick Pier. Combination of colors, regular size bricks. Shown in buff bricks. Red mortar.

No. 15, Stone Panel. Range work, rock face. Shown in brown stone.

No. 16, Brick Pier. Combination of colors. American enamelled bricks. Shown in chocolate, buff and blue.

No. 17, Stone Panel. Rubble work, rock face. Shown in granite.

No. 18, Brick Pier. Stretchers. Laid in red mortar.

No. 19, Stone Panel. Broken ashler, dressed face, marginal lines. Shown in light colored limestone.

No. 20, Brick Pier. Combination of colors, thin, long Pompeian and Roman. Shown in black, mottled and red.

No. 21, Stone Panel. Log cabin work, picked face, dressed beds. Shown in brownstone.

Two specimens of pebble dashing are also shown on the plastered walls under the windows adjoining the north and south ends of the space occupied by this special exhibit.

Taken as a whole, this work constitutes a practical demonstration of most of the technical terms used by architects in drawing their specifications for stonework and brickwork, and will be generally recognized as a valuable standard whereby architect, builder and owner may be enabled to readily understand one another when drawing specifications, contracting for, and erecting the stone and brick finish of buildings, and by this means prevent or amicably adjust many such disputes and expensive litigations as have heretofore arisen between parties interested in the preparation and erection of this class of work.

Reception to the Architects.

The exhibition department of the Master Builders' Exchange, Philadelphia, on Thursday evening, May 15, gave a reception to the architects of Philadelphia. The objects in view were to afford the members of the architectural profession the opportunity to inspect the exhibition room of the Exchange Building under the most favorable circumstances. Upwards of 100 invitations were sent out, while the Exchange was represented simply by its executive officers and the Committee on Permanent Exhibition. A very small number of press representatives were also present. From this it will be seen that the affair was quite exclusive, and as a result the architects were allowed to inspect the Exchange in all its features without interruption and without the suggestion that perhaps they might be buttonholed by over-enterprising contractors and builders. The exhibition room, which is fully described in another column, was handsomely arranged for the occasion. The lighting was excellent, and just enough of floral display was introduced to set off its other beauties. The galleries of the Exchange Building, as shown in the general view on page 143, were handsomely festooned with green and decked out with flowers at appropriate places. The Exchange room was very happily transformed from a prosy place of business into a most attractive banqueting hall. Instead of the hosts and guests being seated at long tables as is usually the rule, they were pleasantly grouped about small tables, thus facilitating acquaintance and making conversation easy and interesting.

After a very attractive *menu* had received full justice, Charles Gillingham, the chairman of the Committee on Exhibition, called the assembly to order, and in a few well chosen remarks set forth the objects in view and paved the way for other speakers. William H. Sayward, secretary of the National Association of Builders, was then introduced, and in a ringing speech carried the assembly to a high pitch of enthusiasm concerning the objects and purposes of the National Association, and the general advancement that follows upon the efforts of the local exchanges and the national organization within the builders' trade, incidentally pointing out how and wherein the architects are concerned in all

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that is taking place. Amos J. Boyden, secretary of the Philadelphia Chapter of Architects, spoke in behalf of that organization and reciprocated in full the pleasant sentiments that had been expressed in behalf of the Philadelphia Master Builders' Exchange, and also by the secretary of the National Association of Builders. Stacy Reeves, president of the Exchange, dwelt at some length upon the mutuality of interest between architects and builders, and the importance of such an occasion as that which commanded the presence of those assembled.

Without a complete report of all the addresses it would be impossible to quote in a way to do justice to the speakers. Suffice it to say that the utmost good feeling was expressed upon the part of representatives of each class, and the hearty co-operation of architects and builders together in an effort to advance the building interests, was repeatedly pledged by the different speakers. Addresses were made, in addition to those already referred to, by the following, on behalf of the Masters Builders' Exchange: David A. Woelpper, ex-president; George Watson, first vice-president; Franklin M. Harris, director, and Charles Gillingham, chairman of the Committee on Exhibition. In behalf of the Philadelphia architects speeches were made by Joseph M. Wilson, John Ord, Willis G. Hale, Charles Balderson, and C. Henry Roney. Brief addresses were also made by A. O. Kittredge, editor of *Carpentry and Building*, John N. Gallagher, proprietor of the Philadelphia *Real Estate Record*, and William P. Lockington, correspondent of the *Architectural Era*. It is scarcely necessary to add that the entertainment accomplished all that the master builders had in view, namely, convincing the architects of Philadelphia that the exhibition department of the Builders' Exchange is a place that they cannot afford to ignore, and further, that it affords them opportunities for demonstrating to their clients the ideas they seek to convey in their plans and specifications in a manner far superior to any other facilities at their command.



Master Builders' Exchange, Philadelphia.—View in Director's Room.

Operative Builders, Philadelphia.

The Operative Builders' Association, of Philadelphia, is an organization among what is known in that city as Operative Builders. This term, perhaps, on account of the special use that is made of it in and about Philadelphia, is not likely to be understood by readers in other cities. In various parts of the country builders of the same class are known as "speculative" builders. They are, in fact, those builders who, instead of contracting to build houses for others to the plans and specifications furnished by architects, buy their land, arrange their plans and carry on a building "operation," resulting in a number of houses which, in turn, are put on the market for sale. It is not uncommon for men of this class to carry through operations involving 25, 50, 75, 150, or even 200 houses. Recently, certain acts of executive officers in the city government of Philadelphia, and the lack of action upon the part of city councils, have given builders of this kind grievances, which has had the good effect of bringing them together in an organization intended for mutual benefit. Since they have got together for this reason they have found various other matters beside their interest before the city councils, and before the head of the Department of Public Works, to keep them united, and accordingly, instead of disbanding, they have been providing themselves with a desirable assembly room or exchange, which is located at the southeast corner of Broad street and Columbia avenue.

On the occasion of the opening of this room, May 13, a banquet was given to which were invited a number of guests representing the city government, the press, the Master Builders' Exchange and other interests. About 200 people were seated at the dinner. The Exchange room, which is on the third floor of the Tenth National Bank Building, was beautifully decorated, and served as a reception room until the banquet room on the second floor, directly over the bank, was thrown open. Then the hosts and visitors, headed by president W. T. B. Roberts, secretary W. C. Merritt, treasurer C. C. Moore and vice-president Charles M. Baker, filed in, to the strain of inspiriting orchestral music. The opening address of the evening was made by president Roberts, who briefly sketched the purposes and history of the organization, stating that it was not more than six months old and owed its commencement to several operative builders who formerly met at the Lumberman's Exchange and in other places. It was intended to fill a want which the Master Builders' Exchange did not supply, and it in no way antagonized that exchange, but on the contrary had a peculiar mission over and outside of the work which that organization was arranged to perform. The Master Builders' Exchange, he continued, was composed mainly of contractors and builders purely; the new association was composed of those who build houses to sell, and also of

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material men. The latter felt the want of better municipal improvements such as street, sewer, water and gas pipes, and their agitation of the subject had an important influence upon pending questions. General Wagner, Commissioner of Public Works, was then introduced and made a strong speech in favor of the builders having what they wanted in the way of municipal improvements, but at the same time giving them warning that money was required for the purpose, and that it could only be obtained through action of the city council. He was of the opinion that the city ought to take better care of its operative builders, and if it did so, the city would prosper and the building interests would prosper. A brilliant address was also made by ex-Mayor Smith, which was listened to with frequent bursts of applause and no little laughter. John N. Gallagher, proprietor of *The Philadelphia Real Estate Record*, in the course of some interesting remarks pertinent to the occasion, presented some very interesting statistics of the building operations of Philadelphia as compared with other cities. A few of these figures are of interest to our readers.

In 1888, Philadelphia erected 8262 new buildings, at a cost of $29,848,000. During the same year the sales of real estate indicated a transfer of 12,679 buildings, with a total valuation of $62,663,000. In 1889 there were erected at Philadelphia 10,250 new buildings, and there were also 1,646 alterations, at a total cost of $33,745,000. The sales that year showed transfers of 15,945 buildings, with a valuation of $80,225,000. An analysis of these two building years showed that about one-fifth of the buildings were three storeys in hight and upwards, and that the others were two story houses. It is only by a consideration of the number of new buildings which are each year added to a city that an idea can be gained of its importance as a center, and the growth that is taking place in its population. The statement was made that so regular is the growth of Philadelphia that it may be measured by the number of houses built. The population per house in that city, while perhaps not so in other cities, is a fixed ratio and does not vary from year to year. Contrasted with these figures concerning Philadelphia, the speaker presented statistics from New York, Chicago, St. Louis, Baltimore, and other cities, all to the advantage of Philadelphia.

THE EIGHT HOUR MOVEMENT.

THE FIRST AGITATION of the question of eight hours work per day, in this country, says a writer in *Once a Week*, was communicated by the National Labor Union, founded in 1866. This organization, although short-lived —it was ruined by its connection with politics—is said to have had, in 1868, 640,000 members. At its request General Banks, on June 24, 1869, introduced into Congress an eight hour day bill, which was straightway passed and signed by the President, and was enforced in the Navy Yard at Charlestown, Mass., on July 6 of the same year. In violation, however, of the spirit of the law, the employees of the United States were notified that the Government would reduce wages one-fifth, but that those who so desired could work ten hours at the old rates. So much indignation was expressed by workingmen at this announcement that the order was reversed by the President. But this success was illusory. The eight hour law is still on the Federal statute books, and a like law regarding workmen in public employment exists in several States.

An effort was made to revive the eight hour movement by strikes, in 1872 and 1873, when eight hour leagues were formed in several States and cities. In the spring of the first-named year there was an impressive demonstration in New York City, the number of persons taking part in the procession being estimated at 20,000. Again, however, the endeavor was fruitless. A more strenuous attempt to introduce an eight hour day was made on May 1, 1886, and several hundred thousand men struck by way of effecting the purpose. But the movement did not meet with the cordial approval of the Knights of Labor, then the most powerful labor organization, and once more the demonstration failed. Many thousand laborers, however, did attain at that time an eight hour day, and a still larger number obtained a reduction from the former quota of ten hours. Nine hours became common in the building trades, and in some cases a work day of nine hours five days in the week and eight hours on Saturday was secured. Still more recently a Saturday half-holiday law has been enacted in New York and some other States. Finally, the American Federation of Labor, of which Mr. Samuel Gompers is president, and which is now by far the strongest workingmen's organization in the United States, has made an eight hour day a fundamental plank of their platform, and has entered on a systematic agitation of the question.

THE SITUATION IN CANADA.

At present the rule in the Dominion is, as regards duration of continuous employment, that ten hours constitute a working day, but there are a good many exceptions on both the right and the wrong side. Some of the Quebec cotton mills, where children are employed, are said to work nearly thirteen hours. On the other hand, throughout Ontario, in many trades the nine hour system prevails very generally, and in some vocations the hours of work are compulsorily curtailed in winter by the shortness of the days and the severity of the climate. The street car drivers, however, work twelve hours a day all over the Dominion, and shop assistants are employed for extraordinarily long hours. It is noteworthy that at Hamilton a firm of tobacco manufacturers made the experiment of reducing the hours from ten to nine, with the result that there has been no diminution whatever in production. A Canadian Royal Commission, which finished its labors in 1889, reported, with regard to the labor of adult males, that in their judgment all Government contracts should stipulate for hours of labor not to exceed nine. We may add that the printers of Quebec struck not long ago for a nine hour day, their demand being formulated for them by a branch of the Knights of Labor and by a printers' union of French workmen. The only instance within our knowledge where an eight hour day has been obtained in the Dominion is at Quebec, where the Ship Laborers' Union enforced the reduction.

AUSTRALIA.

In the eight hour movement, as in many another feature of the workingmen's programme, continues the same writer, we must look to Australia for the first systematic and efficient application of the principle It seems to be the mission of that fraction of the English speaking folk, which has settled in the furthest corner of the Eastern Hemisphere, to open the paths in which their brethren may safely and profitably follow. It is 34 years since the artisans of the colony of Victoria began their agitation in favor of limiting a day's work to eight hours, and in 12 days they gained all they wanted. The United Trades gave notice that after April 21, 1856, they would only work eight hours a day, and so instantaneous and complete was their triumph that the anniversary of the next day, April 22, has since been kept as a public holiday. From Victoria the eight hour movement spread to the other Australian colonies and to New Zealand. The American commissioner, who was lately sent to study the condition of labor in Australasia, has reported that, while the great majority of the trades work 48 hours a week, the bricklayers and masons of Victoria work only 45 (insisting upon a half-holiday on Saturday) and that the carpenters are likely to secure a reduction of hours to that number.

In view of the current assertion that a diminution of the hours of work must inevitably be followed by a proportionate curtailment of wages, it is interesting to observe the results of the experiment in Australia, where it has been tried for a generation. Throughout Australasia skilled workmen get nearly double the wages for a shorter day that the same class of men obtain in England. It may be imagined that the purchasing power of money in the colonies is correspondingly less. Such, however, is not the case. The relative cost of living in Victoria and in England is as five to four. The slight excess is due to the rent. The other necessaries of life are cheaper, and artisans are able to save so much that, according to a careful estimate, half the working people in Melbourne are owners of house and land.

It seems, then, that, so far as Australian example bears on the labor problem presented in Europe and the United States, it is favorable to the attempt to gradually introduce the eight hour day in the contracts of the State and of municipalities, and even to give it the force of a general law in the case of those trades to which it would be most easily applied. The experience of Australia, however, confirms what would be expected on *a priori* grounds, that an eight hour law could not be enforced unless it were demanded by public opinion and conformed to a practice already existing.

EUROPE.

On the continent of Europe the agitation for the curtailment of a day's labor to eight hours has only recently made much progress. At the Marxist Congress, held last summer in Paris during the Exposition, it was decided to make, on May 1, 1890, a concerted demonstration in favor of an eight hour day. This took place in France, Belgium, Italy, Spain and Austria, but the resolution of the congress was only partially carried out in Germany. The more conservative leaders of the German socialists have not hesitated to avow their opinion that their country is not ready for a general reduction of the hours of labor to eight hours. They recognize, also, that it might not be safe for Germany to move in this direction, unless her competitors in the world's markets should take the same step. It is a moot question, whether the curtailment of the hours of work would not involve a shrinkage in the volume of products and an increase in the cost of production. The orthodox economists insist that such results would be unavoidable; the opposite consequence

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are predicted by the advocates of the reduction. Their argument is that an eight hour day would absorb all the unemployed, and add to the productive power of a country, and they adduce the success of the ten hour and nine hour movements as supporting their contention that a lessening of the hours of labor means, not only added production, but diminished cost of production.

THE END AND THE MEANS.

That the moral and material well-being of workingmen would be signally furthered by the leisure obtainable through an eight hour day is undisputed. The fact that at a given time and in a given country such a reduction of working hours might not be practicable in all kinds of employment is no argument against its application to those trades where it is feasible.

How can an eight hour day be universally established throughout the United States, so far, at least, as regards all those trades in which a longer term of continuous employment is not essential to effective production? Even those who wish to bring about such a state of things by law must see that they cannot look to the Congress at Washington for material assistance. The British Parliament or the French Chambers can pass a bill regulating the hours of labor in every species of employment throughout their respective countries. Not so with the Federal Congress. The utmost that this body can do is to pass a bill, like that of 1869, limiting the duration of a day's labor for workingmen in the employ of the Federal Government; but these constitute only an insignificant fraction of the toiling millions of this country. They who wish to reduce, by statute, the number of working hours in a day should memorialize, not Congress, but the State Legislature. But experience has shown that to try at the outset of the agitation to obtain an eight hour day by statute is to begin at the wrong end. What is needed is public sentiment to enforce the claims of the workingmen. Whenever public opinion approves the measure the law will follow as a matter of course.

Trade School.

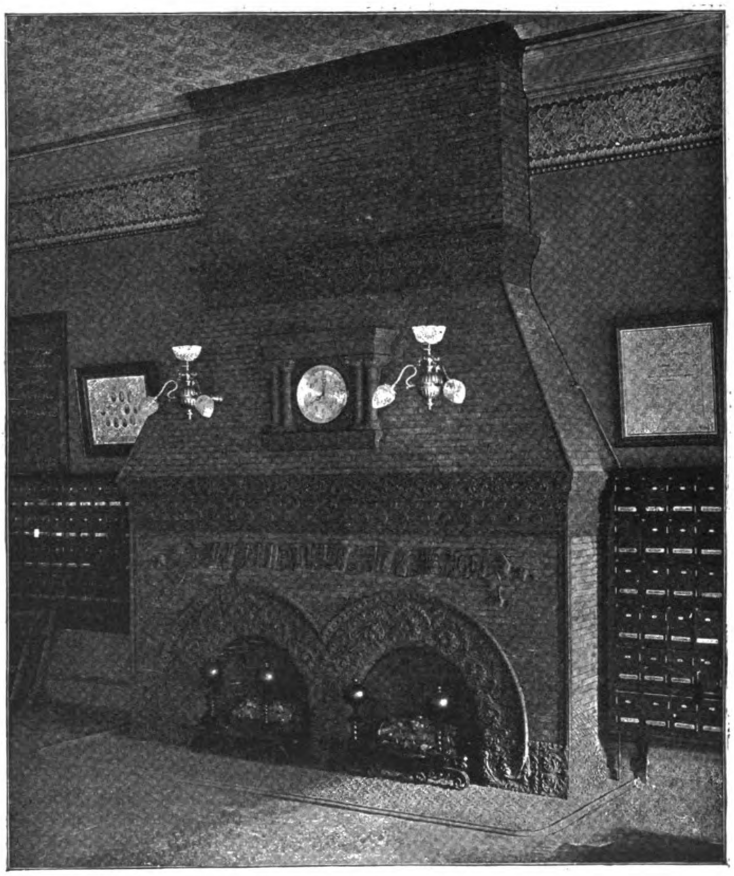
A prominent feature of the work of the Master Builders' Exchange of Philadelphia is the trade school for which very extensive preparations have been made. A representative of the Exchange has been abroad, and has carefully inspected all the trade and technical schools that could be conveniently reached in Great Britain and on the Continent of Europe, with a view to securing for the Philadelphia school the best, in every respect, that can be provided. The various efforts in this line in this country, made by private individuals and by trade associations, have also been carefully inspected, the object being to secure for Philadelphia a model institution of its kind. There is to be combined with this school the effort heretofore sustained by the Master Plumbers of Philadelphia. In fact, the latter is to be absorbed by the former. The first session of the school, under the auspices of the Builders' Exchange, will open in the fall.

The basement of the Exchange building, being that portion immediately under the exhibition department, a plan of which is given on page 135, has been carefully arranged for instruction in various branches, including bricklaying, carpentry, plastering, painting, stucco, plumbing, carving, &c. Since arrangements were commenced, the school has developed to such proportions that at the present time there is a feeling, in certain circles, at least, that the accommodations, as liberal as they have been made, will scarcely be sufficient to accommodate the school comfortably. Enlarged quarters accordingly are being discussed. We refrain from a more explicit description of this undertaking at the present time, on account of plans being in an unfinished state. We shall devote more space to this enterprise on another occasion when arrangements are completed.

The Present Outlook.

The first of May has come and gone and the general public feels relieved. The newspapers, for lack of any other sensational matter, made the most of what labor was going to do, and, as a result, business in some sections of the country waited ready to be paralyzed, or at least panic stricken, as soon as the first step in the series should be taken. Day after day the writers for the daily papers described the awful consequences of inaugurating the eight-hour day. The armies of labor were marshaled (on paper) and made to march and counter-march; their generals were interviewed and made to say to the public many foolish things they never uttered to the reporters in private; the battle fields (prospective) were described, and the very smoke of the engagement, yet in the future, was made to curl about the paper in the hands of the innocent reader, and fill his nostrils with the stench. His eyes were blinded to the real situation, and until the day was past he failed to realize that the reporters were making all the hubbub. He could not see that labor was quietly working upon public opinion—waging a moral warfare, so to speak—instead of resorting to force and doing all the awful things promised and prophesied, some of which, for the sake of news, it is almost fair to suppose the daily papers would have been very glad to chronicle.

What has been accomplished to date, and what is the present outlook? In another column we have given a brief account of the eight-hour day, showing the general progress that has been made since the agitation was commenced many years ago. Our present inquiry, then, refers specifically to the results of the effort made on May 1 to still further advance the short day. A few strikes were ordered, notably of the carpenters in the principal cities, and these have been very generally discussed in the daily papers. Others have been so quietly managed that the general public in the same communities have scarcely heard of them. In hundreds of other cases, employers and employees have reached a satisfactory understanding without any semblance of strike or dispute, and all this has taken place without any serious jar upon the machinery of business anywhere. In a large number of cases the eight-hour day has been conceded. In other instances, where 10 hours has heretofore been the under-



Master Builders' Exchange, Philadelphia.—Chimney Piece at the end of Exchange Room.

standing, 9 hours has become the rule. In a few instances both hours and rates of pay have been adjusted in a way to be more advantageous to the mechanic. A substantial gain has been made everywhere.

We have already referred to the fact that, of late, labor has been relying quite as much upon the force of public opinion as upon mere strength of numbers and organization. The leaders of the different societies and guilds have evidently realized that in this struggle labor can get and hold no more than is conceded by public

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opinion to be just and fair, and by managing in the temperate way that has characterized them of late they have done much to gain sympathy and substantial support from the public. A change also has come over the feelings of contractors and builders in this regard. They seem to realize that it makes no difference to them within certain limits, what rate of wages they pay, or how many hours constitute a day's work, so long all pay the same, and all work the same number of hours, and so long as the rates and hours have the sanction of public opinion. Of course to change rates and hours arbitrarily, after contracts are taken, is unfair and wrong, but labor has been willing to give timely notice. Further, to make rates so high and hours of labor so short as to greatly increase the cost of building would result in curtailing the business. Hence nothing must go beyond the line approved by public opinion, and this seems to be fully realized and conceded. Labor is to be congratulated upon the peaceful victories it has won and is winning, and employers are to be congratulated upon the reasonable views they are taking of the situatian, and also upon their willingness to yield to labor its fair share in the general prosperity with which the building trades are at present blessed.

The Tool Convention.

Under the above title James F. Doyle contributes an article to a late issue of *Puck* which we think our readers will find amusing reading. It says:

There was some commotion in the Tool Chest. "Well," the Hand Saw was heard to remark, "I know I am superior to you all. As Julius Cæsar once said, 'I came, I saw;' and when I settle down to work you can hear something drop."

"But," said the Hammer, "there is no steadiness in your character. You shift forward and backward, while I am distinguished for always hitting the nail on the head. (*Here the Nail was seen to furtively rub his cranium.*)

"Mr. Hand Saw," remarked the File, in a rasping voice, "have you lost any front teeth lately?"

"Silence!" cried the Hand Saw. "It's a shame that gentlemen must associate with such an ugly, cross-grained character as you. You try to scrape every one's acquaintance."

The Plane tried to smooth things over, and stated that he would have something to offer before the meeting adjourned.

"Oh, Shavings!" growled the File. Whereat the Paper of Tacks laughed till it burst its sides.

"Gentlemen," said the Glue Pot, "while you can all saw, chop, hammer and destroy, remember! that I am the only one who can mend and restore. In me are the elements of true greatness."

"I say," said the File, "ain't you somewhat stuck on yourself?" At which the Glue Pot fairly boiled with indignation.

"Permit me," said the Spirit Level, "to direct your attention to the even disposition which I ever display. I make all things straight."

"When you have a drop of alcohol in," suggested the File.

"Your work, *gentlemen*," continued the Spirit Level, with an emphasis on the "gentlemen" which was intended to crush the File; "your work is never accepted until I have examined it, and this I say on the——"

"On the dead level," sneered the File.

The Sand Paper essayed to speak, but was promptly laid out flat, and advised that no unnecessary friction was desired. He had plenty of sand, however, and was only silenced by the Mallet, who rapped loudly for order.

"Where do I come in?" asked the Ten-Penny Nail.

"You don't," said the Claw Hammer, reaching for him. "You come out."

The Jack Knife who was something of a blade, opened up, and declared that he had a point which he would like to present, but was greeted with loud cries of "shut up!" which he did, with a click, after threatening to cut the acquaintance of every one present.

At this moment the Auger commenced to stagger 'round, and vow that he would "let daylight" through every one, when the Lid-of-the-Chest, a slam-bang sort of fellow, came down with a wack, and said:

"Boys, I'm onto the whole crowd."

And the hush thickened.



Master Builders' Exchange, Philadelphia.—Office of the Superintendent of the Permanent Exhibition.

Novel Method of Economizing Fuel.

The following appeared in a late issue of one of the New York dailies:

"What is the matter with those horrid men in the front yard?" excitedly inquired Mrs. Smallboy of her husband, as she retreated in alarm to the cellar, where that gentleman was at work on the furnace, which supplies heat to the aristocratic boarders on the upper floors of the Smallboy mansion. Two rough looking men, covered with coal dust and carrying shovels were arousing the quietness of the neighborhood by calling for Smallboy: "Come out 'n act like 'r mon!" exclaimed one of the men in great rage, shaking his fist in the direction of the area gate. "I've got 'r wife 'n thirteen children t' support, 'n we want that money."

"Hush, dear," said Mr. Smallboy. "I pay those men a quarter to come around twice a week, abuse me and demand payment for coal they never put in. Fine scheme."

"What are those?" asked Mrs. Smallboy, pointing to a row of tinware, which she recognized as old kitchen friends, elevated on a single plank. "Well, you see," explained Mr. Smallboy, "the floor is covered with sheet iron, and when I let things fall around the boarders imagine we are putting on coal. Imagination, my dear, that will help to pay off the mortgage. Now, just tip over the tinware while I dump this barrow of bricks on the floor." A deafening crash followed.

"Drat it!" continued Mr. Smallboy, in answer to a peal at the bell. "That's the cold-blooded poet on the third floor. We'll soon warm him up. Set up the tins again while I drag this old boiler across the floor. Ah! there goes that broker on the second floor. He'll imagine he's too warm in a moment, and will turn off the heat. Tip the cans, dear, and I'll rattle this barrel of old iron. Play the bellows up the air shaft and drag the poker up and down the heater pipes while I shovel these stones across the floor. They'll open the windows, go round in their shirt sleeves and think spring is here in a minute."

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CARPENTRY AND BUILDING.

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A. O. KITTREDGE, - - - - EDITOR.
JOHN S KING, - - - BUSINESS MANAGER.
66 & 68 DUANE STREET, NEW YORK.

JULY, 1890.

Our Colored Plate.

For two or three months past we have been talking about surprises for the readers of *Carpentry and Building*, and in successive issues have referred to some special features for which those numbers were particularly noteworthy. The last issue was what may be appropriately designated as a mammoth number. The present issue, it will be observed, is more nearly our usual size. In it will be found, however, a great deal of interesting matter relative to various subjects, all important to the building trades, treated in such a manner as cannot fail to command the attention of our readers. One of the special features to which notice should be particularly directed is the colored plate which appears upon the supplemental sheet. This piece of colored work represents a neat frame building erected not long since in the neighborhood of Cincinnati. The illustration being based upon a photograph is not in any respect the product of a fanciful imagination, but is as nearly true to life as the engraver's art can make such things. Among the reading pages will be found details drawn to scale, also elevations and floor plans, all of which are represented in our usual thorough and accurate manner.

Legal Decisions.

Our readers will observe this month a new department in this journal. It is entitled "Law in the Building Trades." It is our purpose to give in it from month to month a brief summary of some of the more important decisions of the State and Federal courts of general interest to those engaged in the building trades These abstracts will, in some measure at least, give the drift of legal opinion upon numerous points which are constantly arising among those engaged in building operations. What is presented in this department is not by any means intended to take the place of advice of trustworthy counsel, nor yet is it designed to make every builder his own lawyer. The purpose is rather to give the builder that familiarity concerning legal matters which will enable him to converse intelligently with his lawyer, whenever cases arise in which a lawyer's assistance is necessary or desirable, and it is intended more especially to assist the builder to keep out of legal entanglements, by giving him in advance what otherwise he might learn only at the end of costly litigation. We invite our readers to a careful consideration of the instalment of abstracts of decisions presented this month and shall be glad to have in return suggestions concerning the further conduct of the department.

Complaint Against Tin Plate Importers.

A gentleman, who from his business connections has a very thorough knowledge of the tin plate trade and the ways of dealers and roofers, nt us a private letter recently, in which he takes the importers to task with a good deal of severity. As an illustration of the cause of complaint, and as proof of his charge that the architects are under the control of the jobbers, he cites a case of two special brands of plates, which we will call A and B, and which, to within a year, were practically the same in price, and were regarded by the trade of equal quality in every way. Now, a year later, the same architect, who had specified either of the two brands A and B, demands in a recent contract that brand A be used, which is quoted at from $1 to $1.50 a box above the market price of brand B. Commenting on this instance, our correspondent continues: "This makes a great additional and unnecessary expense to the contractor, and there is no question about the quality of one brand being as good as the other. The fact is, the architect is controlled by the importer and the people are forced to bow to them, and so you may imagine how it makes an old, practical, intelligent tinner, who has been laying tin for the best part of half a century, chew his tongue to see these skim-milk, irresponsible architects handled like a lump of putty by importers who claim to have made a fortune on single special brands of tin. In my opinion, this scheme of the manufacturers of specialties and importers of private brands of roofing tin to rob the public, by roping in and controlling architects, is the danger of the day, and it is ten times more common than most of us imagine."

The Pliable Architect.

This is a distinct charge against the architects and importers from a person in the trade who holds a recognized position and is not talking from ignorance. At this particular moment, however, we do not propose to consider whether the charge against importers be true or not. If it be true that the architects are but lumps of putty to be molded at will by the importers' deft fingers, then we think the profession, as a whole, has far fewer men of honor and independence than we have always imagined it to possess. It would be a natural inference, if the architects are really so pliable, that their yielding disposition and readiness to do the importers wishes is the result, not of argument, but of the proper distribution on the part of the importers of gifts, bonuses and douceurs, or other definite aids to the specification of certain brands. This whole matter is a grave question and needs looking into, we freely confess. The two losers, however, so far as we can understand it, are the public who pay presumably more than a brand is worth and thus lose money, and the importers themselves, who by questionable means introduce their brands at the expense of their integrity and good name. What the interest of the practical roofer in the matter is, we do not quite understand, for it seems to us that it is quite immaterial what brand he places upon a roof so long as the quality is good, and it is not likely to reflect upon his business reputation.

The Position of the Roofer.

Whether the tin costs $5 or $10 a box is something immaterial to the roofer, for in estimating from a specification he simply enters the tin at its current market price and the customer must stand the expense. For him to set up a wail, therefore, seems to us uncalled for, if not inexcusable, for we cannot imagine it is his solicitude for the welfare of his customer that leads him to complain against the architect and importer. Let him state the case to the owner and there his responsibility ends, and as we said before it is immaterial what the roofing plates costs since it is a fixed item in the estimate and cannot be altered one way or the other. When the roofer complains that he is given no latitude in the choice of the brands of terne plates where there are one or two that he considers fully equal to the brand specified and on which he can save 75 or more cents a box, the inference is reasonable, though of course, we do not say that it is necessarily true, that his object in having a freedom of choice is that he may enter the cheaper plate in his contract at the price of the more expensive one and thus with no injury to his customer, since the two brands are of equal (?) merit, he himself can pocket the difference in price between the two brands, and at the same time give his patronage to the importers who are willing to trade on the lowest margin. A truly conscientious roofer will, of course, want to use the least expensive plate out of regard for his employer's interests. But are the roofers as a class any more conscientious than the importers, or even the much reviled architects themselves?

Testing the Purity of Air.

In the report of an address on methods of heating and ventilating school houses, read before the Boston Society of Civil Engineers, a few months since, and published in a recent number of the journal of the Association of Engineering Societies, we find many interesting figures on the actual state of affairs discovered in school houses in certain parts of New England. The paper itself is principally a record of the results of investigation into the sanitary condition of this class of buildings. In the discussion, however, some valuable information is given on several points connected with the ventilation of school houses, and in glancing over the article we were much interested in reading the accounts of different apparatus for testing the amount of carbonic acid present in the atmosphere. One instrument, of English design, consisted of a bottle filled with lime water and connected with it was

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a rubber ball to be used as an air pump. The proportion of carbonic acid in the atmosphere was indicated by the number of times it was necessary to empty the bulb in the lime water before the latter became opaque. Another instrument depended upon a certain bright carmine colored chemical which was arranged so as to moisten and drop from a string. According to the increase of carbonic acid in the atmosphere this color was bleached white, and the point of the string where the color disappeared, referred to a scale behind it, showed the percentage of carbonic acid gas present. After describing these ingenious instruments, there was a discussion as as to their practical value, and how much attention and education it needed upon the part of the teacher to make proper use of them, and tell from their signs when extra ventilation was needed.

The Need of Fresh Air.

From a scientific point of view all this was very interesting, but we must confess our sympathies are decidedly with one of the members who stated in substance that the amount of air admitted into a room should never be left to the discretion of either the teacher or the janitor, but should be made absolute. The speaker granted that the temperature should be under the control of the person in charge of the room, but the quantity of air, he very wisely held, ought not to depend upon the records of delicate instruments that needed constant watching, but rather should be a fixed amount, to be admitted at all times. A school house, or any other building where a number of people are wont to congregate, should be designed with a view to constant ventilation, adequate to the maximum number of individuals the house would ever contain. In that way an ample supply of fresh air is provided, and if the house is never filled to its limit of population there is always a wide margin of safety against the dangers of foul air. We wish this whole matter of the need of ventilation could be deeply impressed not only upon the teachers and school commissioners, but upon every individual who lives under a roof and within four walls. Of course the poor school children, factory hands and certain classes of workmen suffer most from this sort of poisoning, but the aggregate amount of distress from this cause in offices, private houses and other places over which the public, in one sense, has no control is seldom appreciated. Fresh air is a prime requisite to good health; good health is a prime requisite to efficient work, and, furthermore, contentment goes along with it.

Carpenters' Strikes.

In view of the numerous strikes in the building and allied trades, which have recently occurred or are now in progress in the United States, it is interesting to note the extent of the movement and the causes which have, in some measure, led to it. According to the official organ of the United Brotherhood of Carpenters and Joiners of America, there have been strikes the present season in 141 cities, involving 208 unions and 54,852 union and non-union men. In examining into the causes which have led to these strikes, it is found that in 42 cities the men went out on the refusal of a demand for eight hours to constitute a day's work; that in 81 cities the men went out on a demand for nine hours a day, and in 18 for either an increase in pay or for a reduction in the hours of labor on Saturday. In a number of cases the necessity of a strike was avoided by conference between employers and employed while in others no amicable adjustment of the difficulty was reached and the men quit work. Up to the present time, according to the authority quoted, the results show that in 27 cities and towns the movement for an eight hour day has been successful, affecting 23,355 men in the trade. In nine cities the men are still out for the eight hour day, while in six cities a compromise on nine hours has been reached. It is stated that the nine hour day has been established in 72 cities and towns, with the addition of eight hours a day on Saturday in many instances. This compromise affects 14,180 carpenters, while it is said that gains have been made in the way of increased wages in 18 other cities, affecting 2662. The organ quoted further claims that the trade movement among the carpenters this spring has been successful in 117 cities, involving 40,197 workmen. The strikers claim to have found a formidable opponent in the master builders' exchanges in different parts of the country; the latter, it is asserted, having based their action on what they call "the fundamental principles of the right to employ or not to employ." At the same time, it must be admitted, that, through the concerted action of the builders in their exchanges, many prompt adjustments of questions at issue have been effected, of which a settlement would otherwise have been long deferred. At the time of going to press there are strikes among the carpenters in a number of cities in which both sides are maintaining a firm attitude, and neither being willing to yield anything.

Among the numerous inquiries which reached us during the past month was one from a correspondent in the State of Michigan relative to the strength of floors. By accident this letter was destroyed before we had opportunity to prepare a reply to it, and we therefore take this occasion to ask the correspondent to kindly repeat his inquiry, accompanying it with a sketch as before.

Brickmaking Past and Present.

The following from a recent issue of the *Clay Manufacturers' Engineer* will be found of general interest:

Twenty years ago brick yard labor was looked upon as the hardest work in the land. At that time there were but few yards employing steam power. A spiral plastic clay machine was a dangerous financial experiment; a pug mill plunger machine an improvemeat to be envied; a semi-dry process was the notion of some semi-insane crank. Dry houses were almost unknown. To go to work at 7 o'clock in the morning and quit at 6 in the evening was the practice of only a few new firms, who were predicted to be failures on account of it. The yards were mostly small and made their bricks by hand on soft clay horse-power machines.

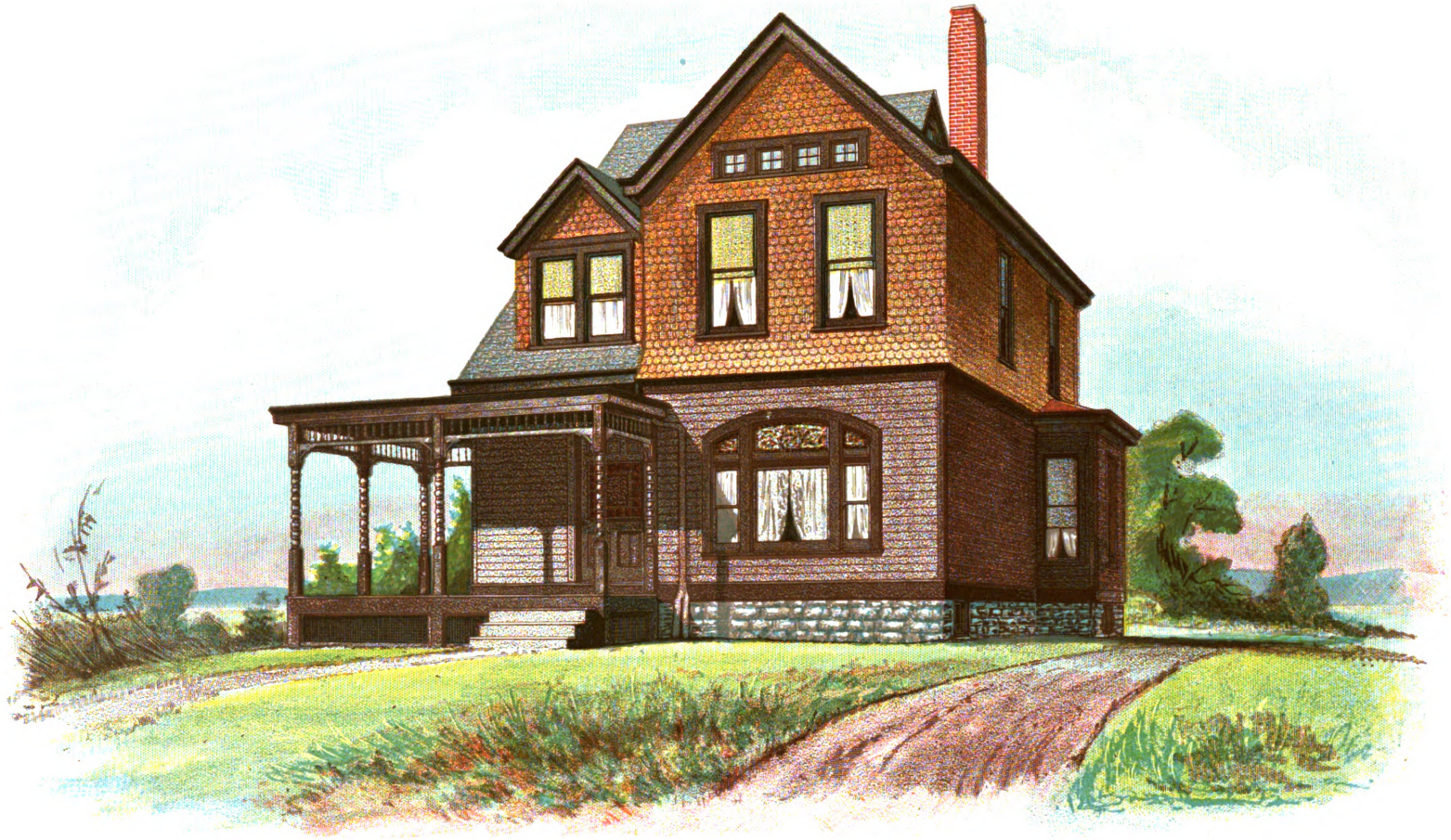
The brickmaking season was about nine months in the Southern and about eight months in the Northern and Western States. The hours of labor commenced generally at 4 o'clock in the morning, in order to get the day's work molded by 10 or 11, so as to have the bricks dry and under "houses" the same day. A day in the brick yard really meant twenty-four hours. When the day's task was done then the anxiety began as to whether it would storm or something else turn up to interfere with the regular work. It was a common occurrence to call all the help together at midnight to cover up brick hacks and then wait all next day for the yard to dry off. Many yards away from the towns provided for board and lodging for their men by running boarding houses in connection with the yards—and queer boarding houses they were. "Salt horse" (the common name for pickled beef), dried apples, boiled potatoes and black coffee was the fare three times a day for the eight or nine mouths, and baked beans, with pork, syrup and apple or pumpkin pie, of a kind that could only be digested by a brick yard employee, would cap the glories of a day of rest. Beds for the men, in many of the yards, were unknown luxuries; a bunk made of rough boards, with a mattress of straw and a blanket, completed the outfit. If the mosquitoes were lively it was found advisable to keep on boots and clothes during the entire night. A roughly made table of boards, with one candle, was allowed for every eight men.

Trade journal reading was a thing unknown, for none existed; the only thing to accomplish was to make $20 a month, and kill time on rainy days and Sundays. But the times have changed. A brick yard man is somebody now; he goes to work like other mechanics; his work, by the assistance of machinery, has become more mechanic-like and in many cases less laborious. With the introduction of machinery the work has become simpler and more productive. This change influenced the condition of brick yard labor to such an extent that it has outgrown the reputation of "rough and tough;" more educated labor sought its employ, and with it came the disappearance of the brick yard shanty and its degrading influences. Machinery has elevated every branch of the trade; it is making high-grade man of the once ignorant worker, who had no opportunity to study and develop himself. Machinery is making better materials, and making them cheaper. Machinery has removed every kind of drudgery which had a tendency to make life miserable. When men were machines every effort required muscle; their hours of toil were long and severe and the consequences were brutalizing and degrading. It is to be hoped that the time will come when the perfection of all machinery will be such as to require only the presence of an attendant, without any manual labor to speak of. Many laborers condemn machinery, saying that it does away with their labor; but when the comparison is made between the labor 20 years ago and at the present day it can safely be said that with the introduction of machinery there have only been taking away long hours and hard work, and in their place came opportunities for cultivation and the improvement of the social and domestic condition of those following brick making as a profession.

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HOUSE IN ELMWOOD, CINCINNATI, ERECTED BY BOFINGER & HOPKINS.

FOR FLOOR PLANS SEE PAGE 153.

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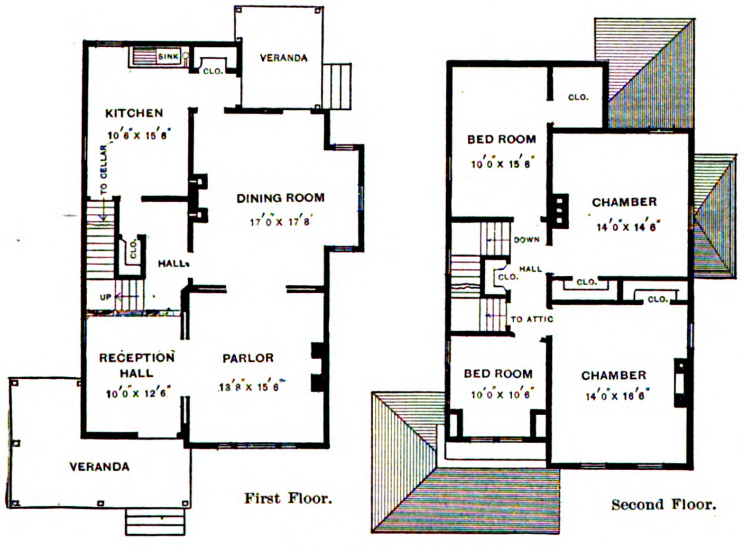
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A SUBURBAN RESIDENCE.

WE PRESENT upon this and the following pages the elevation, floor plans and details of a neat and attractive house of moderate cost, erected in a suburb of Cincinnati by Bofinger & Hopkins, of that city. The perspective view of the house forms the subject of our colored supplemental plate this month. Upon the first floor of the dwelling are 4 rooms in addition to a main hall. The arrangement is such that the visitor passes directly from the veranda to a reception hall 10 x 12½ feet in size, and from thence he may pass into the parlor at the right, or to the hall behind, from which rise the main stairs. Behind the stairway is the kitchen, while to the right is the dining room connected by folding doors with the parlor. These latter rooms are fitted with hard wood mantels and tiled hearths. This arrangement of rooms permits the "domestic" in the kitchen to reach the front door without having to pass through either the parlor or the dining room. Upon the second floor are 4 sleeping rooms so disposed as to utilize all the space to advantage. Ample closet room is provided, as well as a stairway leading to the attic. The cellar extends under the entire house. The building is covered with a slate roof. The water supply of the kitchen is obtained by means of a pump from a cistern having a capacity of 144 barrels. This house has been erected by the firm above mentioned at a cost of about $2,350.



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



Scale, 1-16 Inch to the Foot.

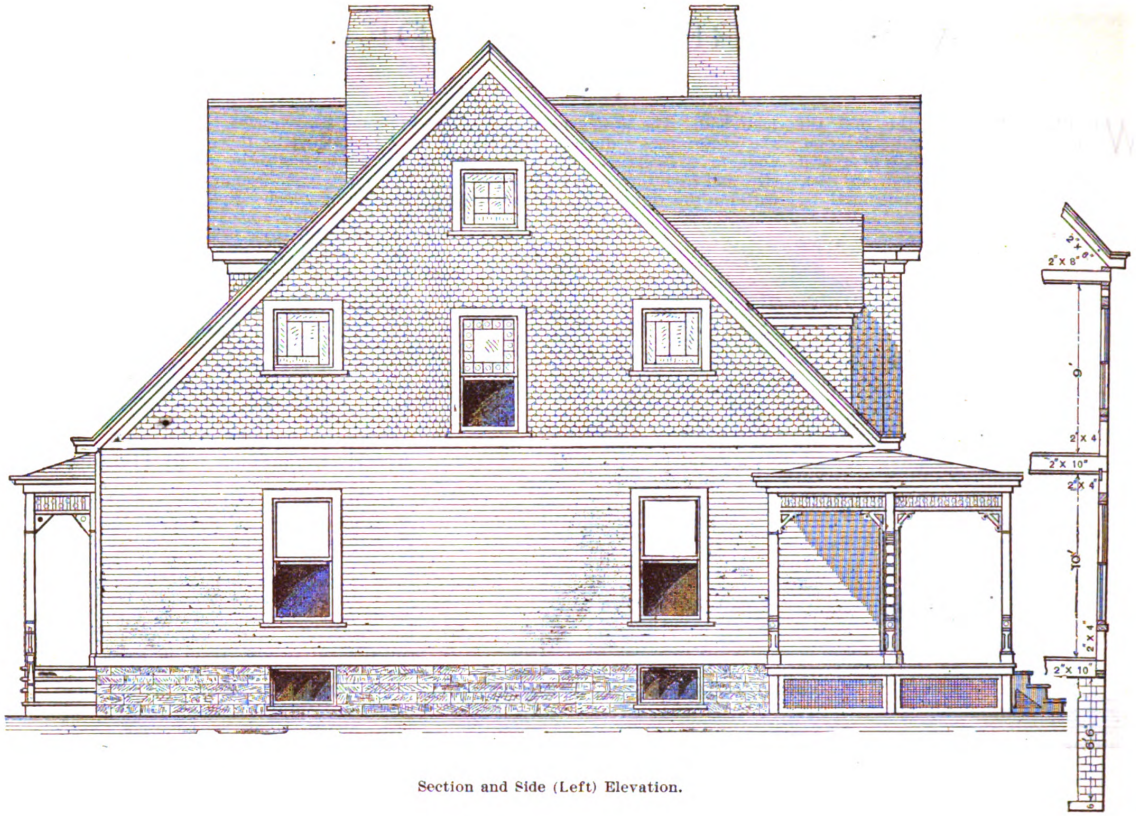
A Suburban Residence, Erected by Bofinger & Hopkins, Cincinnati, Ohio.

Modern Methods of Wall Finishing.

In the treatment of wall surfaces, says A. Ashmun Kelly, in *House Painting and Decorating*, very much will depend upon the condition of the ground to be operated upon whether we shall be successful or not. As a rule, our walls are far from being in a suitable condition for treatment with oil or water colors when we are called upon to take them in hand, and nothing certainly is more trying to one's patience than this. If the plasterer did his business properly, there would be no such abominations as hot, absorbent, porous, fire-cracked and the like walls. We used to have what were known as "wash-walls," so called because they were troweled down to a hard, smooth and glossy surface, and thus made suitable for washing down with scrubbing brush and water, an annual performance which constituted one of the charms (?) of the domestic life of our good old mothers. Such walls were simply perfect for the decorator's use. Unfortunately, they are rare. Cheapness in first cost has obliged the plasterer to finish up his white coat just as speedily as possible, and the result is bad walls. Given ample time in which to do it, the work of this artisan is capable of the grandest possibilities. He might add coloring matter to his plaster and produce the most beautiful effects in tints, tones, shades and colors, and not only add to the fine effect of his own work, but lay a foundation for the decorator that would enable this personage to produce the best results with the least trouble and expense Why plastered walls continue, as a general thing, to be of ghastly whiteness I cannot conceive. A tinted-plaster wall, troweled down to an egg-shell gloss, strikes me as being a beautiful possibility. Imagine it! Take a lovely turquoise blue, for instance, for the body of the wall, with a soft buff or rich cream-colored frieze, suitably treated afterward with embellishments, and one can scarcely imagine the beauty of the effect.

Ordinary whiting or distemper kalsomine is very hard to work on a bad wall. In such a case it will pay to give the wall a coat of paint or cheap varnish. This will stop the suction, which is the chief mischief. An attempt to finish such a wall without such a preparatory coat will surely end in failure and wasted labor. Alum, plaster-of-paris and soap mixtures are also used, but the first mentioned articles are better. The best gilder's whiting, bolted, should be used, and only the best dry pigments, because their tones are clearer and it requires less of their substance to tint the mixture. Likewise, only the best glue—gelatine or fish glue—should be used for a binder. Too much glue will cause cracking of the surface; too little, flouring off and a poor surface to work

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Section and Side (Left) Elevation.

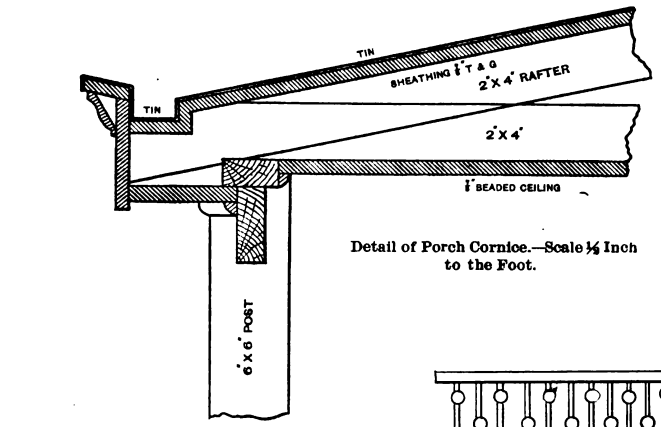


Side (Right) Elevation.

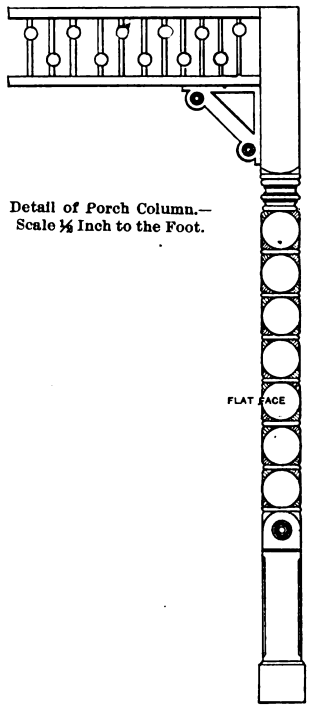
A Suburban Residence Elevations.—Scale, ⅛ Inch to the Foot.

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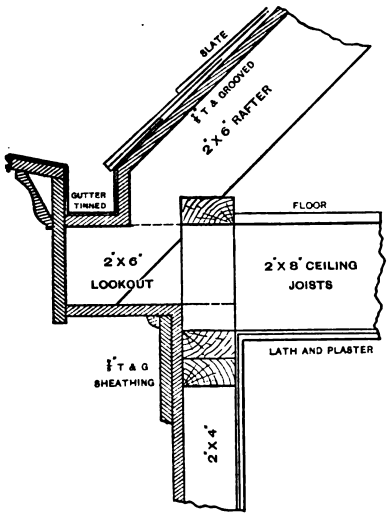
on subsequently. The whiting is first put to soak, say over night, the color worked in by hand, and finally the glue. Afterward hot water is applied and the mixture put through a fine strainer. Then it is set aside to cool. A custard-like consistency is best for working. Use a broad, long-bristled kalsomine brush, and dab the mixture on quickly and evenly in a haphazard sort of way (so it will look to a novice), using the ends of the bristles rather than the other portion. Kalsomine proper, or Paris white, gives better results than ordinary whiting, being free from that gritty feel which characterizes the latter substance, and gives a smoother, more pleasing finish. In my apprentice days we used to prepare the kalsomine ourselves, boiling the dry white with the fish glue—or "isinglass," erroneously so called—and applied it hot. We used white mostly, seldom any tints, and made beautiful ceilings with it. Nowadays we have the prepared kalsomine, such as Johnston's, which is more convenient for small jobs than mixing it ourselves.



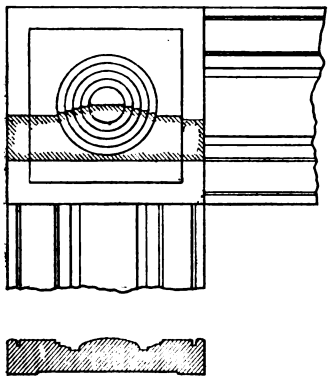
Detail of Porch Cornice.—Scale ½ Inch to the Foot.



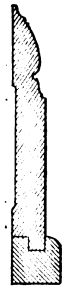
Detail of Porch Column.—Scale ½ Inch to the Foot.



Detail of Main Cornice.—Scale ½ Inch to the Foot



Details of Base and Finish.—Scale ¼ Full Size.



Section of Base.—Scale ¼ Full Size.

A Suburban Residence.—Details.

I am a great admirer of the Johnston prepared kalsomines, and have used them for the past 15 years with uniform success. Several other wall finishes are now on the market, some imitations of Johnston's, others quite different. One of the latter is a plaster or prepared gypsum compound, such, for instance, as "Alabastine." Alabastine (and there are several similar preparations in use) possesses many excellent qualities which will commend it especially to houseowners, while the decorator will be apt to dislike it, especially upon first trial. I have used it to some extent experimentally, and believe that my experience will help others who may be called upon to try gypsum preparations. My first efforts with it were not brilliant, judged by the results. In fact, I failed, and had a fearful time of it. Full directions accompanied each package, but then directions avail little with the amateur. But I experimented until I succeeded in effecting a beautiful job of wall finish. I found that the stuff, which had more tricks than a mule, had to be handled "just so" or it wouldn't work. It had to be mixed very thin, to begin with—thin as ordinary lime wash—and applied at once. Having a lot left over, I saved it that night, and, though aware that it would not do after setting so long, I mixed it with a fresh batch next morning and spoiled my walls. It granulated and dusted off and made the wall full of suction. I scrubbed this off with a dry root brush and gave another coat of fresh stuff, but still without success. The mixture must not stand more than a very few hours. It will set, just as plaster-of-paris does, and in this state is worse than useless, having lost its original character. It will work over wood or paint, but its one peculiarity is that no preparation of the wall, such as sizing, is needed.

A friend, a painter in a South Pennsylvania town, used alabastine under my direction, last fall, on a bank building and a church, and achieved splendid success, creating quite a talk in his neighborhood over it. But I was very minute in my instructions, and cautioned him very particulary against such things as had proven my early ill-success, otherwise I think he too, would have joined in the cry of many others who dislike the material. The best thing about gypsum preparations is their sanitary value. They give a perfectly porous surface, through which the walls, as Mr. Bradshaw has aptly said, can breathe, and being free from animal substances, such as glue, cannot decompose and generate disease germs, nor will they crack, scale, flour, or the like. In fact, being simply plaster, they become a part of the plaster wall and harden with age. But the finish is easily soiled, and therefore I do not like it outside of bed-rooms or parlors, but it takes varnish splendidly, though thereby suffering a change of appearance that may or may not prove an objection to some persons. I never worked anything that was nearly so easily applied as this gypsum preparation. It was like putting on buttermilk. Use it just right and you will like it. I may add that I have no interest in its manufacture, but write solely with a view to help some one who may have to use it for the first time.

THE NUMBER of immigrants who arrived from Europe during 11 months up to May 31 is 401,609, against 392,560 during the corresponding 11 months of last year. This indicates that the total European immigration of the fiscal year about to end will exceed that of any previous year except 1881, 1882, 1887, and 1888. The most significant changes, as compared with last year, are in the figures of Hungarian and Italian immigration, which has more than doubled.

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LAW IN THE BUILDING TRADES.

THE FOLLOWING SUMMARY of recent decisions of the courts relating to matters in the building trade will be found of interest to our readers:

EXTENT OF MECHANICS' LIEN.

The Indiana statutes provide for a mechanics' lien upon any building, to the extent of the value of the labor done and materials furnished, and directs that any person desiring to acquire a mechanics' lien shall file "a substantial description of the lot or land on which the building may stand or be connected with," and that any description will be sufficient, from reference to which the lot or land can be identified. Under this statute the foundation of a barn constitutes a building, and a description of a lot, which alleges the building to have been erected on a certain tract containing 160 acres, though the lien cannot extend to the whole tract, is not void for indefiniteness.

Scott *vs.* Goldinhorst, Supreme Court of Indiana, 24 N. E. Rep., 333.

MECHANICS' LIEN.

In an action upon a mechanics' lien to recover for material furnished to a contractor, to whom at the time of filling the motive of the lien there was a sum due by the defendent owner, defendants should be permitted to show in defense that the contractor had not completed the work; the amount of work uncompleted; the cost of completing the work and any payments made on account of the contract.

Frazier *vs.* McGuckin, Supreme Court of New York, 9 N. Y. Supp., 435.

PARTY WALLS.

In the absence of a special agreement or controlling custom providing otherwise, party walls must be capable of substantially similar use by the adjoining owners.

Hamman *vs.* Jordan, Superior Court of New York City, 9 N. Y. Supp., 421.

Where one builds a party wall under a city ordinance authorizing and regulating city walls, he cannot claim the benefit of such ordinance unless the wall is of the thickness required by the ordinance, and otherwise conforms to it, and is without openings.

Traute *vs.* White, Court of Chancery of New Jersey, 19 At. Rep., 196.

LIABILITY OF MASTER IN EMPLOYMENT OF SERVANTS.

A master must use due care in the employment of servants, but he cannot be held liable for damages resulting from the mere incompetency of a servant, of which he had no notice.

Thomas *vs.* Herrall, Supreme Court of Oregon, 23 Pac. Rep., 497.

MECHANICS' LIEN AS TO SUB CONTRACTORS.

The lien given by the Indiana statutes to sub-contractors "to the extent and value of the work and labor performed or material furnished, or both," is only for the reasonable value of the work and material and not for their price, as fixed by original contract.

Morris *vs.* Louisville N. A. & C. Ry. Co., Supreme Court of Indiana, 24 N. E. Rep., 335.

STATEMENT FOR MECHANICS' LIEN.

Where the statute requires that a statement for a mechanics' lien for labor performed, or materials furnished under an entire contract, which includes both labor and materials at an entire price, shall specify the contract price, the number of days of labor performed or furnished, and the value of the same, a statement which shows that the labor was furnished under a contract, and which states the number of days labor and the value of the labor and the contract price therefor, or which states the materials furnished and the value and the contract price therefor, is not sufficient, as it does not show the contract price of the entire work.

Hurley *vs.* Laly, Supreme Judicial Court of Massachusetts, 28 N. W., Rep., 884.

COMPLIANCE OF CONTRACT NECESSARY TO SECURE LIEN.

In order to secure a sub-contractor's lien it must appear that such sub-contractor has not only furnished the materials or labor on which his claim is based, but that he has complied with the terms of the contract relating thereto. In a contract to furnish building materials for a building in process of erection "within 60 days" time is of the essence of the contract, and substantial compliance must be shown.

Kirn *vs.* Champion Iron Fence Co., Supreme Court of Appeals, of Va., 10 S. E. Rep., 384.

MUNICIPAL CONTROL OF BUILDING CONSTRUCTION.

The power of a municipal corporation to control and regulate the erection of buildings is not an implied power, but must be specially conferred by the Legislature.

State *vs* Schuchardt, Supreme Court of Louisiana, 7 South. Rep., 67.

CONSTRUCTIVE MEASUREMENT.

A rule of a bricklayers' association for what is termed "constructive measurement," which varies constantly according to the percentages which are added or deducted under other rules of the association, cannot be applied to the contract unless the other party is fully informed as to the rule and the effect of its operation. A contract for mason work by the cubic yard must be measured as cubic yards are ordinarily understood, and not by an arbitrary rule unknown to the other party of the contract.

Ambler *vs.* Phillils, Supreme Court of Pennsylvania, 19 At. Rep., 71.

MECHANICS' LIEN ON PROPERTY OF WIFE.

Where lumber and building materials and labor are furnished to a man for the erection of a house upon land of which the legal title is in his wife, the property is subject to a lien for such labor and materials, where it appears that she knew that the lumber was being furnished and the labor was being performed for that purpose, and by whom, and that she made no objection thereto.

Howell *vs.* Hathaway, Supreme Court of Nebraska, 44 N. W., Rep., 1136.

KNOWLEDGE OF OWNER REQUIRED TO SUSTAIN MECHANICS' LIEN.

Where a person other than the owner of land purchases material or employs labor in the erection of a building on such land it is necessary that the notice for the lien should show not merely that such other person is the owner of the land, but it must appear that such building or improvement was placed on such land with the knowledge of the cattle owner.

Allen *vs.* Rowe, Supreme Court of Oregon, 23 Pac. Rep., 901.

CANCELLATION OF BUILDING CONTRACT FOR INCOMPETENCY.

Where a contract for the erection of a building provides that the contractor shall erect the building in the best, most substantial and workmanlike manner, and authorizes the owner to terminate it if the work is not done in accordance with the terms, the owner is justified in terminating the contract, on account of the incompetence of the contractor and his workmen by reason of ignorance and dissipation. In an action by the contractor for damages sustained by the termination of the contract, recovery was sought for extra work not called for in the specifications, and it is held that if the cost of completing the building was less than the contract price, the contractor is entitled to recover for such extra work, but if the completion of the building was greater than the contract price and the value of the work, he is not.

Rector *vs.* McDermott, Supreme Court of Arkansas, 13 S. W., Rep., 334.

DAMAGES FOR DELAY IN BUILDING CONTRACT.

In case of a contract to deliver materials to be used in the construction of a building, in order to charge the seller with loss of rents arising from his failure to deliver such materials within the time limited by the contract, the contract must have been made under such circumstances, and upon such a state of facts that it may reasonably be supposed to have been contemplated by the parties, when making the contract, that such loss would follow its breach, and hence that the seller consented to become liable for it, and such facts and circumstances if relied upon must be pleaded and proved. Where the contract is silent as to the time of performance, a reasonable time is intended, and if it is in writing, proof of an oral agreement variant from that presumption will not be admitted.

Liljengren Furniture and Lumber Company *vs.* Mead, Supreme Court of Minnesota, 44 N. W. Rep., 306.

ARBITRATION CLAUSE OF BUILDING CONTRACT.

Where a building contract provides that any dispute as to the meaning or scope of the specifications shall be decided by the architect, and that any dispute as to the value of any work omitted by the contractor shall be submitted to arbitration, a claim for work done under the contract, where the only defense is that the work was not properly done, need not be submitted to arbitration. Where the contractor used his best ability and effort to comply with a contract, and the other party receives and retains the benefit of his labor and materials, the fact that the work has not been fully performed and has not been well done is only a defense to the extent of the damages caused thereby.

Gallagher *vs.* Sharpless, Supreme Court of Pennsylvania, 19 At. Rep., 491.

CONSTRUCTION OF PENALTY CLAUSE IN BUILDING CONTRACT.

The rule is that if damages result from the performance or omission of acts which are certain or can be determined by evidence, the sum which is stipulated in a contract to be paid in the event of the failure to perform such acts will be considered as a penalty, and will not be inforced, but where such acts or omissions occasioning damage produce a result which cannot be measured by a pecuniary standard, such stipulated sum will be considered in the law of liquidated damages and will be enforced. The provision in a building contract that the contractor shall pay after date a certain sum if he fails to complete the building at the time designated, is in the nature of a penalty and not liquidated damages.

Brennan *vs.* Clark, Supreme Court of Nebraska, 45 N. W. Rep., 472.

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MEASUREMENT OF ROOFS.*

BY TRIANGLE.

IN PREVIOUS NUMBERS there have been given rules for finding the areas of various plane figures, as the square, rectangle, triangle, &c., and then following these figures were a number of examples of roofs and directions for obtaining their shapes from the plans and elevations. While the directions already given may enable the reader to compute the surface of any roof commonly met with, there are other shapes that it might be well to consider before proceeding further with the subject. It has been shown that the area of the square, rectangle, rhomboid, &c., can be obtained by resolving the figure into two or more triangles, and while special rules may be given for obtaining the surface or area of other figures, it will be shown that the various rules are really based on the same principle, and it could almost be said that when one is able to obtain the area of a square and triangle, or of the various shaped triangles, that he can obtain the area of any shaped plane figure that can be drawn. While these articles relate to the measurements of roofs, the reader is probably aware that there is hardly any limit to the strange shaped roofs or coverings of parts of buildings drawn by the architects of the present day, and on this account there is hardly any limit to the number of shapes that can be considered as within the scope of these articles. As the first shape considered was the square, we will now consider a shape that might be called its opposite and that is the circle, and while circular roofs or buildings may be seldom constructed, there are many buildings parts of whose surfaces are formed of at least the part of a circle, and if we can determine the area of a whole circle it would appear to be an easy matter to figure the area of a part, or if we can determine the area of part of a circle, it will be equally easy to determine the area of the whole. While there may be a number of methods for obtaining the area of a circle, we will first see how we can manage to secure this result without the help of any rule whatever.

In Fig. 50 the circle shown is divided into four equal parts by the lines A B and C D. We will draw the line C B, forming the triangle C J B, then bisect C B by F E, and form two other triangles by drawing, C E and E B; then bisect C E by G H, and produce two more triangles by drawing H C and H E. We have now carried our divisions as far as can be done with an ordinary pencil, as the two lines between C H or H E run nearly together. The rule previously given for obtaining the area of a triangle was: "Multiply the base by the altitude and divide by 2," or, what is the same thing, multiply the base by one-half the altitude. This operation is shown in Fig. 51, where area of

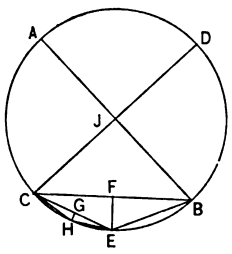


Fig. 50.—Area of Quarter Circle by Means of Seven Triangles.

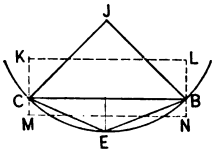


Fig. 51.—Approximate Method by Means of Triangles.

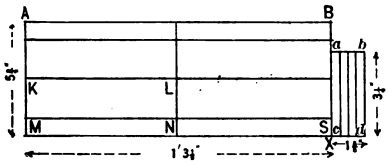


Fig 53.—Area of Circle Shown in Fig. 50, as Obtained by Triangles.

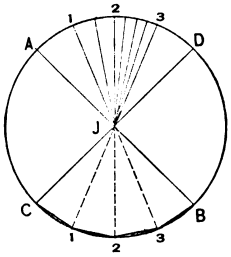


Fig. 54.—Second Method of Finding Area of Circle.

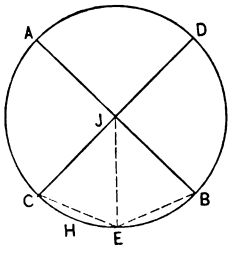


Fig. 55.—Third Method.

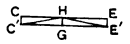


Fig. 52.—Detail of Method.

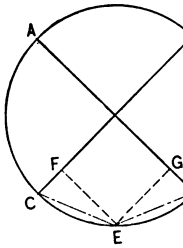


Fig. 56.—Fourth Method.

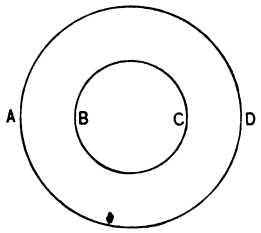


Fig. 58.—Obtaining Area of Annular Space.

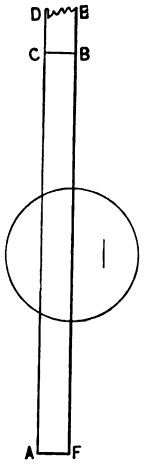


Fig. 57.—Finding Area of Circle by Rule 2.

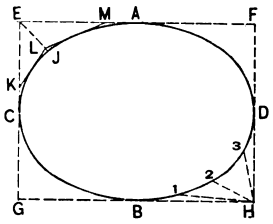


Fig. 59.—Area of Ellipse.

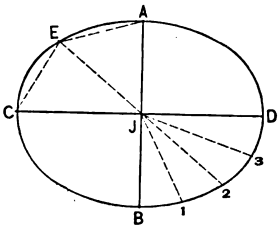


Fig. 60.—Second Method.

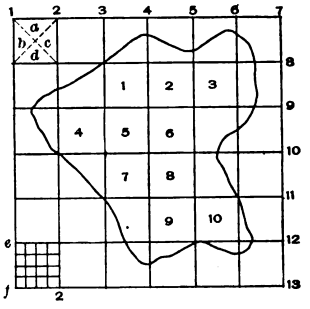


Fig. 61.—Area of Irregular Figure.

Measurement of Roofs.

* Continued from page 120.

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triangle C J B is shown by C B L K, and of the two triangles C E F and E F B by C B N M. The areas of the two small triangles C G H and H G E are shown in Fig. 52 by C H G C′ and of the two similar triangles between E und B (Fig. 50) by G H E E′. We have now obtained the area of the quarter-circle C J B E, as nearly as can be shown by the use of ordinary lines, and to get this area it is only necessary to figure the area of K L N M in Fig. 51 and C E E′ C′, Fig. 52, four times, which would represent the area ot the circle A D B C, Fig. 50.

In Fig. 53 K L N M represents the similar shape shown in Fig. 51, and A B S M four times as much, or the area of the whole circle A D B C in Fig. 50, excepting the area of the small triangles in Fig. 52, which are shown at *a b c d*; only four such figures are drawn, showing the area of all the small triangles as would be contained in the entire circle, as shown in part by C G E H, Fig. 50. The circle shown in Fig. 50 being drawn to a scale of 1½ inches to the foot, represents a diameter of 11 inches. On looking at a table of areas of circles it is shown that the area of an 11-inch circle is 95.033 square inches, and by reducing the dimensions of figure shown in Fig. 53 to decimals and figuring the area, we have as a result 94.390 square inches, which lacks only 0.643, or slightly over one-half of a square inch, of being the same result as shown by the table, and when it is considered that the result has been obtained by measuring a figure one-eighth full size the amount is not far out, especially as an ordinary pencil mark by the scale used is about ¼ inch wide.

In Fig. 54 is shown another method of obtaining the area of C J B by dividing it into four triangles as indicated by lines 1, 2, 3, and then obtaining the area of each triangle, as previously explained. The smaller the base of the triangle, as shown by the divisions between A D, the greater the accuracy of the calculation. In Figs. 55 and 56 are shown two other methods for obtaining the same result, the illustrations being given to show those of the readers of *The Metal Worker* who are not familiar with the subject that they are not to be tied to any particular rule for securing the desired result, as they are in possession of at least one method on which the rule or rules for obtaining the area of a circle are founded.

It will be seen that there is hardly any limit to the number of shapes that can be drawn in a circle, and as long as straight lines are used in making the divisions, the reader should be able from the directions previously given to estimate the area of any one, and the area of all the shapes being obtained the sum of all should give (nearly) the area of the circle, the "nearly" depending upon the accuracy with which the operation is performed.

Before proceeding further with the subject it might be well to remark that plane figures are composed wholly or in part of straight or curved lines, and, as it is a question if "the oldest inhabitant," or any other equally well-informed individual, can determine what shapes the architects of the present or future will use in the various parts of buildings, some of which shapes are to be covered with roofing material of some kind, it would perhaps be well to further consider the methods to be employed in obtaining the areas of various figures, even though some of them may not be commonly used.

While special rules may be given, the intention is to so present the subject that one who has followed the subject thus far will be enabled to obtain the area of any plane figure that can be drawn without the use of any rule or rules other than those used for squares, triangles, &c.

While on the subject of circles, we will state that a circle is a plane figure, bounded by a curved line, all points of which are equally distant from a point within called the center. The circumference or periphery is the curved line. The diameter of the circle is a line passing through the center and terminated by the circumference, as A B in Fig. 55. The radius of a circle is a line drawn from the center to the circumference, as A J or J D, Fig. 55.

For finding the area of a circle three rules will be given:

1. Multiply the square of its diameter by 0.7854.

2. Multiply its circumference by one-fourth its diameter.

3. Multiply the square of its radius by 3.1416.

Regarding the above rules, they all require more or less calculation, and in case of a circle the diameter of which would be difficult to measure the calculation would be rather complex, to say the least, and if we were required to use any of the methods previously given the operation would be too tedious or too complicated on account of the number of triangles necessary to be used, and on this account we will give what might be called a practical translation of the second rule.

The circumference of a circle can be obtained by measuring, or cutting the circle out of any convenient material and then rolling the disk. In order to obtain the area of a circle, using the second rule, all that would be required would be to cut a strip of paper in width equal to one-fourth the circle's diameter (or one-half its radius), and then by any convenient means, as by rolling the disk on the paper, obtain the circumference, when the area would be obtained. As an illustration we will take the circle shown in Fig. 57, which is of the same diameter as a nickel. The strip of paper shown by A D E F is cut one-fourth the width or diameter of the nickel, and being wound about the circumference, as shown by B C, the part of strip shown by A C B F is the area of the circle or nickel.

If it is desired to obtain the area contained between two concentric circles, as A D and B C in Fig. 58, it is only necessary to first obtain the area of the large circle, then of the small and subtract the latter from the former.

As a circle is a plane figure that can be described within a square, so an ellipse is a plain figure that can be described within a rectangle, as shown in Fig. 59. After having described the rectangle E F H G about the ellipse A D B C, it would be easy to figure the area of the rectangle, and then by drawing the lines E L, K L and L M two triangles are obtained that nearly give the area of the corner K L M E, and four times the area thus obtained subtracted from the rectangle will nearly give the area of the ellipse. In the case of a larger figure, or if greater accuracy is desired, the remaining space could be again divided into triangles as was done in Figs. 51 and 52, or the corner can be divided as shown between B H D.

The rule for finding the area of an ellipse is to multiply the product of the two diameters by the decimal 0.7854, which is doing by the aid of arithmetic nearly what has been done by the use of triangles in Fig. 59, for in that case we obtain the area of the rectangle by multiplying the length by the breadth, or obtain the product of the two diameters, as it might be called, and then subtract the area of the two corners. By the rule we do the same thing when we multiply by 0.7854, which decimal being 0.2146 less than one, the operation is similar to the one performed in the diagram, as 0.2146 could be said to represent the four corners. Another method is shown in Fig. 60, where one-fourth of the ellipse C J A is divided into two triangles by the lines C E, E A and E J. The areas of these triangles are obtained and the operation performed as in previous figures. By dividing the ellipse, or one-fourth of it, as shown by the figures between B and D, greater accuracy is obtained.

As an illustration of how simple a matter it is to obtain the area of any plane figure Fig. 61 has been drawn, being formed by 36 squares, as shown, and if an irregular figure is drawn in these squares, the work being done to some scale if necessary, we can see how the area of the figure can be obtained. If convenient, each square as formed by the lines 1, 2, 3 &c., 7, 8, 9, &c., can be divided into triangles, as is the square between lines 1 and 2, forming the triangles *a*, *b*, *c*, *d*, or a number of small squares can be made, as at *e*, *f*. It is easy to see that there are 10 full squares in the irregular figure, and the reader, it is hoped, will be able to obtain the area of any of the remaining parts of squares without the aid of further directions.

Native Hardwoods.

An article on hardwoods in *Timberman*, after speaking of the rage for foreign expensive woods and their imitations, says:

"Later on, a very much more sensible idea took possession of the people in the matter of furniture and house finishing. Walnut was the first native wood to come into general favor, probably because it can be finished with stain, to look a little like the tropical hardwoods. With the incoming of walnut came a general tendency to natural woods of all kinds. The sensible idea that no paint or stain is as beautiful as the natural wood with its grain, knots, curls and natural appearance maintained with transparent varnish took possession. Pianos, and other articles of furniture which owe much of their beauty to their massiveness, held on to the tropical wood idea, both in natural wood and imitations, long after they had been practically discarded on other lines. But now even they are built of the natural native wood. Cherry, maple, ash and chestnut are capable of receiving and maintaining as high a degree of polish and finish as the finest tropical woods, are held at higher figures than the finest imitations and veneers of tropical woods. The finest and most expensive pianos, and the ones which musical instrument dealers exhibit in their show windows most prominently now, are built of the native woods. In the matter of house building, the solid, plain native cherry is coming in quite rapidly, and those who build expensive houses with rooms enough to demand that they shall be finished in different woods, are leaning toward ash, walnut and maple. Chestnut is a bright, rich and pretty wood, but it bears enough resemblance to some cheap woods to cause the untutored eye to imagine it is cheap and shoddy like. But all these native hardwoods are gaining strength continually, and the increase in their popularity is greatly enriching the locations where they grow, and in certain States, West Virginia for example, where formerly the timbered land could hardly be sold at any price, its owners are finding in the growing demand for hardwoods a most welcome source of revenue.

A BROWN STONE QUARRY about 20 miles east of Black River Falls, Wis., is said to be attracting a great deal of attention. The quarries consist of a large mound, or bluff, covering a large amount of ground. The leading feature in the stone consists in the fact that when first quarried it is so soft that it can be cut or worked in any shape almost as readily as wood, but after being exposed to the air, it gradually becomes as hard as granite. It is susceptible to a high polish, and is very pretty when smoothly finished.

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Hot Water Heating Plant in Public Library.

THE HEATING PLANT recently installed in the Public Library at New London, Conn., by the Hopson & Chapin Mfg. Company, of that city, is shown in the illustrations which we present upon this and the following pages. The building, a perspective view of which is shown in Fig. 1, covers an area of ground 96 x 44 feet, and contains a basement 8 feet high, in magazine room, delivery room and entrance hall and stairway, while in the latter are the librarians' room, an ante room and the book room. All these apartments open into one another, and connect by the stairway to the second or attic floor, which has an average hight of about 8 feet. This upper floor is more for storage than for occupancy, and it is intended to maintain but a low temperature in it. The northern rooms or parts of the building are approximately 40 feet long by 24 feet wide, the southern part being about 42 feet long by 35 feet wide, internal measurements. The total cubic feet of air space and square feet of glass and wall surface in the building are apportioned as follows:

The cellar and second or attic floor are only partially heated, while the temperature of the first floor is to be maintained at 70° F. when the outside atmosphere is zero, and this is done by means of indirect radiators only, there being no direct surface used in any part of the building. To correctly ascertain the surfaces required, Mr. John Hopson, Jr., explains the manner in which he arrived at the quantities used in the following table:

Conditions taken were to change the air twice per hour and maintain tempera-

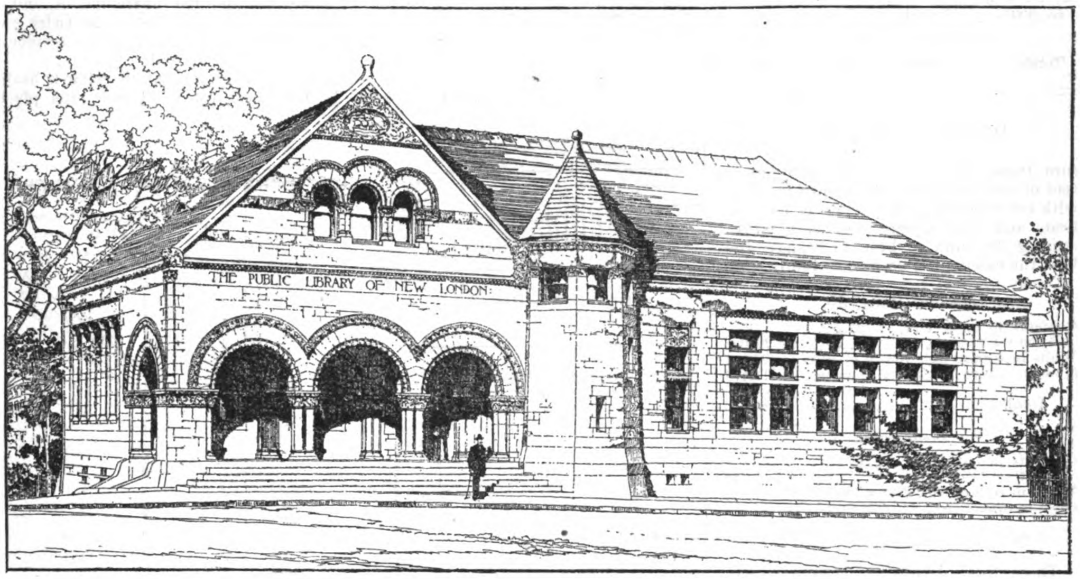


Fig. 1.—General View of Library.

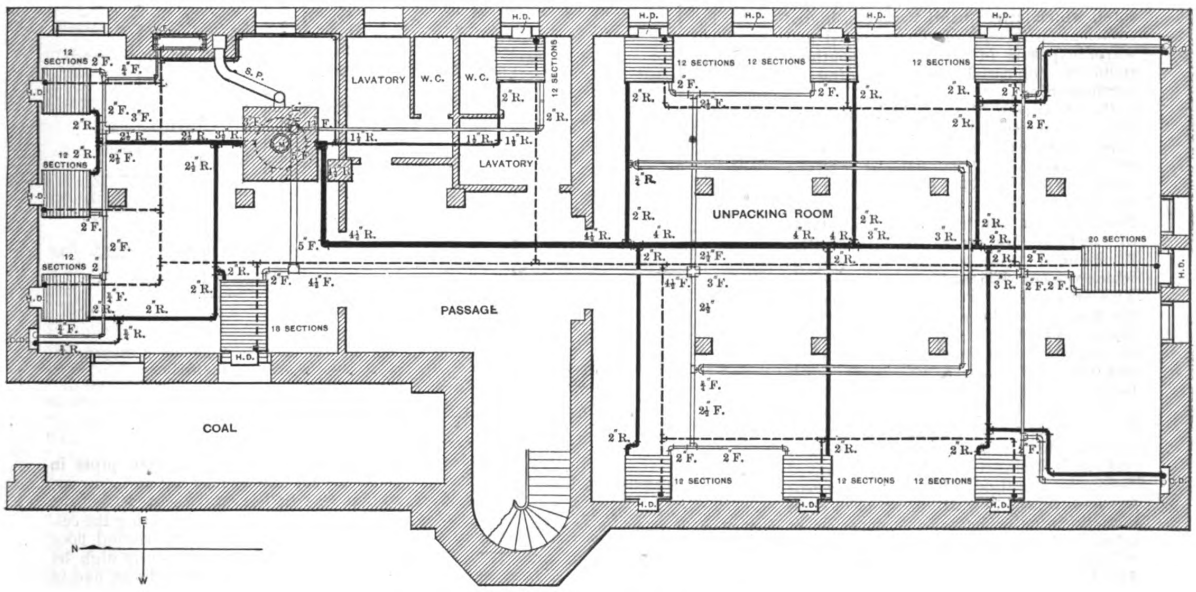


Fig. 2.—Plan Showing Heating Apparatus in Basement.

Hot Water Heating Plant in Public Library.

which there are lavatories, unpacking room and boiler room. The first story is 17 feet high, and may be said to be divided into two rooms, north and south, the former containing the reading room,

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ture of 70° inside when at zero outside, with temperature of 175° in the indirect radiators Each cubic foot of air requiring 154 units of heat to raise its tempera-

	Cubic feet of space.	Square feet of glass.	Sq. feet of wall surface.
Cellar	16,000	90	662
First floor....	44,000	660	4320
Second or attic floor....	18,000	70	500
Totals.....	78,000	820	5482

Air Space and Wall Areas.

ture from zero to 70°, and each square foot of wall (20 inches thick outside stone with brick backing) requiring 14 units of heat, and each square foot of glass requiring 38 units of heat to replace the loss, the calculation became as follows:

Reading Room, &c.

Contents in cubic feet, 17,725 x 2 = 35,450 x 1.54 units.. ..... = 54,600
Walls in square feet, 1626 x 14 units = 22,764
Glass in square feet, 302 x 38 units.. = 11,476
Total..... 88,840

Book Room.

Contents in cubic feet, 26,442 x 2 = 52,884 x 1.54 units ..... = 81,440
Walls in square feet, 2692 x 14 units = 37,688
Glass in square feet, 357 x 38 units.. = 13,566
Total..... 132,694

These totals divided by 150 units, the heat units emitted by indirect radiators from water at 175° give the following results:

For reading room.....592 square feet.
For book room.....885 square feet.

There were placed in stacks to warm the former 66 indirect radiator sections of 594 square feet total, and in the latter 92 indirect radiator sections of 828 square feet total, which latter quantity was considered sufficient on account of the protected and warm exposure of the book or southern room, as compared to the reading or northern room.

By reference to Fig. 2, which shows the plan of basement, the distribution of the various stacks of sections will be readily understood. The indirect radiator used was of the Pin radiator form made by the contractors, and is known as the New London Pin radiator. The stacks of sections are set as shown in Fig. 3, inclined upward from the end at which the connections to pipes are made. This arrangement gives natural ascent to the flow and a descent to the return. The stacks are suspended from the floor beams on heavy wrought iron hangers and bars, and the joints between the sections are faced and recessed in which are asbestos packing, and top and bottom bolts every three sections secure a good joint, dispensing with the use of nipple. Each stack of sections is inclosed in double galvanized casings having tight joints so as to prevent any loss of heat by a still air space. Each section is rated as having 9 square feet of actual surface, and in order to verify this estimate the following figures are reproduced:

Length of section, 40½ inches; hight of section, 6½ inches; width of section, 1½ inches.
Four bosses, two on each side of section, 3½ inches in diameter, ⅞ inch thick.
Four bolt lugs, two on top and two on bottom, 9½ inches long by ¾ inch thick.
Nine hundred and ninety (990) pins, 495 on each side; 7-16 inches in diameter at base of pin; 9-32 inch in diameter at top of pin by ¾ inch high.

	Sq. in.	Direct surface.	Sq. ft.
Topsurface of section, 40½ x 1½ inches....	60.75		
Deduct for two bolt lugs, 9½ x ¾ inches.....	7.125	= 53.625	
Vertical ends, 13 x 1½ inches.		= 19.500	
Horizonal bottom surfaces, 40½ x 1½ inches.....	60.75		
Deduct for two bolt lugs, 9½ x ¾ inches....	7.125	= 53.625	
Vertical sides' surfaces, 40½ x 6½ x 2 inches.....	526.500		
Deduct ⅝ area of four bosses.....	23.667	= 352.036	
Deduct area, .1503, of 990 pins.....	148.797		
Total direct or plain surface, in one section..... ...		478.786 = 3.324	

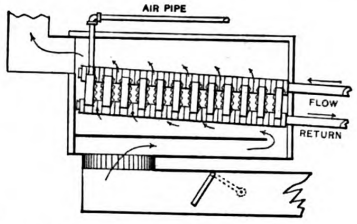


Fig. 3.—Setting of Stack of Pin Radiators.

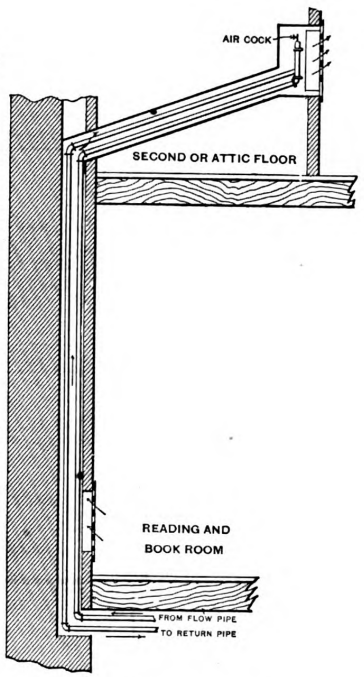


Fig. 4.—Pipes in Circulating Ducts.

surface is in this case fairly well demonstrated. The warm air ducts which are marked H D on plan, Fig. 2, conduct the heated air from the radiators to the registers on the first floor, while the cold air is supplied to the stacks through circular openings from the cold air ducts of galvanized iron in each of which is a damper to regulate the admission of cold air from the nearest window openings.

From the summary presented on the next page it appears that the total area of the warm air ducts is equal to 13.2 square feet, or 1900 square inches, and to change 44,167 cubic feet of air twice each hour through this area requires a velocity of 1.86 feet per second.

The unpacking room in cellar is heated by 150 lineal feet of 1¼-inch pipe placed

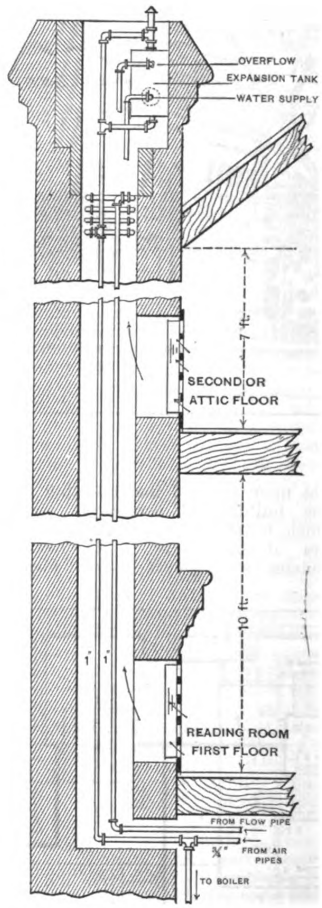


Fig. 5.—Provision for Ventilation, Expansion and Air Emission.

Hot Water Heating Plant in Public Library.

	Extended surfaces.
Four bosses, 11 inches in circumference by ⅞ x 4 inches....	38.500
Top of pins' area, .0625 x 990 in..	61.875
Horizonal surfaces of pins' area, 8448 x 990 inches	.426
Total extended surface in one section, square inches.....	936.801 = 6.505
Total surface extended and plain...	= 9.829

The direct or plain surface is 29½ per cent. of the total surface.

From this it appears that less than 30 per cent. of the surface used in heating the building is direct or plain surface and the remaining 70 per cent. is extended surface, so that the usefulness of extended

near ceiling; all flow and return pipes in cellar are covered by hair felt and canvass, so that very little heat is wasted from the main pipes to the stacks in heating the cellar. The temperature of the second floor or attic is maintained sufficiently high by the use of three circulating ducts, one in north wall and the other two in south wall, as shown on plan, Fig. 2. A sectional view of one of these ducts is given in Fig. 4. The ducts are fitted with a vertical coil of 1¼-inch pipe, consisting of a flow and return pipe, and the two ducts in the south wall have a combined area of 400 square inches, while the one in the north wall has 160 square inches. The

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larger ducts have registers, 14 x 22 inches, and the smaller one 12 x 19 inches, on first and second floor. The pipes within these ducts insure a circulation, and by them and the open stairway the air of the second floor is maintained at the desired temperature.

The boiler used is the Pequot Magazine hot water heater, having a 36-inch diameter of fire pot of 7 square feet area, and 196 square feet of boiler surface. It is brickset and the outside dimensions are 58 inches square by 56 inches high. It is located as shown in plan, Fig. 2, the coal magazine being marked C M and the smoke pipe S P. The sizes of the main flow and return pipes are marked on plan, Fig. 2. The double lines represent the flow, the black heavy lines the return and the dotted lines the air pipes. This plant is greatly simplified by nearly the complete omission of valves. On the top of the pipes in the circulating ducts, Fig. 4, are three air cocks, one on each. These and the blow off cock and water supply valve are the only ones used throughout the entire plant. From the top of the highest section in each stack, see Fig. 5, a ¼-inch air pipe is taken and is conducted as shown on plan, Fig. 2, to the bottom of the ventilating flue V F, where it connects with the expansion pipe from the boiler, see Fig. 5, and continues of 1-inch pipe to return connection of coil in ventilating flue, there to branch to bottom of expansion tank and finishes by connecting to air pipe out of top of expansion tank which passes to top of ventilating flue. The expansion tank has a capacity of 20 gallons, it is placed in a recess in ventilating flue and fitted with ball cock and water supply pipe. The overflow pipe from it is led down the ventilating flue made, and the work has the merit of combining good and useful theories with practical experience.

Rooms heated.	Number of stacks.	Number of Sections.	Square feet of radiating surface.	Number of registers.	Size of registers, inches.	Area in square inches of hot air ducts.	Number of cold air ducts.	Diameter of cold air duct openings, inches.	Area in square inches of cold air openings.
Reading Room, &c.	4	48	432	4	12 x 19	600	4	11	384
	1	18	162	1	14 x 22	200	1	14	154
Book Room.....	4	48	432	4	12 x 19	600	4	11	384
	1	20	180	1	14 x 22	200	1	15	177
Librarian's Room...	1	12	108	1	12 x 19	150	1	11	96
Ante Room	1	12	108	1	12 x 19	150	1	11	96
Total.....	12	158	1422	12		1900	12		1291

Table of Surfaces, &c.

and discharges at a convenient place on floor of boiler room, where it is readily seen.

The ventilation of the rooms has received particular attention, in order to secure an easy exit for the foul air. The general arrangement of this flue used is shown in Fig. 5. The opening from first floor has an area of 400 square inches, while the one on second floor has 200 square inches. Near the top of the flue is a large coil of 1¼-inch pipe, by means of which a constant current is maintained in the flue.

The main flow pipe from the boiler is 6-inch, see Fig. 2, as far as what is known as a "turret head fitting," from which the others branch horizontally, and in which is placed a copper vessel filled with a liquid which vaporizes at a low temperature, and connected with a diaphragm to form an automatic damper regulator. The work is neat, simple and effective. No odd or complicated fittings are used. The sizes of the pipes are well graded, based on practical experience, and not on minute theoretical calculations. In designing the apparatus, it is apparent that wherever calculations were necessary they were

Finishing Woods.

The following interesting article on different methods of finishing woods appeared in the columns of the *Northwestern Builder* a short time since. It is from the pen of Benn Pitman, of Cincinnati, Ohio, who for many years past has made a special study of woodwork, wood carvings, &c., and whose reputation is world-wide. We are sure that our readers will be interested in it:

Fine woods, like rare stones, need smoothing and polishing to show their beauty. While gems are only beautified by polishing, woods are benefited. Seasoned wood, when properly filled and polished, is nearly impervious to moisture, atmospheric changes, shrinkage and expansion. Polished surfaces exclude dirt and discoloration, and the beautiful markings of choice wood are thus retained for an indefinite period. Old Cremona violins, supposed to be varnished with amber—the hardest of all gums—grow increasingly beautiful with age, and the resonant tones of these choice instruments are supposed to be partly due to the varnish with which they are coated. Woods of so open and fibrous a texture as black walnut, oak and mahogany need to be "filled" in order to show a perfectly smooth and polished surface. Articles of furniture may be filled and finished with oil without polish. Many persons prefer carved furniture, to prevent the subdued effect of oiling. Black walnut and oak may be thus successfully treated. At least three coats of raw linseed oil should be given, laid on with a brush at intervals of a month, allowing each time as much oil as the wood will absorb. If a gummy appearance is presented on any portion of the wood, it should be removed by rubbing with a brush, cloth or piece of felt, moistening with coal oil.

To obtain a perfectly smooth and polished surface, for the tops of tables, edges of shelves, and other flat surfaces, the wood must be filled. This can be done, and perhaps most successfully by amateurs, by giving the surface three or four coats of shellac varnish on successive days, using a brush to lay it on, and rubbing the surface smooth with fine (No. 0) sandpaper before giving the additional coat. If a day is not allowed between the coats for the shellac to harden, the final result will not be satisfactory. If the pores of the wood are not filled, it shows that an additional application is needed. In brushing the shellac on the wood, let the stroke be across, as well as in the direction of the grain.

When the surface presents a perfectly smooth face, a final polish is obtained by laying on the last coat with a "dabber." The dabber consists of a ball of cotton batting about the size of an unshelled walnut; this, when covered with a piece of linen or cotton cloth, is used as follows: Partly saturate the cotton, by placing it on the mouth of the bottle, and throwing the solution toward it two or three times. Then replace the covering, and holding the dabber by the gathered edges of the cloth, not too tightly, rub it over the surface to be polished. Rub with a circular motion. Keep the dabber moving, and do not attempt to cover more than 5 or 6 inches square at once. In a second or two after the shellac has been thus spread and exposed to the air, it would become sticky and rough; this is prevented by touching the surface that is being polished, here and there, with a little sperm oil, which the operator must have ready on a finger end of his left hand, remembering to have a little oil ready for use in a saucer, with which to replenish the finger tip when needed. The oil is only of service to facilitate the spreading of the shellac smoothly. If the dabber is charged with sufficient, but not too much shellac, and if sufficient oil has been used, and not too much, a glossy, even and beautiful polish will be obtained. The whole surface to be polished should be done in small portions at a time.

If a small panel or other piece of work has to be polished that will not be steadied by its own weight, it must be clamped in position, so that both hands may be free to engage in the work of rubbing and supplying the oil. Experiment alone will determine to what extent the cotton should be saturated, and how much oil should be used for a given surface. If the dabber is too highly charged, the shellac will fail to harden and smoothly spread. If too much oil is used, a cloudy and smeary surface will result. Should the first trial result in failure, wait a few hours, rub with sandpaper and try again.

A quicker and cheaper method of obtaining a hard satin finish, and one to be recommended when large surfaces, as doors, are to be prepared, is by the use of a special preparation called "filler." This starchy compound must be thinned to the consistency of thick cream with benzine. It is light in color, and when used upon oak needs no stain. When employed on black walnut, burnt umber mixed with Indian red must be added to bring the filling to the desired color. It should be rubbed into the wood with a cloth, so that the pores are effectually closed. It speedily hardens, and in about ten minutes the surface may be cleaned without rubbing any from the pores. The following day a coat of shellac with a brush, and the succeeding day, after sandpapering, afinal polishing coat with the dabber will give a very satisfactory result. These technical operations will be more likely to result in success if they are first seen performed by an experienced person. Smooth surfaces, and not carved work, should be highly polished.

Of the three methods described the easiest, of course, is the simple application of raw linseed oil. Sweet gum becomes a beautiful golden brown, and black walnut nearly as dark as ebony, when so finished. An old chest seen in Cincinnati, finished with raw linseed oil, had acquired, from rubbing, a metallic luster resembling old bronze. Oak becomes very beautiful and rich in tone when treated in this manner. The beauty of this finish is much enhanced by rubbing the article vigorously with a stiff bristle clothes brush or flannel cloth as often as convenient. All woods become very much darker when filled with raw linseed oil. Very often it is desirable to finish the wood as nearly as possible in the natural color. This may be done by the shellac finish, which does not materially

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change the color of the wood if white shellac is used. Gum shellac comes in dark, medium and bleached or white. It is prepared by allowing an ounce of the gum to dissolve in a pint of pure alcohol. This should be placed in a tightly corked bottle, as the alcohol evaporates rapidly. To darken the wood and give a high finish also apply several coats of oil before applying the shellac. The best artists do not polish carved furniture, especially if the decoration is in relief, but finish simply with raw linseed oil. There are many persons, however, who prefer a high finish even to relief carving. When this is undertaken only the design should be polished; the background needs nothing but a coat of shellac. A thin coat of shellac really renders the background less difficult to dust than when nothing has been applied but oil.

The Building Handicrafts—I.

Some time since one of our English exchanges published a series of articles bearing the above title, in which careful attention was given to the several building trades, with reference to what constitutes the trades, and by what system of instruction skill is to be acquried and the trade in itself advanced. We are sure that what was presented on this subject in the article mentioned is of considerable interest to our readers, and accordingly we shall present more or less of it in these columns in a few short articles. At the outset, it is to be mentioned that the examples cited and illustrations given are of course altogether from English experience. This, however, will not make the article less valuable to our readers.

In the early days of architecture, the building artificer and artist craftsman contributed their share to the development of the art; in truth, it was more from within that the art grew than from external influences; but if we compare the action of our modern craftsmen, we shall find very little growth takes place in this way, as their work is controlled by external circumstances. Instead of being operative artists they have become mere instruments in the hands of the general contractor. We must bear these altered circumstances in view in estimating the influence of the various trades upon architecture; how far each can be said to have improved or otherwise, and to what extent modern architecture is indebted to the building operative. And if we were asked which of the trades had done the most for the art in recent times we should be inclined to answer, taking the order of them in building—the bricklayer, the carpenter and joiner, the engineer, the plumber, the plasterer and decorator. What about the mason? There are excellent masons, no doubt, some of them equally skilled with those of old who reared the arcades and vaults of Amiens, of Salisbury, and the elaborate fan vaults of Gloucester, King's College Chapel and Henry VII's chapel; but they are few, and their services are now fallen to a discount. In the roofing to our churches and schools the mason has been seriously supplanted by the carpenter and plasterer. In fact, the work which raised the mason to the highest point of geometrical and artistic skill, and the art of masonry to a high pitch of perfection in the arts, is very seldom required. Not 15 per cent. of our modern churches are vaulted with stone, and very few of them exhibit the elaboration and intricacy of stone cutting which was found some years ago. So of masonry we must say that the art and craft have fallen greatly from their once high estate, due largely to the diminution of buildings requiring the highest skill in the masonic arts. Moreover, the brick cutter and setter has, in many districts, to a considerable extent superseded the stone mason, and the trade of bricklaying has immensly risen during the revival of brick architecture.

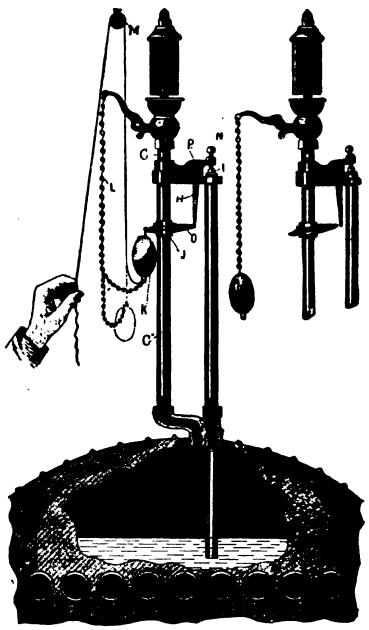
It will be evident that, in both the cases of the mason and bricklayer, the rise or decline of the art and the craft has depended a good deal on the material used and the locality. Better masons were to be found in the Southern and Eastern districts of England 50 years ago than now, and better plasterers than bricklayers. And why? Because at that time stone was more generally used for churches than brick, and stucco was more common than brick. The use of a material will, therefore, always have a great deal to do with the position of the craftsman, as has been the case in manufacturing industries. Even in such matters as ladies' fabrics, we know how much depends on the materials in fashion; we know that some industries have completely died out, owing to the disuse of the material upon which they depended, or its being superseded by another. The employment of a particular material led, of course, in time to the exercise of skill upon it, and experts or schools of craftsmen followed in every district. Let us take, for example, the masonry of the Eastern Counties—the "flush work," as it is called, of Norfolk and Suffolk, where flint is introduced in panels formed of stonework. The masons learned this combination so perfectly that it became a beautiful feature in the porches and parapets of their buildings, as we notice in the fine churches of Long Melford, Eye, and Woodbridge, in Suffolk, and we have mainly to notice that it was the abundance of flints in these localities that led the masons there to the invention of this beautiful flint panel work in their walling. So, again, turning to the magnificent roofs, rood screens, and bench ends to be found in this part of England. We can only account for the perfection in them by the carpenters and carvers having formed guilds and devoting themselves to the perfection of woodwork. The same development in this branch is to be noticed in Devonshire and Somerset, where many churches have roofs carved and painted like those of Norfolk and Suffolk, and where remarkably fine carved screens are to be found, as in the church of Wrington. In Somerset the masons and carvers appear to have been remarkably proficient. The stone cutting of the grand towers of Wrington and St. Cuthbert, Wells, among many more, display much elaboration and scientific skill, notably in the grouping of pinnacles and in the intricate stone cutting of the angles of the towers. In short, the student of local peculiarities cannot fail to mark that wherever there has been a school of masons, of woodworkers, or of carvers, there has been an unrestricted supply of good stone or wood. But we cannot expect to find skilled artists in any materials, when every few years the taste changes, and we turn from stone to brick, and from brick to stucco. Change of style has been inimical to development such as we are considering, as it supposes a revulsion or drawing back from all that we had done previously, and working artists are not prepared to unlearn what they have acquired, and to begin to be taught new modes and details of work.

THE DEARTH of timber in the old Pine Tree State is shown by the fact that a Maine Shipbuilder last week bought 60 spars brought from Oregon via Cape Horn.

THE METHODS of preserving wood against fire are of two kinds, the injection of saline solutions and the application of a paint or coating. The former appears but little practiced. In the majority of cases, coating with a brush is the only practical solution of the question, and the substances most to be recommended for use in this manner are cyanide of potassium and asbestos paint.

The Fox Improved Low Water Alarm.

The Fox Machine Company, Grand Rapids, Mich., have just put upon the market the Fox Improved Low Water Alarm, the construction and operation of which can be readily understood from the accompanying engraving. Referring to the cut, it will be seen that the device consists of a whistle attached to a steam pipe entering the upper part of the boiler, and a second pipe of copper, the expansion of which under high temperatures releases a lever, and that in turn opens the steam passage way to the whistle. As long as the water remains above the bottom of the pipe the copper tube is full of water, the temperature of which is said to be about 212°, but as soon as the water in the boiler falls below the bottom of the pipe the water in the copper pipe runs out by gravity and steam takes its place at a temperature of 260° F. at 20 pounds pressure, or 320° F. at 75 pounds pressure. This difference in temperature of 48° to 113° (according to the pressure) causes an expansion of the copper tube of from $\frac{1}{160}$ to $\frac{3}{160}$ inch. One-half of the former amount, it is said, is sufficient to move the bottom of the lever H, shown in the cut from the catch O, which releases the end of the yoke that is pivotted at J and allows the weight K to slip off the yoke and sound the whistle. The position of the weight and lever when



The Fox Improved Low Water Alarm.

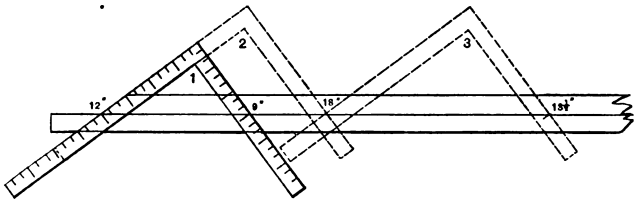
the whistle is sounding is shown in the smaller cut at the side. As soon as the water again enters the pipe the weight can be replaced. It is said that an expansion of $\frac{1}{160}$ inch of the copper tube will move the bottom of the lever over $\frac{1}{8}$ inch, which makes its release positive. It is pointed out that operating the whistle valve by the action of the weight gives a full opening of the valve, making a signal that can always be heard. The lever H is removable, also the plug I at the top of the copper tube, which admits of a swab being run through the tube to remove any sediment. Where bad water is used it is advisable to clean the pipe frequently.

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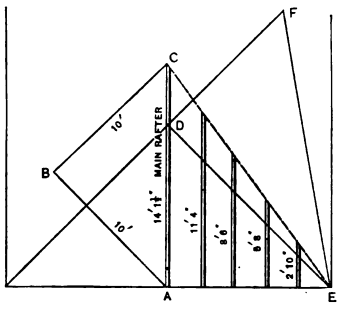
CORRESPONDENCE.

Length of Jack Rafters.

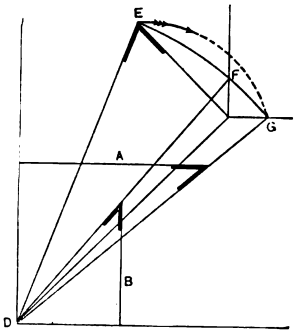
From D. L. S., *St. Louis, Mo.*—I notice in the April number of *Carpentry and Building* that "H. W.," Labnon, Pa., asks for a method of obtaining the length of jack rafters. In reply I would say, if the roof should raise 9 inches to a foot, the main rafters must be cut on 9 and 12. Now, mark a line on 9 and 12. Suppose it is desired to have the jacks 18 inches apart. Place the square on the 9 and 12 line, move it up to 18 on the blade, which will give about 13½ on the tongue. Now 13½ and 18 give the cut and length of the shortest jack. Lay the square on twice and it cuts the second jack and so continue until all are cut. Any pitch roof and any space between jacks will work with the same rule. I enclose a sketch which illustrates my method. Square No. 1 as placed on common rafters. No. 2 moved up to 18 inches gives the cut and length of the shortest jack. No. 3 placed the second time on 13½ and 18 gives length of second jack rafter and so on.



Sketch Submitted by "D. L. S."



Plan of "M. E. B."



Method Suggested by "J. W. and C. L."

Length of Jack Rafters.

From M. E. B., *St. Mary's, Pa.*—In reply to "H. W.," of Lebanon, Pa., in regard to jack rafters, I will give him a simple rule, which can be applied to a roof of any pitch. Find the length of the common rafter. Divide that length by the number of spaces between the jack rafters on the plate from center to end, and the result will give the length of the shortest rafter. Twice the result will give the second rafter, and so continue until all are obtained. In order that "H. W." may better understand what I mean, I give the following example: Take a building 20 feet wide, to be hipped on the ends, the pitch to be one-half. The length of the common rafter would be 10 inches run, 10 inches rise, which equals 14 feet, 1½ inches, or 169½ inches. Now add ½ inch to make an even 170 inches, which is accurate enough for any roof framing.

5 + 170" = 34" the length of the shortest jack rafter.
68" the length of the second shortest jack rafter.
102" the length of the third shortest jack rafter.
136" the length of the fourth shortest jack rafter.
170" the length of the center rafter, which is the same as the common rafter.

Of course, the lengths are in the center of the rafters, and the correspondent must deduct one-half the thickness of the hip rafter. I enclose a sketch, showing the method employed to obtain the length of common and hip rafters. Referring to this sketch, A to B is the run, from B to C is the rise of common rafter, and from C to A the length. From D to E is the run of the hip rafter, and from D to F the rise. From F to E is the length, which is the same as from E to C in the method suggested.

From J. W. and C. L., *Maxinkuckee, Ind.*—At the request of "H. W.," Lebanon, Pa., we submit the following sketch, showing our method of obtaining the length of hip and jack rafters: The line from D shows the seat of the hip rafter, while A and B shows the jacks. Set the rise of the roof at E. Set the length of the hip D E from D to F on one side of the deck and from D to G on the other side. Extend the jack B and all the jacks on the side to the line D F for the length and top of the bevels. Extend the jack A and all on the side to the line D G for the length and bevels on this side of the hip. The down bevels of the jacks will be the same as that on the rafters.

From J. M. S., *Anna, Ill.*—In answer to "H. W.," of Lebanon, Pa., I submit my plan of getting the length of jack rafters. Referring to the sketch which I enclose, let A B represent the seat of the hip rafter and B C and B D the wall plate on which the rafters rest. Set up C E as the elevation of a common rafter, in this case 8 to 12 inches. Now, divide the distance from C to B into as many equal parts as may be desired, say for example, six. Raise vertical lines from this point, intersecting the seat of the hip rafter. These lines will represent the seat of the jack rafters. From these points now obtained run horizontal lines parallel with the plate C B, and cutting the elevation of the common rafter. This divides the common rafter into as many equal parts as is the plate C B. The length of the common rafter in this case is 14.42 square feet, divided into six equal parts gives us 28.8 square inches, which is the difference in length between the jack rafters. This plan will work on any pitch and whether the hip rafter runs at an angle of 45° or some other angle. The rule condensed is as follows: Divide the common rafter into as many equal parts as it is designed to put in jack rafters, not forgetting that there will be one space more than rafters. Commence to cut jacks as follows: Take the distance from C to the first division as the length of the first jack; the distance from the first to the second division as the length of the second jack, and so on. "H. W." quotes Hodgson as saying that the difference in the length of jack rafters in one-third pitch is two feet. Permit me to say that is wrong. I do not mean to say that Mr. Hodgson does not know better, but merely that there is a mistake somewhere. I do not believe in carrying around a book of tables to work from. The books are all right to study for information. I never go back on them for that purpose, but every practical mechanic must get the principles into his head and be self-reliant. It may take a few years to do this, but there is a great deal of satifaction in it. I am not finding

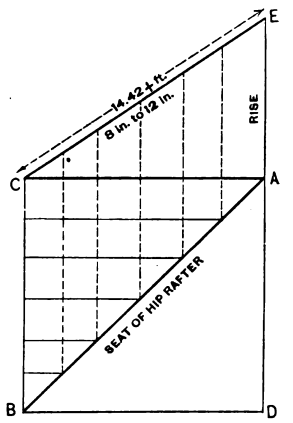
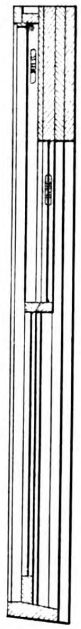


Diagram Accompanying Letter from "J. M. S."

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fault with "H. W." because he asks his questions, for I take pleasure in answering him. I was there once myself.

From J. W. B., *Dupont, Pa.*—In reply to "H. W.," Lebanon, Pa., permit me to say that the difference in lengths of jack rafters for half pitch 2 feet apart, would be 34 inches; for one-third pitch the difference would be 29 inches, and for one-fourth pitch 27 inches. The length of



Hanging Sash in Box and Mullion Window Frames.—Fig. 1—*Vertical Section of Box Frame.*

rafters may be obtained by pacing them off with the square the same as the majority of practical carpenters lay out rafters. I lay out hip rafters by the same rule.

From J. W. G., *Charleston, S. C.*—In a recent issue of *Carpentry and Building*, "H. W.," of Lebanon, Pa., asks for a rule for obtaining the length of jack

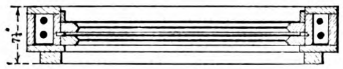


Fig. 2—*Cross Section Showing Sash Boxes.*

rafters. I hope the hip and jack rafter question may be fully discussed, as I desire to learn something in that line.

Hanging Sash in Box and Mullion Window Frames.

From S. W. S., *Indianapolis, Ind.*—In reply to "I. M. K.," of Toronto, Canada,

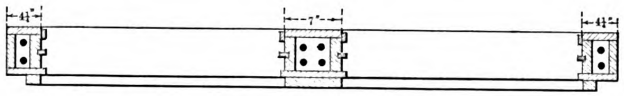


Fig. 4—*Cross Section of Mullion Frame.*

and "W. L. R.," of Mount Carmel, Ill., whose inquiries appeared in *Carpentry and Building* for October, 1889, I send the enclosed sketches. These drawings show how I would make the half-circle head box window frame, as well as the mullion frame. For the ½-inch thick parting strip



Design for Barn.—Fig. 1.—*Perspective View.*

for the circle, the grain should run diagonally the full width of the box, so as to nail to the circle, pulley stile, back lining

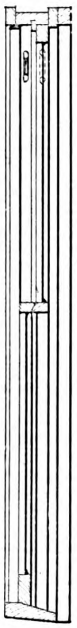


Fig. 3—*Vertical Section of Mullion Window Frame.*

and head, making the ½-inch and circle stuff in two pieces, or a quarter circle. The pulley stile, back lining and sill should be cut as shown in the sketches. Saw ⅞ inch outside the head lining for weights inside of box or mullion frame unless specially ordered.

circle, 2 inches wide, or same as hanging stile. Tack on a piece of ½-inch stuff at the spring line in order to stop up the box as shown. I never put swing partitions

Design for Barn.

From L. M., *Arcadia, Mo.*—I inclose herewith a general view, Fig. 1, and floor plan, Fig. 2, of a barn which I erected last fall, which may be of possible interest to some of the readers of *Carpentry and Building*. The structure is of such size

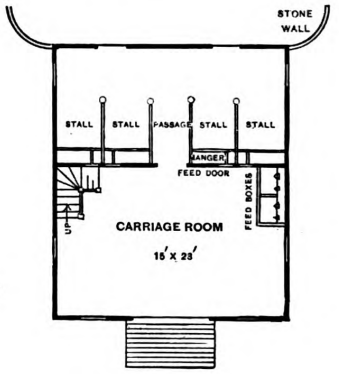


Fig. 2—*Floor Plan.*

as to give a carriage room in the front of the barn 15 x 23 feet in size, while the back portion is used for stalls, of which there are four, two being at the right and two at the left of a central passage, clearly shown in the floor plan. Entering from the front door it will be noticed that there are feed boxes placed at the right hand just in front of the stalls, making a very convenient arrangement for feeding. At the left is a stairway leading to the hayloft. I think the engravings so clearly indicate the arrangement that further description is unnecessary.

Bird Houses.

From G. W. H., *Jefferson, N. Y.*—I would like to ask some of the readers of *Carpentry and Building*, if they will contribute plans of bird houses, suitable for placing on lawns and in other positions. I have seen them while I have been travel-

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ing about the country, and thought they added much to the appearance of a place. I do not think, however, I ever saw plans or details.

Rule for Hopper Bevels.

From F. E. S., *Hutchinson, Kan.*—I submit herewith several sketches illustrating a universal rule for hopper bevels and miters, which I think will prove both novel and useful to many readers of *Carpentry and Building*. The principles employed will give correctly the bevel and miter for a hopper on any angle and at any pitch. For the purpose of illustration let us examine its application to an octagonal hopper. Referring to Fig. 1 of the sketches the octagonal figures *a a a*, &c., represent the bottom of a hopper of which Fig. 2 is a vertical section. The dotted line *e e e* shows the top of the hopper, the distance between the two lines being the amount of flare in the side of the hopper. It is evident at a glance that the space between angles on the line *a a* is the length of the side at the bottom, and the line *e e* is the length at the top. By drawing C C, then parallel to A A, and at a distance from it equal to the width of the side of the hopper, squaring out from the points *e e* and connecting the points of intersection thus obtained on the line *c c* with the points *a a*, we have an exact pattern of one of the sides. The bevels for cutting them will be found at C C. In the sketch submitted I have drawn two sides, though this is unnecessary, as the sides are all alike. It will be plainly observed that if these two sides were raised at the outer edge the points C C would meet directly over the point named.

To find the bevel for the miter, draw the quarter circle D E, Fig. 3, from the point F, using a radius equal to the width of the side of the hopper. Draw E G, extending it to the left indefinitely. Draw the perpendicular line D F. Now we know the figures that would miter an octagon, if the sides stood perpendicular, to be 7 and 17. From the point D draw a line at an angle of 7 and 17, with the perpendicular line D F, producing it until it intersects the line E G, thus establishing the point H. Now draw F I on the pitch the side of the hopper is to stand —that is, *a b* of Fig. 2. Draw I L parallel to E G, thus establishing the point L. Connect L with H and the miter will be found at L. The miter for any other pitch may be found in the same, for instance, as shown by the dotted lines of Fig. 3. Figs. 4 and 5 show the application of the same rule to a hexagonal hopper, the pitch of the side being 45°. Figs. 6 and 7 show the application of the rule to a square hopper. This rule, I am convinced, will be found very useful in cutting flaring plancias and facias around bay windows, towers and the like.

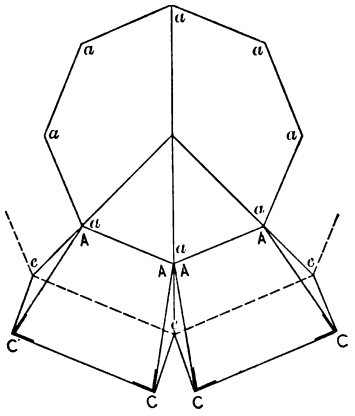


Fig. 1.—Octagonal Hopper.

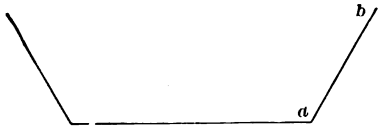


Fig. 2.—Vertical Section.

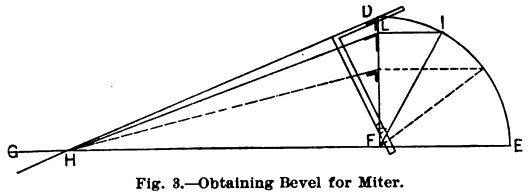


Fig. 3.—Obtaining Bevel for Miter.

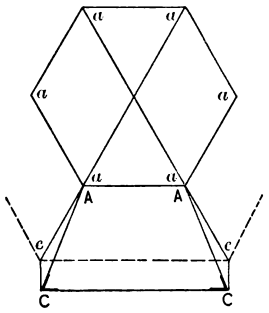


Fig. 4.—Hexagonal Hopper.

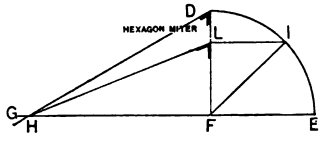


Fig. 5.—Obtaining Bevel for Miter.

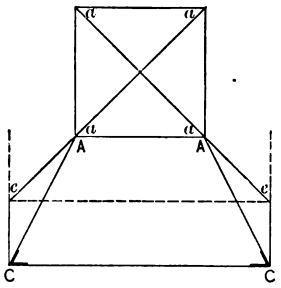


Fig. 6.—Square Hopper.

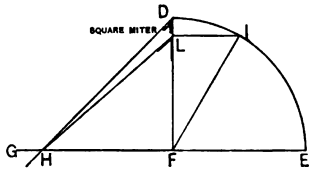


Fig. 7.—Bevel for Miter.

Rule for Hopper Bevels, as Suggested by F. E. S.

Mortar Mills.

From W. E., *Napanee, Canada.*—In the March issue of *Carpentry and Building* I notice an inquiry from "J. W. A.," Ishpeming, Mich., for a design for a mortar mill. I do not know of any made in this country, but I have in mind a portable mortar mill, made by a firm in England, which answers a very good purpose. It is provided with a pan 5 feet in diameter and has rollers 2 feet 8 inches in diameter. The motive power is from a three horse-power engine with vertical boiler, mounted upon a strong carriage provided with cast iron wheels. I think it doubtful if this mill can be obtained in this country, but full particulars can be had by addressing A. D. Studd & Co., proprietors of the Glendon Engine Works, Kettering, England.

Proportions of Coffin.

From Dupont, Pa.—In reply to "T. B.," Headingly, Mass., I desire to say that I have made coffins, and always make the swell two-third the distance of the length, measuring from the foot. The swell is two-thirds of the length from the head to the swell. Two-thirds the width of the swell would be the width of the head, and two-thirds the width of the head is the width at the foot. The rule for the sides is, be sure and get them high enough. This should be about the width of the head. I usually make them a little larger than the above, but I do not profess to be an undertaker; rather a carpenter.

Preventing Tools Rusting.

From F. K., *Keiler, Wis.*—In the May number of *Carpentry and Building*, "J. C. W.," Pine Hill, Pa., asks the readers of the paper what is the best preparation to employ in order to keep tools from rusting. I always employ the best Seneca oil, or kerosene as it is called. Tools wiped off and a little of the oil put on them when they are wet will prevent their rusting. I apply a little of the oil every evening and never have any trouble with rust. I always notice that the tools work a great deal better when so treated. I would here remark, however, that it is well to use the best quality of oil, as poor oil will rust the tools instead of preserving them from rust. As oil is cheap and can be had almost anywhere there is no reason why carpenters may not always have it on hand.

Rake Molding Intersecting a Level Molding.

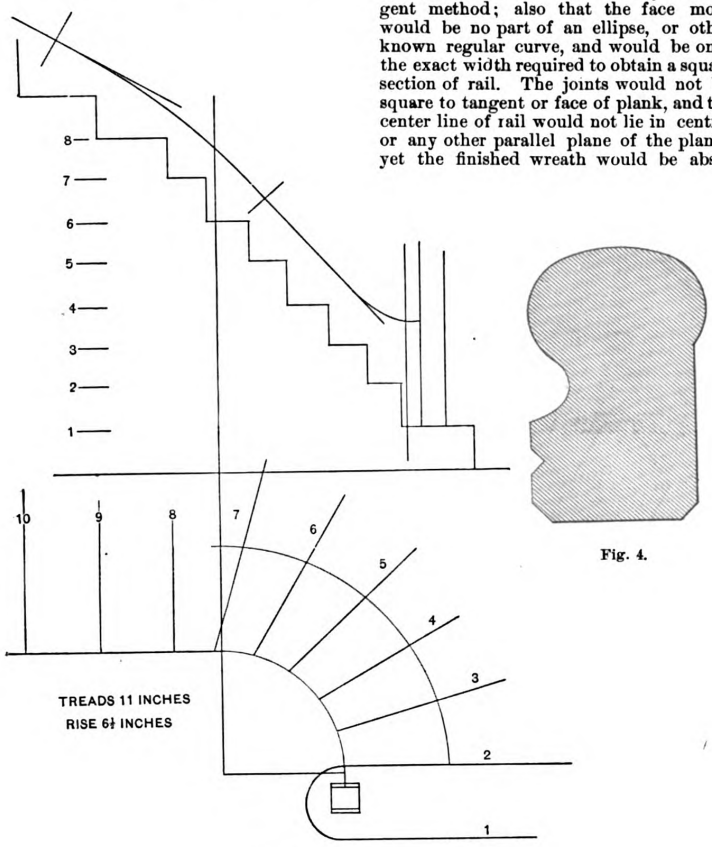
From J. M. B., *Dupont, Pa.*—Something like eight years ago I began to read *Carpentry and Building*, and am free to say that I am much interested in all that appears in its columns. In the February number I notice a letter from "O. A. H.," replying to the inquiry of "J. W. B., Jr.," Burlington, Pa., with reference to mitering a rake and level molding. The question should be whether the level molding is put on plumb with

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the pitch, or square. I wish "O. A. H.," of Chariton, Iowa, as well as some others, would explain what the length of the rafter would have to do with the cut across the miter box? I think this question should not be dropped until it is decided. So far as I have observed, the question has not as yet been correctly answered.

Discussing Problems in Hand-Railing.

From W. J. B., *London, Eng.*—I notice in the January issue of *Carpentry and Building*, an article from the pen of J. H. Monckton, and from a perusal of it I am of the opinion that he has a great deal to learn in the art upon which he is supposed to be such an authority. The tone of his letter throughout in reply to N. B. Garvock conclusively proves that he is utterly unable to leave the beaten track of the tangent system, and, therefore, unable to teach or enlighten N. B. Garvock in his laudable attempt to discover a method superior to that advocated by Mr. Monckton and others, which system would certainly not meet all the requirements and conditions of several cases which I call to mind, and, I would add, work which I have done in a superior graceful way with ramp and wreath in one piece and balusters all one length, with no more thickness of plank than would have been required of the tangent system. Let me ask, Mr. Editor, through your valuable and interesting journal, if "J. H. M." means for the readers to understand that the art of hand railing has reached its highest point of perfection in the tangent system, as set forth in his book? If so, then, sirs, I cannot compliment him with being imbued with the spirit of progress so universally admitted to be the characteristic of the country over which waves the Stars and Stripes, borne upward and onward with the motto of the strange device "Excelsior," and of which I have the honor to be a citizen. I have had considerable experience in the tangent system, and, like Mr. Monckton, thought it perfect until the light of the falling line system dawned upon me through the aid of one who has developed it in a new light, which entirely upsets the theory advocated by "J. H. M." Perhaps it will surprise "J. H. M." to know that it is quite possible to get wreath and ramp in once piece, and in most cases use no more thickness of stuff than by the tangent method; also that the face mold would be no part of an ellipse, or other known regular curve, and would be only the exact width required to obtain a square section of rail. The joints would not be square to tangent or face of plank, and the center line of rail would not lie in central or any other parallel plane of the plank; yet the finished wreath would be absolutely correct in every respect. "J. H. M." knows better than I can tell him what a lot of stuff is wasted by cutting out to the tangent mold where there is much bevel, and oftentimes it does not give enough stuff where the section of rail is deeper than it is wide. Having had 12 years of London experience in hand rail work, a good deal of which has been stone stairs, over the planning of which I had no control, and which I did not see until I took the dimensions, I think I can lay claim to be heard in this matter. It is useless here to talk of planning stairs to suit the rail. The architects are boss of the situation, and the work has to be done to the conditions they lay down. I do not mean by this that all are badly planned, or that all hand rails or stair builders in London are perfect; far from it, but is it not a "pearl of great price" to a man to be in conscious possession of superior knowledge and ability that enables him to accomplish more than his fellows? And in this respect, as in others, demonstrating the truth of the proverb that "knowledge is power."



Figs. 1 and 2.

Fig. 4.

I would be glad, sir, if "J. H. M." would show the readers of *Carpentry and Building* how to do the work shown in Fig. 1 of the sketches, and which I executed three years ago. The architect being very particular I was obliged to work to his conditions, which were as follows: Rail to be 6 inches deep by 4 inches wide; 2 feet 8 inches high to top. All balusters to be exactly the same length as shown in one-half full size detail. Newel to be 6 x 6 with miter cap; joints where shown and ramps in wreath piece. Fig. 2 of my sketches shows the development of central line of top edge of molded capping. Balusters to be 2 x 2 inches turned as per detail.

Fig 3 is a piece of work I executed over stone stairs which would puzzle "J. H. M." to do on the tangent system, with ramps included in wreaths; iron balusters, all one length and no cripple allowed, but must carry a graceful line when finished.

Fig. 4 is a section of rail one-half full size, made of American walnut. This worked on the tangent system would give what I call "leg of mutton face molds," with a lot of stuff wasted. J. H. Monckton says he can work the ramp in the wreath, "but to do this the plan must be suitable; that is, it should have but one winder in the cylinder and be planned with a view to that result." Now, that proves the inferiority of the system he advocates, so what is the use trying to bolster it up? On the contrary the falling line system knows no bounds, the hand railer having perfect freedom and control over position of joints, ramps, hight for length of balusters and thickness of plank—in fact is complete master of the situation whatever the plan, and a dead certainty of being correct, and is also sure that the joints will be true butt joints to the central falling line of the finished rail. So if "J. H. M." wishes to keep pace with the times, the sooner he realizes the inadequacy of the tangent system the better. We cannot stop W. B. Garvock and others from crying out "light, more light," any more than we can palm off a farthing rush light on an Edison, nor would the tangent system of hand railing any longer satisfy me.

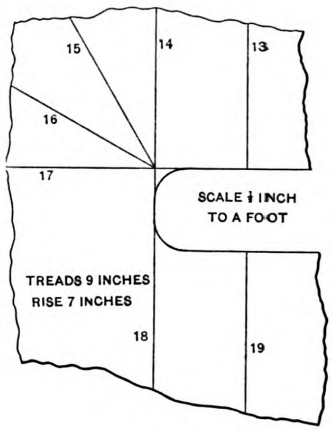


Fig. 3.

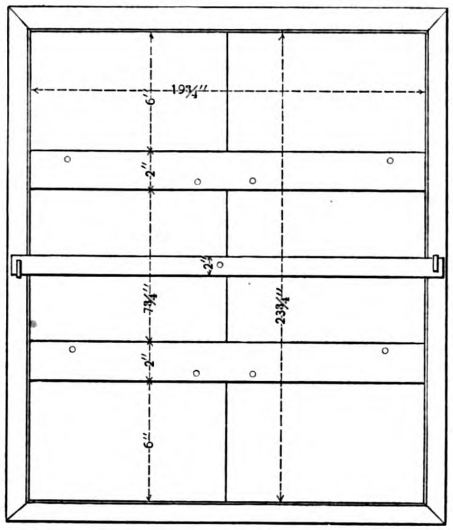
Discussing Problems in Hand Railing.—Diagrams Accompanying Letter from "W. J. B."

Making Blue Prints.

From J. H. K., *Raleigh, N. C.*—In his reply to "N. D.," in the March number of *Carpentry and Building*, "E. E. C." gives no description of a frame for blue printing. As this is of more or less interest, I send full drawings for a blue print frame suitable for making prints on sheets 19 x 20 inches. The glass should be double

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thickness and as clear and free from defects as possible. It is held fast in the frame by a strip ⅛ inch in the back and a ⅛ quarter round in the front. The back is made of two pieces fastened together, as shown in Fig. 1 of the drawings, and is held in place when the frame is in use by a 1-inch cleat, which passes under hooks



Making Blue Prints.—Fig. 1.—Back of Frame.

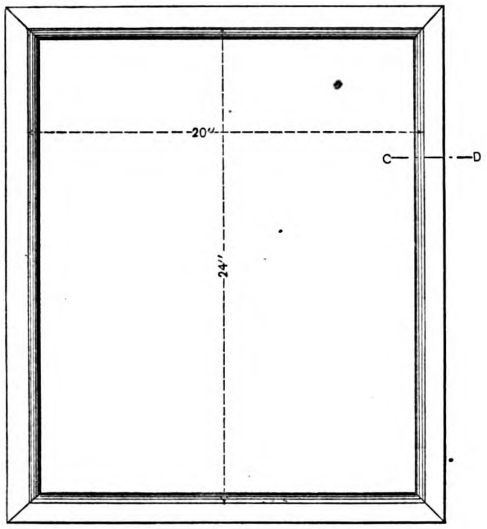


Fig. 2.—Front of Frame.

in the sides of the frame. On the inside of the back should be tacked two or three pieces of heavy canton flannel, so that when the drawing is in the frame it will be pressed tightly against the glass. To make a blue print of a drawing it is necessary first to make a tracing of it on tracing linen with black ink. All markings and lines should be clear and distinct. Put the tracing in the frame with the side on which the lines are next to the glass. Then put on top of this the prepared paper. Now put in the back, fasten it in place and expose the glass to the direct rays of the sun if possible. The length of exposure can only be determined by experience, as it depends largely upon the solution used and upon the day. Ordinarily 10 or 15 minutes will be sufficient for the purpose. Remove the prepared paper from the frame and wash thoroughly in clean water, and then hang it up to dry. When dry the print is finished. In making blue prints I use the following preparations:

1¼ ounce potassium ferryicyanide dissolved in 8 ounces of clean water.
1½ ounce ammonium iron citrate dissolved in 8 ounces of clean water.

Each solution should be filtered after being made and then bottled in a blue glass bottle, or a white glass bottle covered with blue paper. When wanted for use, take equal parts of each solution, mix together and apply to the surface of a tough white paper with a soft sponge. Keep the prepared paper in a dark place until used, as the fresher the paper the better will be the print. Any druggist will prepare the solutions. The white lines on a blue print may be erased by drawing over them with a pen that has been dipped in a mixture of the solutions given above. White lines may be made on the blue paper, when it is desired to make corrections, by using a pen that has been dipped in a strong solution of common lye, or a strong solution of caustic potash. Fig. 2 represents the front of the frame and Fig. 3 a sectional view through C. D.

Roofing Bracket.

From F. K., *Keiler, Wis.*—I would like to ask the readers of *Carpentry and Building* for information about roofing brackets. I recently bought a set of Stanley's Patent No. 1 8-inch, and cannot use them at all. The brackets work very well if the shingles are laid 5 inches or over, but on shingles that are laid 4 or 4½ inches the brackets will not work. Now, why do not the manufacturers of brackets state how far the shingles should be laid in order to secure the best results in the use of their brackets? I should like to know whether the shingles should be laid 5 or 6 inches in order to secure the better roof. The claim is made by the manufacturer of the brackets which I have that a better roof is made if shingled with the use of his brackets. I am impressed with the fact that a man should know a little something about shingling before he commences to manufacture brackets. The brackets are really good and handy devices if they would only fit on roof shingled to any width. I should like to hear from some of the readers who have used brackets of this kind and to know what they think of them.

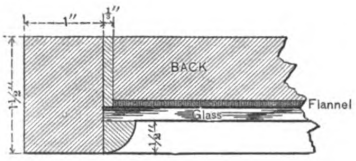


Fig. 3.—Section through C D of Fig. 2.

Lightning Rods.

From M. A. X., *Cane Creek, Tenn.*—Please inform me through Correspondence whether the conducting power of a metal, say the capacity of a copper rod for conducting electricity, depends upon its transverse sectional area, or upon its surface; in other words, would a ½-inch solid copper lightning rod be as good a conductor as a copper tube of same weight per linear foot?

Answer.—There is a theory held by experts in lightning rod matters that the efficiency of a rod as a protection against lightning depends more upon its surface and surface angles than upon the area of the rod itself. According to this the copper tube would be a more effective conductor than the solid round rod. So far as mere conduction of electricity is concerned it is the sectional area of a metal that determines it, but in the case of lightning rods it is necessary to abstract, if we may used the word, the electricity from the atmosphere before it can be conveyed to the ground. For this purpose it is usual to tip the rod with sharp points, and it is also a common practice to make the body of the rod with sharp angles of square or star shaped sections, or else of a rope of square or round copper wires. We do not presume to speak authoritatively in this matter, for the protection of buildings against lightning is a special branch of science in which reliable information is only obtained by much study and investigation.

Shingle Clapboards.

From C. J. B., *Lebanon Springs, N. Y.*—I notice in the September issue of *Carpentry and Building* for last year an inquiry from "W. H. K.," relative to shingle clapboards, and in the November issue of the same year "J. Y. F." replies that he makes his own clapboards, as does also "J. W. K." in the December number. Now, I should like to ask these correspondents, or any others, why clapboards are preferable to fancy cut shingles, which will lay more to the weather? The clapboard stock costs as much in this section of the country as shingles. Of course, boards can be put on more rapidly, but not enough faster, according to my judgment, to pay for the trouble and expense of marking and notching. One of the correspondents mentioned refers to the use of a chisel or draw shave. I think a mortising machine with mitering or O G tool would be far preferable. While speaking on the subject of shingles I would like to inquire of the readers of *Carpentry and Building* which, in their opinion, is the better way to nail shingles. An old carpenter told me he preferred one nail, as it allowed the shingle to shrink without danger of splitting.

Ornamental Glass Doors.

From H. D. B., *Flanagan, Ill.*—Will some of the readers kindly tell me the way to hang doors in which there are panels of glass ornamented by etching? What I desire to know is: Should the side upon which the etching is done be hung toward the outside, or should it be toward the inside?

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THE BOSTON MASTER BUILDERS' EXCHANGE.

JOHN A. FOX, ARCHITECT.

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THE BOSTON BUILDERS' EXCHANGE.

CONTEMPLATED improvements in the building owned by the Master Builders' Association of the city of Boston, for the primary object of enlarging and improving the accommodation for Exchange purposes, makes a brief reference to the enterprise of that association eminently fitting and proper at this time.

Early in the year 1885 the organization known as the Master Builders' Association was evolved out of the old Mechanics' Exchange, the step seeming desirable on account of certain unfavorable conditions in the old organization.

The new association secured accommodations by leasing apartments in a centrally located building, at 164 Devonshire street, and almost immediately began to consider the feasibility of purchasing the property as an investment and to secure a permanent home. The purchase, however, was not effected until July 1, 1887, when the corporation agreed to pay $250,000 for the estate.

The property comprehended 6600 square feet of land, with large frontage on Devonshire and Federal streets, covered by a four-story building with granite facades on both streets.

The second-floor of the building is devoted to the uses of the association for Exchange purposes, the balance being occupied by mercantile concerns, but it has been the intention of the association from the start to eventually change the structure so that, substantially the whole of it might be devoted to the interests of the body, bringing under one roof as much as possible the various rooms and offices of builders and builders' associations.

The changes proposed are now under consideration and contracts are about to be made for a remodeling, which will materially benefit the association, not only in the superior accommodation afforded to the Exchange, but also in a financial way.

A fifth story is to be added, to which, as well as to the other floors, access will be had by new and elegant fire-proof staircases and by the most modern elevators. A new steam heating plant will be put in, electric lighting will be introduced and every advantage and improvement available for the benefit of the tenants secured. The portion to be devoted to the special uses of the association will be the whole second story, together with a portion of the third story, a section of the third floor being removed and thrown into a large and elegant assembly hall, with a gallery at former level of third floor. This gallery or balcony will afford room for estimating or consulting rooms, ten in number, doubling the accommodation previously had in that department. On the Exchange floor (see full page engraving), in the assembly hall, entirely new and novel disposition will be made for the members' letter boxes, the arrangement being similar to that in use in Government post offices, the superintendant distributing the mail and other matter from the rear, his quarters being also inclosed with a handsome counter, giving ample desk room, besides supplemental boxes for large parcels, &c. Telephone rooms will be put in, with latest arrangement of double partitions and double doors to prevent transmission of sound; lockers for the use of members will be built, each one large enough to accommodate personal apparel, plans, &c., so that each and every member may have a place of deposit for such articles under his own lock and key.

Toilet and sanitary arrangements have been provided upon the same scale and plan as the best club house, and, in fact, every arrangement possible for comfort and conveniece will be comprehended.

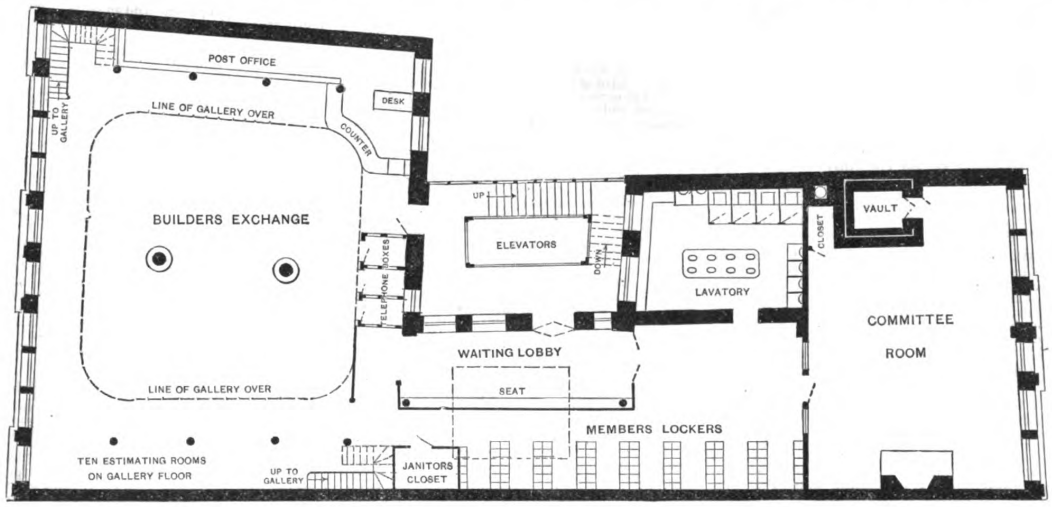
The room formerly occupied by the officers and directors will be greatly enlarged, giving an apartment amply sufficient for full meetings of the corporation, in addition to its regular uses. This room will also be available for the meetings of any special trade associations desiring such accommodation, or bodies who have naturally some connection with the building interests. This room will be made still more attractive by the introduction of a fine fireplace in terra cotta, the gift of one of the members.

The plan of the Exchange floor, together with prospective view of the assembly hall, is shown in the full-page engraving, in which will be seen the post office and superintendent's department, gallery front, estimating rooms, telephone boxes, lockers and the general appearance of the hall.

Accomodation for the public has not been forgotten, for in this Exchange advantage is freely taken of this common rendezvous of builders, by owners and others desiring to see them on matters of business, so that an assemblage of outsiders as great or greater than at the stock, produce, real estate or other exchanges is of daily occurrance. For the convenience of these parties a lobby has been provided which, during "'Change hour" (from 11.30 a.m. to 1.30 p.m.) will be reserved for their use, and during the balance of the day it can readily be thrown into the general Exchange room.

The rooms have always been kept open for the use of members from 8 a. m. until 5 p. m., and under the new dispensation and conveniences the rendezvous will be still more appreciated, both by those who are members and those who desire to see them.

The stores on the first floor of the building will be rented for mercantile purposes largely to those whose business is connected with or subsidary to the building business. The balance of the building will be fitted up for offices for builders or rooms for the accommodation of special trade associations.



Boston Master Builders' Exchange.—Plan of Second Floor.

The board of management for the year 1890 consists of the officers: L. P. Soule, president; James I. Wingate, vice-president; William H. Sayward, secretary and treasurer.

Trustees: David McIntosh, Lyman D. Willcutt, Augustus Lathrop, J. Arthur Jacobs, Melville C. Grant, and C. E. Clark.

Committee on Admission: Ira G. Hersey, S. Frederick Hicks, Jas. L. Gooch, John A. Emery, William E. Sherriffs, D. A. O'Brian, Walter S. Lyons, Franklin Smith, and Edward Hewitson.

Room Committee: J. Arthur Jacobs, L. D. Willcutt and C. E. Clark. Superintendent, William B. Pearce.

The committee appointed to attend to the details of the alteration is composed of the board of directors (which is made up of the officers and trustees) to which five other members have been added. They are: E. Noyes Whitcomb, L. M. Ham, Elisha Littlefield, Charles W. Parker and I. N. Tucker.

The progressive spirit shown by the Boston Exchange, in the purchase of a piece of property and the devotion of it to the uses of builders and their associations cannot be too highly commended.

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A few of the other cities in the country have done or are doing the same, notably the Exchanges in Philadelphia and Kansas City, both of which have fine buildings with elegant accommodation for the purposes stated, and the Washington Exchange is already building a home for itself.

The scheme is a good one for all cities of any importance, and no body of men can so safely undertake such an enterprise as builders through their Exchanges.

It is to be hoped that in a few years every Exchange connected with the National Association will have a home of its own, affording shelter, comfort, convenience, profit and standing to its members as well as conferring a benefit upon the community.

TRADE NOTES.

THE SYRACUSE DOOR HANGER COMPANY, Syracuse, N. Y., advertise this month the Economy Parlor Door Hanger, which they claim is one of the best devices for the purpose at present on the market. It is provided with independent axles, composition lined wheels, large bearings, and while self-adjusting and always in running order, is easily attached.

THE CINCINNATI TOOL COMPANY, 216–222 West Second street, Cincinnati, Ohio, favor us with a copy of an illustrated descriptive catalogue of mechanics' tools which they have just issued from the press. It is a volume of 40 pages, neatly printed upon a good quality of calendered paper, and bound in colored paper covers, with attractive side title of typographical design. The work is profusely illustrated, and the goods shown carefully described. A comprehensive index facilitates reference. The line of mechanics' tools presented include Clamps of all kinds, Bits, Cutters, Screw Drivers, Spoke and Coopers' Shaves, Saw Vices and Drills.

THE HOWARD FURNACE COMPANY, Syracuse, N. Y., present in their advertising space this month some of the merits claimed for the Howard Furnace and Combination Warm Air and Hot Water Heater which they manufacture. These goods are made of cast iron, with few joints, and are claimed to be gas and dust tight. A catalogue, which the company have just issued from the press, presents full information respecting these specialties.

THE PENN IRON ROOFING AND CORRUGATING COMPANY, Limited, Philadelphia, Pa., advertise this month some of their leading specialties. Among the goods which they are prepared to furnish the trade may be mentioned Steel Brick, Cluster Steel Tile or Shingles, Escalloped Siding, Steel Ceiling and Side Wall Finish. Attention is directed to the fact that they are in a position to supply 68 varieties of Steel Goods, and that samples will be sent on application.

IN CONNECTION with the discussion which has been going on in our columns for some time past relative to the method of making blue prints, the little pamphlet issued by Thomas H. McCollin & Co., of 1080 Arch street, Philadelphia, Pa., is interesting. This presents in a brief and comprehensive manner the method of making brilliant copies of white lines on a clear blue ground by the use of draftsman's sensitive paper, of which the firm referred to make a specialty. Other information of interest to those desirous of making blue prints is also presented.

THE BUFFALO HOT BLAST for heating, drying, ventilating and cooling purposes, is the subject of an announcement presented elsewhere in this issue by the Buffalo Forge Company, of Buffalo, N. Y. The company also give special attention to Steam Fans of all descriptions and are prepared to furnish upon application a special catalogue giving full information

W. H. MULLINS, Salem, Ohio, with New York agency at 108 Chambers street, directs the attention of the trade elsewhere in this issue to the fact that he is prepared to furnish upon short notice stamped ornaments of all descriptions, statuary made of brass, copper and zinc from special designs, ceiling center pieces, galvanized iron cornices, store fronts, &c. Those who are interested in this particular branch of industry are requested by Mr. Mullins to send for catalogue.

W. F. & JOHN BARNES COMPANY, 71 Ruby street, Rockford, Ill., state in their advertising space this month that they were the first to bring out foot and hand power machinery practical for workshop use, and are to-day the only house making a complete line of such machines suited to the various requirements of carpenter and builder. Numerous illustrations of tools which they manufacture are presented in their announcement, and the statement made that with an outfit of these machines the carpenter is in position to compete on even terms with steam power machinery and to hold his share of the business. The company solicit applications for a catalogue and price-list giving full descriptions of the machines manufactured.

ELSEWHERE IN THIS ISSUE J. B. Shannon & Sons, 1120 Market street, Philadelphia, request those interested in the hardware industry to send for their illustrated catalogue and price-list, showing the various lines of hardware manufactured by them. A copy of this catalogue will be sent to any address upon the receipt of stamps to pay postage.

WE ARE INDEBTED to the Utica Steam Gauge Company, Utica, N. Y., for an exceptionally handsome advertising card in which attention is incidentally directed to the Pedal Valve of their manufacture. The publication is a photo-gravure measuring 20 x 24 inches in size, taken apparently from an oil painting, but printed in a way to resemble a remarqued and signed etching. The double printing is done in such a way that the etching appears to be on India paper. The signature is the Utica Steam Gauge Company, and the remarque is a miniature sketch of the pedal valve in the process of being closed by a foot. The picture itself shows a very pretty interior library scene, where the young mistress of the house has just risen from an upholstered wicker chair and is turning off the heat from a radiator at the back of the room. The printing is very carefully done and the brown ink, combined with the scratchy marks of the paint, represent very closely the etcher's line. In a recess at the left of the picture is a book case, table and ornamented lamp, while at the right is a carved table supporting a vase of ferns and grasses. A small waterscape hanging on the wall adds to the effect, though we fear that if the canvas be permitted to hang immediately over the radiator many winters the painting will be seriously injured.

WE HAVE RECEIVED from the Penn Iron Roofing and Corrugating Company, Limited, whose works are located at Hamilton and Twenty-third streets, Philadelphia, Pa., a copy of a catalogue which they have recently issued. It is an oblong volume of something over 100 pages, profusely illustrated, and bound in paper covers. In offering this catalogue to the trade the company state that they have endeavored to explain and illustrate the various uses to which sheet metal has been adopted in the construction of all kinds of buildings during the ten years. On account of the rapidly increasing demand for their Sheet Metal Clapboards, Metallic Pressed Brick, Corrugated Siding, Glazed Steel Shingle and Ceilings, Steel Roofing Curved Awning, Galvanized Iron Cornices, &c., the company have been forced to largely increase their facilities, adding many new and recently patented machines, and an 80 horse-power engine, while at the same time they have doubled their floor space. The company carry in stock 1000 tons of Steel and Charcoal Iron Sheets, of all length and gauges, thus placing them in position to readily fill orders. The catalogue before us presents a great variety of designs of Ceiling Plates, Shingles, Moldings, Roofing, Siding, &c., together with price-lists of various specialties. The work will be found of interest to those engaged in the building trades.

AN EXCEPTIONALLY neat and tasteful catalogue comes from the Detroit Heating and Lighting Company, Detroit, Mich., entitled "Light for Evening Hours." The pamphlet, some 7 x 8 inches in size, is bound in pliable cardboard and decorated in a peculiarly pleasing fashion. On the front cover, in addition to the title, is an interior, scene printed in brown ink, and over it all is an interlacing of lightly gilded lines, the background being delicately shaded. Within the pamphlet a very full and complete description is given of their well known Combination Gas Machine, which has been on the market for over 20 years. Sectional and general views illustrate this apparatus. The principal decorative feature of the publication is the large number of direct process cuts, illustrating the important buildings lighted by this apparatus. The front plate shows a court house in Albion, Ind., while scattered through the pages are a number of very handsome residences located in all parts of the country. The buildings include, in addition to the court house mentioned, hotels, private houses, saw mills, churches, colleges and club houses. The quality of the paper and the type is in keeping with the general excellence of the publication.

THE LUFKIN RULE COMPANY, Cleveland, Ohio, in their pamphlet B present illustrations of an interesting variety of steel tapes and rules. The steel tapes are referred to as coming into more general use, and are made from 2 feet to 100 feet in length, for surveyors', engineers' and bridge builders' use. Folding pocket rules are made from 1 to 4 feet in length, and are described as being neat and convenient, and, being made of steel, will bend to a 3-inch circle. Their Magic Pattern Rule is also illustrated. A new edition of their complete catalogue, embracing all the goods they manufacture, will soon be issued.

W. J. BURTON & CO., of Detroit, Mich., have just received the contract for roofing with Eastlake Metallic Shingles what is known as the Holmes Barn, located near Detroit, and which, it is said, will be one of the largest and finest buildings of its class in Southern Michigan. We understand that Burton & Co. secured the contract in the face of strong competition, and without solicitation on their part further than a circular with quotations and samples of their goods. Trade in Eastlake Metallic Shingles is said to be on the increase, and the company expect to do a very much larger business than last season.

SOMETHING OF A NOVELTY in elevators has just been completed by J. Q. Maynard, of 12 Cortlandt street, New York City. This is a portable elevator which has been manufactured to meet a special requirement, although it may be employed for other purposes. It is designated by the manufacturer as an "invalid's portable elevator." The base consists of a square frame which is of a size to receive the elevator platform. The latter moves up and down between two wooden guides or posts, which with a cross beam at the top form the elevator frame. The platform is raised and lowered by means of a rope which passes through the cross beam at the top over two pulleys and down upon the outside of one of the guide posts to a drum. This drum is operated by means of a crank placed at right angles to it, the power being communicated by means of a worm gear. The elevator is something entirely new in its way, and is the first one which the manufacturer has produced. It is so simple in its construction and possesses such features of novelty that it is believed a large business will be developed.

THE LINCOLN IRON WORKS, of Rutland, Vt., have issued a catalogue of machinery designed for working and handling stone and marble. The pamphlet consists of 68 pages of beautifully printed text upon a fine quality of calendared paper. It is bound in colored paper covers, and through the upper left-hand corner is inserted a cord by which it can be hung up. Each page of text is surrounded by an ornamental border in black and white, greatly adding to the general effect. In the introduction to the trade attention is called to the special facilities possessed for building and equipping mills or complete plants for working, quarrying and handling stone and marble. The company state that they have recently largely increased their facilities, both in their foundry and machine shop, and have added several special tools and other labor-saving devices. Their stock of patterns is said to be large and constantly increasing, and in addition to their patterns for special machines, they have a complete assortment of pulleys, boxes, hangers, gearing, &c. The catalogue is well arranged and likely to prove of interest to those engaged in the industry represented.

WE HAVE RECEIVED from the New York Institute for Artist Artisans, 140 and 142 West Twenty-third street, New York, a copy of their latest report. This organization was founded two years ago, to supply the pressing needs of a growing civilization in technical education. The chief reasons for the organizations of the institute are set forth in the report, and a list of officers, friends, shareholders and scholars is given. In fact, the report contains full information as to the advantages of the organization, the various departments which are in operation, the terms of tuition and the hours at which instructions are given.

THE PROPRIETY of enacting stringen laws to compel manufacturers and dealers to label the goods they handle, so as to show the latter's character and composition, is rapidly gaining the acceptance of the whole honest-minded portion of the community. The prevailing practice of paint and oil adulteration has led to a bill being framed by our cotemporary *House Painting and Decorating* to regulate such adulteration by making it a misdemeanor to falsely label any pigment or linseed oil. The principle upon which the bill is framed is simply that purchasers shall not be induced to purchase paints or linseed oil by deception. There is no attempt made to prevent, nor is it desired to prevent, the sale of cheap material to those who desire to use it. But if, for instance, a manufacturer marks a package "chrome yellow," either with or without such adjectives as "best," "pure," "superfine," &c., such package must contain pure chrome yellow, or both the manufacturer and the seller be subject to heavy penalties. If, however, the package contains, say, only 75 per cent. of pure color and a statement to that effect is placed on the label, the sale of such color will not be unlawful. The bill will be presented to Congress as soon as practicable, and it will be accompanied by the petition of master painters and other consumers of paint in favor of its becoming a law forthwith.

THE PRANG EDUCATIONAL COMPANY, of Boston, New York and Chicago, favor us with a copy of a pamphlet of some 30 pages, entitled "Instruction in Drawing in Primary and Intermediate Schools in Europe and America." The pamphlet consists of a critical review of the Prang course in form study and drawing, by Dr. Arnold Dodel, Professor of Botany in the University of Zurich, Switzerland. The matter is translated from "Pædagogium," Leipzig. An introduction to the work is given by Mr. Lewis Prang, in which he presents a brief account of the manner in which the course in drawing referred to in the translation of Dr. Dodel's article has been developed.

THE PRATT INSTITUTE, of Brooklyn, N. Y., have just issued a catalogue for the school year 1890-91. It is a volume of nearly 100 pages, carefully arranged and printed, and bound in neat paper covers. The frontispiece represents a front view of the institute, located on Ryerson street. Within the covers of the book is a full description of the Pratt Institute, diagrams of the various buildings showing the various departments of the school, a presentation of the course of study pursued in the various branches, a list of instructors and assistants, and in fact all the information necessary in order to obtain a comprehensive idea of the scope of this institution.

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CARPENTRY AND BUILDING.

A MONTHLY JOURNAL FOR THE BUILDING TRADES.
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DAVID WILLIAMS, - - PUBLISHER AND PROPRIETOR.
A. O. KITTREDGE, - - - - EDITOR.
JOHN S KING, - - - BUSINESS MANAGER.
66 & 68 DUANE STREET, NEW YORK.

AUGUST, 1890.

Improvements and Enlargements.

Our readers have had their attention called to changes and improvements in this paper so regularly for several months past, that it is only reasonable to suppose that they would be disappointed, to a certain extent, at least, if in looking at the head of the editorial column of the present issue they should not find something more, of the same sort. Now that changes are the order of the day, and in view of the fact that improvements are being constantly made, and new fields of enterprise continuously sought after, it is natural that the reader should expect something new in each issue. Nor do we intend to disappoint him. We shall ever be alert, and always in the front rank. This number is no exception to the general rule, and the improvement and enlargement to which we now ask attention is perhaps the most important of all that we have so far accomplished.

The Builders' Exchange.

For a year past there has been published in Boston a little paper called *The Builders' Exchange*. It has been the official mouthpiece of the National Association of Builders, and has been under the immediate management and direction of William H. Sayward, the secretary of the organization. It has been bright, aggressive, very readable, and always acceptable to the constituency addressed. It has exerted a potent influence among builders everywhere, and has been the means of doing a great deal of good in strengthening the movement that crystallizes locally in Master Builders' Exchanges, and collectively in the National Association of Builders. But publishing a paper is one thing and attending to official duties such as devolve upon the secretary is quite another. It is very difficult for any man to do two days' work in one day's time, or to perform simultaneously two vocations, each exacting in its requirements, without neglecting the one or the other. Mr. Sayward has worked in this dual capacity for a number of months, accomplishing wonders, so far as results are concerned, but at the expense of jeopardizing his own health. We thought we saw the opportunity of relieving him of a share of his burdens, and at the same time of assisting the National Association in the work upon which it is engaged. Accordingly negotiations were instituted which have resulted in the absorption by this journal of the paper called *The Builders' Exchange*. Hereafter there will be a department in our pages entitled "The Builders' Exchange," managed by Mr. Sayward, which will contain the official utterances of officers of the National Association and the news of Builders' Exchange movements. The first of this new department will be found in another part of this issue. We commend it to the attention of our readers.

Our Platform.

Carpentry and Building appeals to all in the trades. It does not address master builders to the exclusion of journeymen and apprentices; nor architects to the exclusion of the mechanics who execute their designs, and in thus becoming the official mouthpiece of the national builders it does not in the least relinquish its deep interest in the workingmen in the various building trades. Our sympathies are ever with the mechanic, but this should not prevent us from seeing and discussing the interests of employers. Nor shall this new alliance and new responsibility ever interfere with free discussion of questions concerning the relationship of these two classes whenever such questions arise. Labor and capital, employer and employee, master and man, are inseparably associated, and it is only by a just appreciation of the rights of each and the most careful balancing one with the other that exact justice can be done. To treat all fairly shall ever be our aim.

Carpenters' Brotherhood.

We learn from recent advices from the secretary of the United Brotherhood of Carpenters and Joiners of America, that it now has under its jurisdiction no less than 687 local unions in good standing. This, if we mistake not, makes it considerably the largest, numerically, of any craft or trade. This organization has been prominent from the beginning in the effort to secure the eight-hour day among carpenters, more particularly in the effort that has been made since the middle of March of the current year. During that time charters have been granted to no less than 132 new unions, embracing a very large membership and located in various sections of the country.

Condition of the Building Trades.

The building trade the present year is considered to be excellent in many sections of the country, but at the present time there are some notable exceptions. We are advised that trade is relatively dull in San Francisco, Denver, Spokane Falls, Seattle, Troy, N. Y.; Des Moines, Iowa; Pueblo, Col.: Fort Smith, Ark.; Defiance, Ohio; Grand Rapids, Mich.; Bradford, Pa.; Norfolk, Va., and Bloomington, Ill. Perhaps this does not cover the entire list of points where there is less work than contractors and mechanics would be glad to have, but the cities named are among the more prominent ones in which trade is dull at the present time. In another column we present a survey of the building business as developed the past year in the larger cities, from which it will be seen that the general report is excellent.

The Western Union Fire.

All of our readers have heard of the fire in the Western Union Building, New York, which occurred in the second week in July, and, no doubt, many of them have also learned before this of the prompt action of the company in taking measures to continue their business and to put the building into condition for re-occupancy. The fire was a notable one for several reasons. The building was supposed to be fire-proof, and yet in a very short space of time the upper stories were very thoroughly burned out, and it was only by advantageous circumstances that there was no loss of life. Very narrow escapes were made in several instances, and had the building been full, as is usual in the busy hours of the day, it is scarcely possible that all could have escaped. As it was, the fire occurred in the early morning when there were comparatively few operators at work.

Changes in Building Construction.

The Western Union fire calls up a number of considerations. First among these is the fact that so-called fire-proof buildings are not at all fire-proof when they are filled with combustible materials. So many instances of this have occurred in the past that it requires no long argument to demonstrate its universal truth. Another is the fact that very great changes in construction have occurred since the Western Union building was erected, some 20 years ago. This structure was one of the pioneers of the high down town buildings which now characterize the metropolis. It and the *Tribune* building, located a little further up town, for a long time stood alone as high structures. Of late years, however, many other high buildings have been erected, some of them, as our readers know, towering far above both of these structures. It is only owing to improvements in the art of construction that buildings can be safely carried to such extreme hights as now prevail, without danger. Vast changes have occurred in the architecture of the buildings of the lower end of New York in the interval named, as well as in their construction. Mere ornamentation and decoration are now constantly sacrificed to floor space for business purposes. Flat roofs are the general rule, and features which are purely architectural embellishments are omitted.

Changes in Rebuilding.

The Western Union building was provided with a tower which at the outset, no doubt, was a considerable item of cost. It was justified, however, on the score of its architectural character and the individuality it gave the building. For use it originally served the purpose of carrying a flag-staff, and more recently the staff on which the time-ball operated. It was also

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intended for a clock but the clock was never put in place. It is significant of ideas prevailing at the present time that in the reconstruction of the building the tower is condemned and is to be omitted. The building also had a steep roof, which likewise was a conspicuous feature of its architecture. This, too, is to be lost in the reconstruction, because more floor space can be got by another method. The plans of the Western Union Company anticipate the removal of the tower and of the steep roof with which the building was originally covered, and in which were put two or three stories of the available floor space which it contained. The building is to be carried up square some four stories above the line of the eaves of the old and then covered with a flat roof. By these changes the building will loose much of its original characteristics but it will more nearly conform to the general rule among the office buildings of the metropolis.

Cardboard Modeling for Young Architects.

One of the most profitable pieces of work to which the young architect can devote himself during the years of his study, when he has abundant time for such diversion, is the construction of cardboard models of buildings to scale. We believe there is a book written upon this subject, to be found in some of the cheap libraries. But whether the student works under instruction or unassisted, the exercise must be beneficial, and the idea should commend itself to the mind of every diligent student and of every ambitious young man in the architectural line. The difference between the beginner of architecture and the successful man of the profession is nothing more nor less than breadth of knowledge and range of experience. But how are experience and knowledge to be gained? There is nothing like doing a thing for one's self in order to become acquainted with it. A man may stand by and look on, and think he knows all about things, but when he comes to doing these things himself he finds that there is a vast difference between theory and practice. A cardboard model, insufficient though it be, is practice. It brings before its builder a number of practical problems for solution; it forces upon him the consideration of proportions of parts, of various constructive features and of many questions which would never arise while using the drafting board, or when copying work put upon paper by others. However advantageous the cardboard model may be, it is still very far from real practice, and we do not for a moment advocate it as a substitute for practice in actual work, but simply as one of the things a young man can do when he is placed where no other practice is to be obtained. Undoubtedly it would be far better for him to take materials and tools and build a little house for himself, or work for a time as a mechanic upon some building of generous proportions. Few young architects, however, have the courage to do such things and many of them lack the time and the opportunity for them, but all may gain something from cardboard models if they will take the trouble to experiment in that direction.

The Woman Carpenter.

We have all heard of the woman carpenter, but we have not seen her. Sometimes she is in one end of the country, and then again she is in the other. Either she travels a great deal, or else she is numerous; but if she is the latter, why do we not succeed in meeting her when we go from shop to shop? Perhaps she is a myth. It is barely possible that she exists only in the imagination of some of the syndicate writers. Perhaps the public is being "sold," so to speak, by the different accounts that are being published of the woman carpenter and the wonderful work she performs. It may be in this case, as in others, that the story was started as a whim, or as a challenge of public credulity, upon the part of some writer, and that once started, it has never stopped. If the woman carpenter really exists, and by woman carpenter we do not mean an amateur merely, one who on occasion can saw a board and drive a nail, but, instead, one who really works at carpentry as a means of livelihood, we want to learn where she lives We want to present an account of her success to our readers, as something likely to interest their wives and sisters. To show that we are in earnest in this matter, and to give our readers some reason for assisting us in the search, we have this to propose: We will make a present of a set of planes to the first practical woman carpenter who is authentically reported to this journal. The planes are to be first-class tools of their kind, and will be properly inscribed. Who will be the first to report?

Trade Schools.

The subject of trade schools is one which is attracting such wide attention on the part of the general public that the following extracts from the expressed views of Col. R. T. Auchmuty, founder of the New York Trade Schools, will be of great interest and value:

"Trade schools, as you know, although a modern, are not an untried invention. France owes much of her wealth to her industrial schools, Germany has wrested a considerable portion of the American trade from England by her trade schools, and the London guilds are now expending their accumulated wealth in the establishment of similar schools throughout England. The foreign trade schools are of two kinds, those where a trade is learned during the four or five years required to obtain a good education, and schools where young men employed in shops can learn what the workshop does not teach.

"In this country the lad's education can be left to the public schools. What is wanted is some place where he can learn a trade after he has finished his education.

"The practical man, whether he is a master mechanic or a journeyman, will be likely to say that it is not possible to graduate a mechanic capable of doing first-class work from a trade school. This need not be discussed. To attempt to graduate journeymen from a trade school would be both expensive and unnecessary. The trade school can teach, far better than the workshop, a trade in all its parts. More than that, it can teach what no workshop pretends to teach, the science on which a trade is based, and which is in danger of being forgotten. Speed of execution and the experience necessary to meet the varied problems ever presented to the mechanic can only, on the other hand, be acquired at real work. It is therefore the combination of the trade school and the workshop that offers the best results; the trade school first to learn how to work, then the workshop to gain speed of execution and experience."

In describing the course of bricklaying, he says:

"After the young man has paid his fees he is given a ticket. This he takes to the tool room and receives in return for it a trowel. At the close of each evening's instruction he returns the trowel (properly cleaned) and receives back his ticket. Provision is made for the care of overalls, plumb rules, &c. The course of instruction is divided into series of exercises, to each of which a specified number of evenings is given. This course of instruction is printed and hung up in the bricklaying shed, so that each member of the class may understand what will be expected of him. Before commencing an exercise, the instructor, standing on a platform, shows the class how the work should be done, and explains why it should be done in a certain way. Then the young men endeavor to do what has been shown them, and the instructors—there being one to each 25 men—correct them when they are wrong and explain what they do not understand. The first evening is spent in learning how to handle the trowel and spread mortar. The mortar is spread on boards, no walls having yet been built. Then comes three evenings on an 8-inch wall, working on a line, but without using the plumb rule.

During this time the pupils are required to spread mortar over at least two bricks, to bond properly and strike the joints neatly. Three evenings more are given to 8-inch walls, when mortar must be spread over at least three bricks and the wall pointed. After the 8-inch walls, 12-inch piers are built and the use of the plumb rule taught Then 12-inch walls are built for six evenings, 20 minutes each evening being occupied in spreading mortar, the young men being cautioned that they will be judged when they get work to a considerable extent by the way they hold their trowel. Then follow piers again; then 8-inch walls without a plumb rule, so as to train the eye; then 12-inch wall with a chimney breast and flues, then 8, 12 and 16 inch walls turned at right angles and with intersecting walls; then come arches, with two and three rowlock courses, and then the class is again put for three evenings on straight 12-inch walls, 20 minutes being passed each of these evenings in spreading mortar. After this, the class build fireplaces, set sills, window frames and lintels, practice corbeling and then work again on 12-inch walls.

"When the six months spent in this way are over, the young man can lay about 600 brick per day on a straight wall; he can do almost any work that is required of the average bricklayer, but, except on a straight wall he will work slowly and will need watching. I have, with careful figuring, found him to be worth from $1.50 to $1.75 per day, assuming a journeyman's wages to be $4."

Besides bricklaying there is taught plumbing, painting, plastering, stone cutting, carpentry and blacksmithing. The practical results of the school are highly satisfactory, and the general principle of manual training schools is receiving great attention and support, not only from philanthropists, but from the National Builders' Association and all who are interested in the general welfare of the building trade.

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CORRESPONDENCE.

Laying Off an Octagon Bay Window.

From L. W. T., *Upper Alton, Ill.*—I notice in the February issue of *Carpentry and Building* that "W. S. W.," of Washington, Iowa, has come to the front, and I petition for space in which to reply to what he has to say. Friend "W. S. W." I O U an apology, but am not ingenious enough to make it only by an explanation. Please receive my thanks for the figures furnished, &c. They, however, do not help me any. Allow me also to growl at your long delayed answer, which should have been more explicit. Just think of it! For ten long and weary months I have been trying to divide the 360° contained in the great circle by 29, in order to obtain eight equal angles and eight equal sides without having 16° remaining on each and every side. Fig. 1 of the sketches, which I inclose, illustrates my understanding of "W. S. W.'s" explanation. Line No. 1 is the minimum, line 2 the maximum, but splice at 4, which gives line 3 5, the extreme. Draw 4 7, which is the mean proportional desired. Using the figures, 3 4 is to 4 7 as 4 7 is to 4 5; that is, 4 7 is the mean proportional required, which does not seem to me to give one of the four equal sides wanted. Allow me now to state the case, using "W. S. W.'s" own figures: $\frac{5}{12}$ is to $\frac{5}{24}$ as $\frac{5}{29}$ is to an octagon corner, with an angle of 30°. Or another way, friend "W. S. W.," as between U and I, is this: U is to "W. S. W." as I to "L. W. T.," which being translated means the difference of opinion between bosses on polygonal lines or carpentry. I would like to know how the "jours" will ever get such a tangle through their heads as "W.S.W." and I have made. Fig. 1 means "W. S. W.'s" as well as mine, and is (which he will see on the line *w s w*) three-fourths of the half octagon, and this shows that he knew what one side was, and the outset of his instructions proves it. The line 4 7 or the space S will not assist in finding the side wanted. If it will, "W. S. W." should show us how it is done and give plain figures. I will quote from his instructions: "Set off on the line D A the length desired for one side of the window." How did he obtain that? Was it by the quadrant and line 45°? Does the glass and frame regulate that? "As indicated from A to B." If A to B is the side wanted what does he want with five-twelfths? Is there any "pham-phosal" about this sent out to puzzle others? Being something of a polygonal novelty myself, I introduce Fig. 3 drawn on a novel plan and one which I have not met with among the wood butchering faculty. It will produce good results if accurately drawn. I introduce it for convenience in illustration in this controversy, and also as it shows my understanding of a correct half octagon. The dotted half circle is of no use in drawing the figure. It is the spaces marked *x;* the remainders after the two sides are taken from the diameter to which I call attention. Look at the central spaces in Fig. 4 and it will be found that they are equal, and the two lines 4 W of Fig. 1 are equal to one of the sides. I cannot, however, make that "mean proportional" 4 7 a fit anywhere. Fig. 4 is a double-ender and has more in it to the square foot than any five-twenty-ninths I ever met with. The B end is what is usual, connected with some good additions. The R hand is intended to answer "W. S. W.'s," Fig. 2, and some of the remarks of other correspondents. The dotted lines show the difference between men's opinion—between fact and fiction. If the side *a b* is not on the angle 45° from *b d*, what is the name of the figure? Suppose we attempt to change or correct the angle on the same span, 9 feet, what will be the fate of the mullion window? *b* F is common on house corners, and the two sets of lines prove that it is not prudent to be positive when we say "octagon." Fig. 2, if constructed as drawn, will produce the same brand, and so will any of the irregular polygons.

Now, "W. S. W." will, I think, see that I consider his instructions "no good." He thinks apparently that I am heartless, egotistical and abusive, in all of which he is mistaken. In regard to his remark, "The old man thinks he learned it all," &c., and is "down on new tricks," &c., is another error. I am self-willed, stiff-necked and bullheaded, and am in for all of the cheap tricks, short cuts, short hours and big pay plans, and do not care whether they are branded 29 or some other number. It has been my habit to invite criticism, which I now do. "W. S. W." must have noticed that some of the boys came at me with barbed points, which I enjoyed fully as well as they did; however, the climax will come in all things, and it came with me when one moss backed

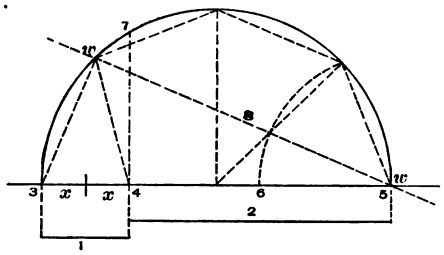


Fig. 1.

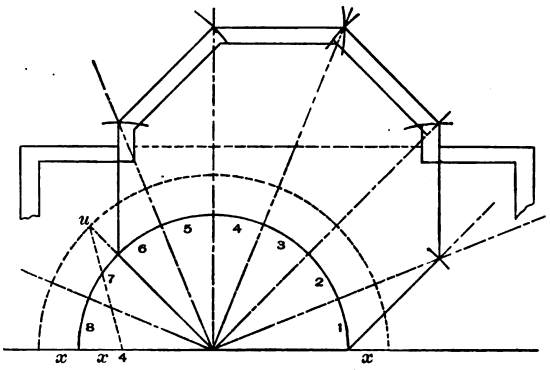


Fig. 3.

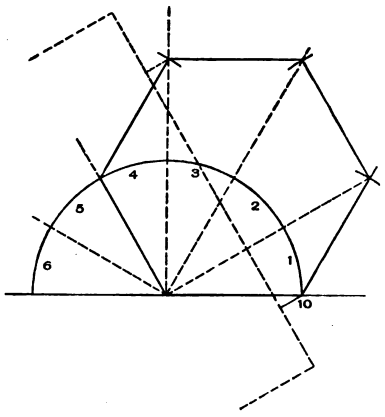


Fig. 2.

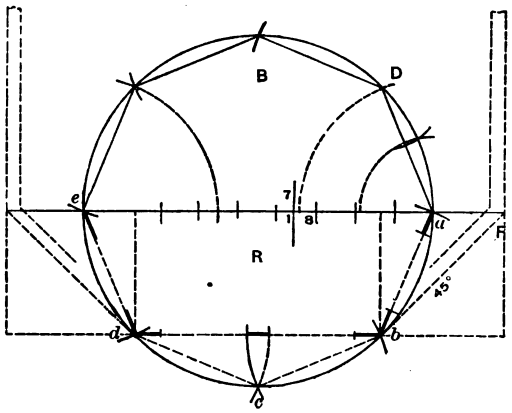


Fig. 4.

Laying Off an Octagon Bay Window.—Drawings Accompanying Letter from "L. W. T."

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fossil, with a high standing collar, sawing octagon corners off the lobes of his ears, walked up to the rack and said to our editor: "Look'e here, boss, I want this to stop;" then I felt bad—pretty near as bad as "W. S. W." did when he thought I was coming at him with a buz saw. "W. S. W." must brace up his spinal column and not let an explosion from some critic's word box knock him out of plumb. No critic can blow effectually at the bung without wasting some little wisdom at the spigot, especially if he furnishes drawings to illustrate the words. By this time "W. S. W." may have noticed that I am decidedly "cranky" and exceedingly charitable towards my own sins. "Charity begins at home." Then I draw the line more taut over others. The bosses all do that with the "jours" on octagon ends, no difference what angles the cornices may be. Since "W. S. W." has not given a practical example of his figures, I will condemn them as too complicated. Any carpenter with a surface board and pair of dividers, rule or square, marked with twelfths, and using 1 inch to the foot scale, can lay out the work and have all the bevels before "W. S. W." can find the 29 parts and divisions ordered. Feeling in pleasant humor and kindly disposed towards my fellow chips, I will discount "W. S. W.'s" 29 parts 11 spaces and give something less complicated that the "jours" and "cubs" will recollect. It is not mathematically correct, but convenient as a starter, and will make average work.

Fig. 4 is drawn to a ¼-inch scale, and is 9 feet outside span. There are nine full spaces. Take three and one-half spaces scant and turn out to D as shown by the dotted arc. Three and one-half feet is about 1 inch too long, which will be found handy outside. When a wall pattern or template is to be made, and will pass muster, defy detection, and average as well as common in such work, divide 9 feet into ⅛ foot, which gives 18 spaces, or ⅛ foot for a side, 1 inch too long, or $\frac{7}{128}$ for a side, 1 inch too long; 9 inches × 12 inches = 108 inches × 7 = 756 ÷ 18 gives 42 inches, which I think is 1 inch too long. Referring now to Fig. 1 let us compare notes. Line 1 is ⅛ of line 2. The half of line 1 is ⅛ of 6 5, which shows ⅛ of the diameter as being equal to one of the sides desired. This is 40⅛ inches. I think it is ⅛ inch too short. 9 inches × 12 inches = 108 inches × 3 = 324 ÷ 8 = 40⅛ inches. Any person who may try and prove this is invited to make an honest report and crack all the jokes he may wish. One side being known is the key to Figs. 2 and 3. Draw the half circle and divide into as many spaces as there are sides wanted; draw the radiating lines; drop two, and with side 9 10 as radius, step around as shown by the short arcs. Will some person point out their practical use? My Fig. 1 seems to be what "W. S. W." was trying to do, and I will now explain it according to to his instructions: Nine inches × 12 inches = 108 inches and $\frac{1}{128}$ of that is 3¾ inches + $\frac{3}{128}$ × 12 (one of the sides) = 45$\frac{3}{8}$ inches, which is 4$\frac{3}{8}$ inches too long for one side. "W. S. W." can see that the space S and the line W S W

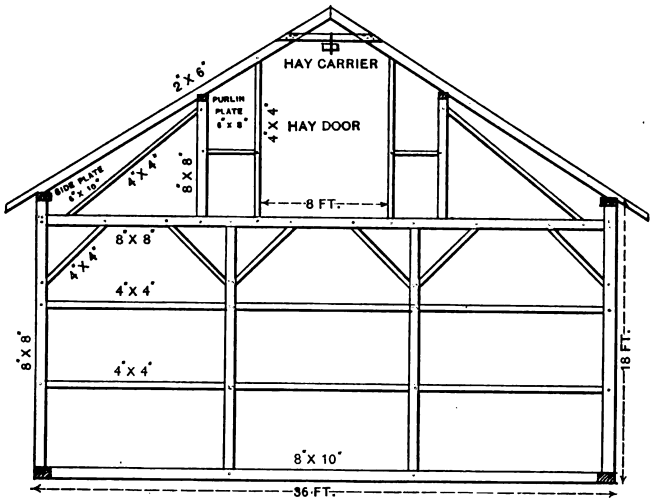


Fig. 1.—Gable End.

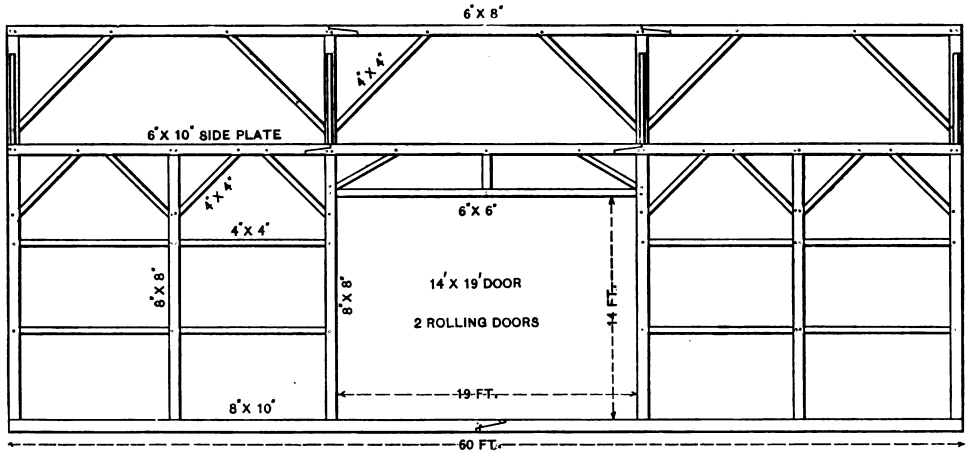


Fig. 2.—Side Elevation.

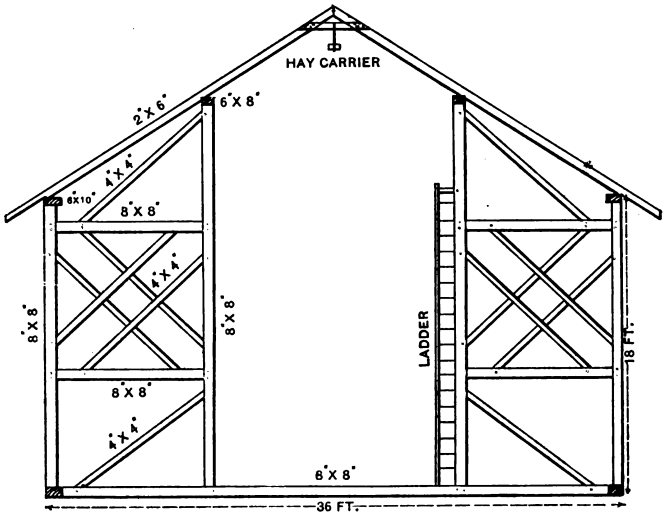


Fig. 3.—Bents Each Side of Floor.

Framing a Barn.

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are both too short, being the diagonal of three-quarters of the half octagon. The line 4 7 seems to be the mean proportional between two peculiar characters, namely, "U and I." If one-half the diameter is equal to one side of six sides, what is the length of one side in twelve sides? If

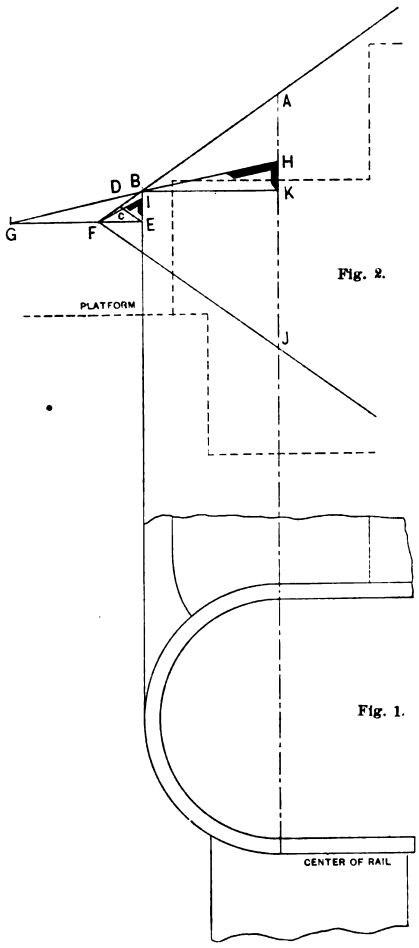


Fig. 2.

Fig. 1.

Problem in Handrailing.—Figs. 1 and 2.—Submitted by "A. L."

six-tenths of the diameter is equal to one side in five sides, what can be said of ten sides? When "W. S. W." gets all this

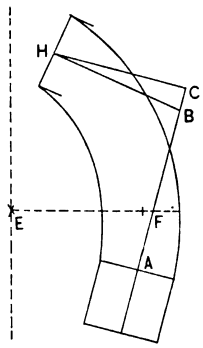


Fig. 3.—"A. L's." Pattern for Wreath Piece.

through his head, his opinion of the writer will probably be improved. My moon joke was intended to draw out a practical explanation, but not appearing as expected, my test will do for the want of a better one.

Framing a Barn.

From J. W. and C. L., *Maxinkuckee, Ind.*—We are readers of *Carpentry and Building*, and are somewhat interested in the questions and plans submitted relating to barn building. We note in the December issue for last year a plan by "J. R. T.," of Lake Benton, Minn, concerning which we are free to say we do not like at all. In the first place, we think the barn will bulge when filled with hay or grain. In the second place, we do not think a barn can be constructed of material as shown in his plan that will stand the strain brought to bear upon it by the wind. In the course of time it will rock and get out of shape. In the third place, we do not like drop siding, as the rain will beat through and make it wet on the inside.

In the March issue we notice the plan of a barn submitted by "F. K.," of Kieler, Wis. We are not altogether in favor of the method employed by this correspondent, and we fail to see the propriety of so many sill braces. Our experience is if the sill is cut too much, the mortise will fill with dirt, get damp and rot the sill. We think the correspondent's plate braces from side plate to purlin post will be in the way when mowing hay, and also have a tendency to push the splices apart in the side plates when the barn is filled with hay. We are also impressed with the fact that his timber is out of proportion. His sills are only 6 x 8, whereas we would use 8 x 10, so that if at any time a part of the foundation wall gives way, or it is desired to raise the barn or make other changes, the sills will be of sufficient size to stand the pressure. His beams are 8 x 10. We think 8 x 8 sufficient for the purpose. His side plates are 8 x 10, while 6 x 10 is all that is necessary.

We submit several rough sketches, showing the manner in which we would construct a barn 36 x 60 feet in size. Fig. 1 shows the side elevation, clearly indicating the framing. Fig. 2 is the gable end of the barn, with hay doors 8 x 12. Fig. 3 shows the bents each side of the barn floor. From a close inspection of this bent, it will be seen that for this barn to bulge it would be necessary for the purlin posts to raise up. The barn is so braced and beamed together that it is not possible for it to rock, and we know from personal knowledge that it will do neither. All braces are framed in with 2-inch tenons and draw pinned. The beams have 2½-inch tenons and two draw pins, top and bottom. The outside posts have 2-inch tenons with two draw pins at the top. All splices in plates or sills may be either bolted or pinned. We would use shiplap siding, 8 inches for siding a barn.

Cutting Wood in Winter or Summer.

From A. M. S., *Kochs, Ohio.*—Will some of the readers of *Carpentry and Building* kindly tell me if it makes any difference to the color of walnut and cherry whether it be cut in the winter or in the summer?

Problem in Handrailing.

From A. L., *Stockton, Cal.*—In looking over some of the recent correspondence in *Carpentry and Building*, I notice the inquiry of "E. S. C.," of Pittsburgh, who asked some of the readers to explain the drawing and working of a molded handrail wreath around a 12 inch cylinder, the rise to be 7 inches and the tread 10 inches. As the correspondent does not give a plan of the stairs, or say whether there is a platform or winders in the cylinder, I infer that the latter is 12 inches in diameter and not 12 inches radius. In the sketches which I inclose I have made a plan of two steps and platform around a 12 inch cylinder, Fig. 1 of which is for the purpose of carrying out my idea of what "E. S. C." desires. The dotted lines in Fig. 2 show an elevation of steps, risers and platform. A F and F J are center lines of the rail. A J is the chord line. Make E G, which is the unfolded tangent, equal to B K. B G is the pitch over the tangent E G. Draw C E at right angles to A F. For the purpose of finding the bevels for squaring the wreath, draw K H equal to E C; connect B H. Make E I equal to E D and connect I F. In Fig. 3 of the sketches I show the pattern for both quarters of the wreath. The work may be done without the aid of Fig. 1, as follows: To draw the face mold take a steel square and apply to the stock of which pattern is to be made and draw the lines C A and C H of Fig. 3 indefinitely. Draw A B C to correspond with A B C of Fig. 2. Make C H equal to B H of Fig 2, and connect B. H., which is the tangent. Draw the curve of the molds by bending a flexible strip, starting square with the joint at each end. Leave a little straight wood at the end A; if the trammel is preferred, make A F equal to B F of Fig. 2. Take A B, and on H mark the arc at E; take B H, and on A cut the arc at E to connect E F, which is the minor diameter. A line drawn through E at right angles to E F is the major diameter. Find the focii and proceed in the usual manner. The bevel at H of Fig. 2 is applied at the joint A, while the bevel at I is applied at the joint H. I desire it to be distinctly understood that I am not fool enough to claim this as original, for the reason that there are too many practical stair builders who read the Correspondence Department, and would pass judgment on me as an amateur or an "Alec."

I am a disciple of Monckton and look upon him as the peer of any author of works treating on the subject of stairbuilding, all cranks to the contrary notwithstanding. My sketches are copied principally from his work, with some variations and omissions and, perhaps, some mistakes. I must say that I do not admire those back action drawings which cover the whole side of a drawing book. What we want are sufficient lines to do the work, but as concise as possible for the practical workman. The so-called cobweb is just the thing for beginners, although the lines that are not important might be dotted or otherwise indicated as such.

I draw the face mold on the stock from which I cut the pattern, consequently I do not like the method of obtaining bevels from it as shown by "J. B.," of Omaha, in the September number of *Carpentry and Building*. In my work I pick up any small piece that will make the pattern, beside keeping within its limitations, which is not always the case when one has to work from a center as at E of Fig. 3

"J. H. M." Replies to "W. J. B."

From J. H. MONCKTON, *New York City.*—I am much interested and somewhat amused with the communication from "W. J. B.," London, England, in the July number of *Carpentry and Building*. This correspondent begins by stating, that having read an article of mine in the January number, it led him to the opinion that "he ('J. H. M.,') had a great deal to learn in the art upon which he is supposed to be such an authority." That I have a great deal to learn is quite possible; and I may also say that I am not only willing but anxious to learn from "W. J. B." or any other person. There are, however, exceptions to my learning some things; for instance, a man who can balance himself on his head may get a notion that his knowledge and muscular ability to accomplish more than his fellows is a "pearl of

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great price," and taunting me with my inability to stand on my head, challenge me to do so. Now, I have always been accustomed to standing squarely on my feet, like the great majority of people, and never had any difficulty in so doing, or any useful call for doing otherwise. I am rather amused than chagrined at his challenge, and dismiss him in the high tide of his exulting mood of an ability to accomplish more than his fellows; content to believe in my humdrum way that anything old or new, in mathematics or physics, must demonstrate itself to me (beyond the fact of its being held by anybody to be unique or wonderful) to be both true and useful ere I adopt it.

As to my being an authority, or assumed authority, I desire to say that if any one accepts me individually as an authority on any matter or subject whatever, I am sorry for it, because such acceptance is detrimental to progress. The fact is, especially in mathematics, that anything treated of to be good, useful or true, ought to be demonstrable from its own premises; depending not at all on individual authority. "W. J. B." asks: "If 'J. H. M.' means the readers of this interesting journal to understand that the art of handrailing has reached its highest point of perfection in the tangent system as set forth in his book?" Frankly, I mean that the readers of this journal should, so far as I am concerned, come to their own conclusions as to any methods of work or modes of drawing that have been or may be presented in its columns; but for myself, I see no reason as yet to doubt that the theory and practice of handrailing and stairbuilding, as given in 97 plates of the most recent edition of my last book, exhibits to-day the highest point of perfection reached in that branch of carpentry, whether I am complimented for it nor not. Why should I doubt it? I have been acquainted with the use and practice of tangents, as applied to handrailing, for 47 years, making occasional progressive steps in its methods, and as a result of this experience I have simplified, generalized and corrected the manner of drawing face molds and finding bevels for squaring wreaths. I have shown how to find the exact position of wreath line, unfolded in position over the unfolded elevation, so that any odd lengths of balusters may be accurately obtained; or, if found desirable, the inclination of tangents may be changed, raised, or lowered, to suit any reasonable requirement in following the nosings.

Much of the hand railing done in New York city, 40 and 50 years ago, was round rail; the center line and joints of this round rail controlled by tangents hung at correct hights, and parallel to the line of cylinder producing its own easings, sometimes its ramp in the wreath. This led me to consider that if the center line of wreath could be geometrically unfolded in position, over the properly unfolded elevation, a command over handrail wreaths would be achieved, which, in its application, would be both useful and new. This I have done; and, further, seeing the great importance of planning stairs correctly, I have treated that branch of the subject to the extent of 50 different plans:

1. How to proceed methodically in planning stairs, and to secure in winding stairs of all kinds even stepping, uniform treads, on a natural line of travel throughout.

2. Devising best plans, insuring safety, ease, comfort of ascent and descent.

3. Making the most of plans of stairs the room provided will permit.

4. Economy of space without detriment to ease of travel, appearances in handrail or finish of stairs.

In this connection it occurs to me that I ought to mention to "W. J. B.," and so make known to the readers of this journal, that I have already received from his side of the great water a sort of left hand compliment through the London *Builder and Engineering Journal*, which journal has been publishing a very interesting and useful series of articles entitled "Halls and Staircases." In one of the series—copied without credit—are some of my plans and suggestions; changing the verbiage slightly, giving lessons as they seemed to put it to the young (?) architects. This fact, I think, augurs that your growing, and to be "boss of the situation architects," will show by and by a marked improvement and no more torment your stairbuilders or your people who are obliged to cautiously ascend and descend such abominably planned stairs which you are obliged to present us with at Fig. 3, or even such hybrid, part-step-ladder-and-part-easy-stair-combination-in-one-flight as "J. H." of your big city kindly submitted to readers of *Carpentry and Building* for August, 1888.

"W. J. B." writes: "Perhaps it will surprise "J. H. M." to know that it is quite possible to get wreath and ramp in one piece, and in most cases use no more thickness of stuff than by the tangent method." No, it won't. It doesn't surprise me a bit. I have in peculiar cases done the same thing many times, and it would not surprise me any more than if a person should inform me that he could complete the whole front wall of a building in a dozen big brick which would take no more clay than the usual size brick and mortar stuff. There will be many practical questions, however, to ask about his big brick. So with "W. J. B.," it may be as he says—possible to get ramp and wreath combined in one piece. For him, too, there are important questions, as for example: Is it profitable or better than usual in any way in the case of a long ramp with considerable curve and a small quarter circle wreath piece? Would not the combined ramp and wreath with its peculiar curvatures cut far into the width of an extra thick plank and leave much odd shaped waste stuff? Again, would not the time in most cases taken in drawing such a complex pattern, finding bevels for joints, also bevels for squaring and increased time to square ramp and wreath together, prove that the game—speaking figuratively—isn't worth the powder? It is easy to see that while many mechanical claims in practice are possible (setting aside the wonder faculty and the pride and overbearing desire to merely do what the other fellow cannot), yet, in fact, some of them, and this claim I take to be one of those, are far fetched, unprofitable in general work, if not wholly useless. "W.J.B." further states that his "face mold would be no part of an ellipse or other known regular curve, and would be only the exact width to obtain a square section of rail." This leads me to inquire what a face mold is. Geometrically, a face mold is an oblique section, produced vertically, on an inclined plane from any curved horizontal section or plan. If the plan, or any part of the plan, is circular, then, at least, that portion of the face mold, produced vertically, over the circular plan must be an ellipse or part of an ellipse. So, then, this thing that "W. J. B." calls a face mold, according to the geometrical law as described, is not a face mold, and is, therefore, from his description, simply a pattern covering in its width and length wood enough to work out the ramp and wreath; and, as this pattern affords no elliptic line on the plane of the plank, one of its bad features is that the side lines of the rail will have to be guessed at by the rail worker.

"W. J. B." makes the following statement: "'J. H. M.' knows better than I can tell him what a lot of stuff is wasted by cutting out to the tangent mold where there is much bevel, and oftentimes it does not give enough stuff where the section of rail is deeper than it is wide." From the above statements it appears that "W. J. B." has a very limited knowledge and experience, for so far as I know about waste, the practice is—if there are a number of wreath pieces required—to saw out roughly or cut out of cheap straw board a parallel pattern giving just enough wood to get out the wreath. This pattern is used merely for marking the pieces on the plank. Ordinarily where there is only one or two wreath pieces, the stuff is saved without making a special pattern. If more width of wood is required for a wreath piece then a face mold for certain forms of rail afford, then the extra wood is allowed at the convex edge, and from the concave edge of such a face mold the additional wood is scribed on the face of plank. The thickness and width of wood required for any wreath piece is readily found, as explained in *Carpentry and Building* for December, 1888, or the same thing is obtained by trial of a square section of rail, in each case with the squareing bevels. Face molds do not need the elliptic curve on the convex edge, nor more width from the center to convex edge than will give sufficient wood, because the concave side of the wreath is the one shaped out first and from this the width of the rail is gauged. "W. J. B." remarks: "I would be glad if 'J. H. M.' would show the readers of *Carpentry and Building* how to do the work shown in Fig. 1 of the sketches, which I executed three years ago, the architect being very particular. Conditions as follows: Rail to be 6 inches deep by 4 inches wide, 2 feet 8 inches high to top. All balusters to be exactly the same length. Joints where shown and ramps in wreath piece." Although "W. J. B." gives his written word that he executed his work, as above, according to the stated conditions three years ago, yet, the fact is, it can't be done, and this can be proved through his own diagrams, as follows: At Figs. 1 and 2, let a parallel line be drawn the depth of rail, 6 inches above "the central line of the molded capping," then continue the fourth and ninth rise lines through the above 6-inch depth of rail. Now, measuring this vertical line through the depth of rail at the ninth rise, it will be 7 inches; and measuring it at the fourth rise it will be 9 inches. From these two measurements it is easy to see that if the hand rail is raised at the ninth rise 2 feet 8 inches high at the top, and exactly the same length of baluster be used at the fourth rise, and so all along, as required, then the rail at the fourth rise will be 2 feet 10 inches in hight at the top, or at the several steps of the lower portion of the flight it will be 2 inches more in hight than over the regular fliers above. I, too, would be glad if "W. J. B.," instead of telling how he had done work in "a superior, graceful way with ramp and wreath in one piece and balusters all of one length," had given the readers of this journal the benefit of his superior ways, by showing how he does it. What is the use of "W. J. B." presenting these plans and elevation and calling upon me to show readers of *Carpentry and Building* how to do the work, as in the case of Figs. 1 and 2, introducing also his puzzle of Fig. 3? Does he want to exhibit me in his one piece pillory? For, according to his statements my methods, or rather the practice of handrailing with use of tangents is obsolete, useless; and the-falling-line-ramp-and-wreath-one-piece-system "is complete master of the situation."

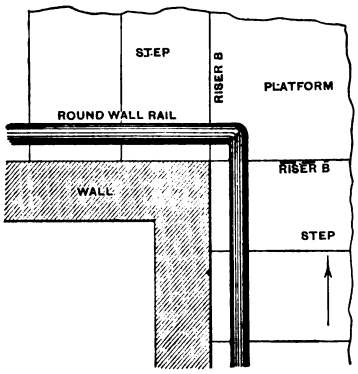
I do not believe any of the readers of *Carpentry and Building* want to "stop W. B. Garvock and others from crying out more light," or of getting all the light they aspire to; but I do believe—and many readers of this journal, I have no doubt, will agree with me, that for all practical pur-

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poses "W. J. B." is flourishing a farthing rush light when he puts so much stress on tacking a small piece of wreath and a ramp together; for that is absolutely all it amounts to as given in Figs. 1 and 2.

Wall Rail for Box Stairs.

From A. L., *Stockton, Cal.*—I once had a 2-inch round wall rail to cut out for a box stairs with a square corner at the plat-



Wall Rail for Box Stairs.—Fig. 1.—*Plan.*

form, as shown in Fig. 1 of the sketches which I enclose. Although this is nothing new I thought it might possibly be of interest to some of the readers of *Carpentry and Building* and for that reason have sent it to the editor. The work was executed as explained by means of Fig. 2, which is an elevation of two steps and riser in connection with the platform, with the rail shown in position. Extend the end of the rail A over the riser B to agree with the plan Fig. 1. Draw the pattern as shown. Should the pitch of the stairs be such as not to admit of sufficient easement the joint line A A may be raised and the upper piece made as shown by the dotted line. Bolt the joints A A together, so that the upper and lower piece will be at right-angles with each other. When the wreath

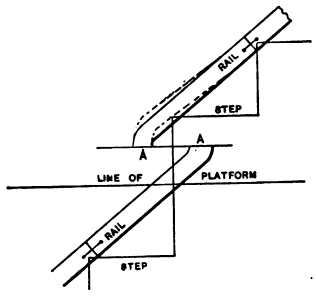
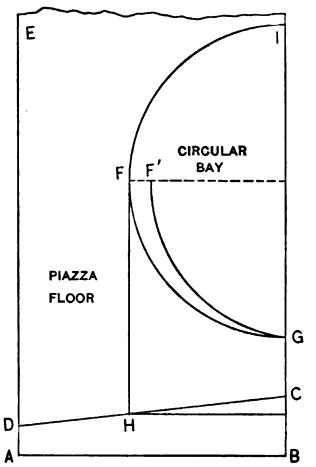


Fig. 2.—*Elevation.*

is rounded up and placed in position it will form a square corner, as shown in Fig. 1.

Baseboard for Circular Bay.

From R. C. B., *Orangeburg, S. C.*—Will the editor of *Carpentry and Building* permit me at this late day to send in a solution, or rather a reply, to the problem of "F. S. S.," of Charleston, S. C., who wanted to know something about baseboards for circular bay windows. I intended to have sent my letter much earlier, but concluded I would wait and see what the older and more experienced readers had to say. After an inspection of what appeared in the April issue of the paper, I thought that I could furnish an answer that would be easier to comprehend by the average mechanic than any of those presented. The fault with the solutions given, seems to me, is that they necessitate a knowledge of more or less geometry, which very few carpenters down our way possess. Down this way we do not have to construct first by lines, but go to work and put on the baseboard. If the method which I present recommends itself to the readers of *Carpentry and Building*, and they see fit to accept it, I am confident that they will have no further trouble in work of this kind. Referring to the sketch enclosed, let E D C represent the line of the piazza and A B C D an end view of it; F and G represent the floor line of the circular bay. It is required to run a baseboard around this circular bay window from G through F to I, so that the top of the base will be

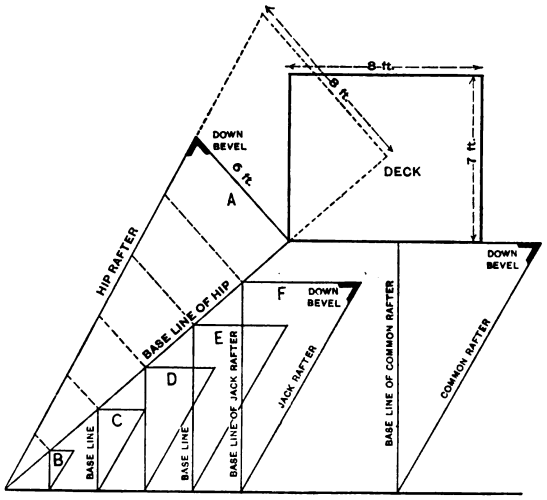


Sketch Submitted by "R. C. B." Showing Method of Obtaining Base Board for Circular Bay Window.

level while the bottom conforms to the slant of the floor. Now, cut out the base to show the desired number of inches, plus the fall of the piazza at the point H. Having found the length of the base tack the base on at G and at the perpendicular line F F', making the distance from the floor at F to the bottom edge of the base equal to the fall of the floor at H, which will equal the distance from F to F'. The arc F' G represents the base in a level position. Now, take the dividers and set equal to the distance from the floor at F and F'; then scribe on the baseboard from F to G. If the base is made in one piece scribe from G through F to I. All that is necessary then is to cut the base to the scribed line and nail it in position, as all conditions will have been fulfilled.

Length of Jack Rafters.

From J. H. P. *Grinnell, Iowa.*—I submit a sketch which may be of interest to "H. W.," of Lebanon, Pa., whose inquiry appeared in a recent issue of *Carpentry and Building*. I do not claim exactness for the plan, but more particularly to show the principle of the rule. To find the length of the hip rafter, set the rise of the roof at right angles of the base line of hip as at A of the sketch. Do this whether for one-quarter, one-third, one-half, or whatever pitch is required. Then the hypotenuse of the triangle will be the length of the hip rafter. To find the length of each jack rafter transfer the distance indicated at the dotted lines (which should be at right angles to the base line of hip and touching the hip line) to the base line of jack rafters and at right angles to the same as at B C D E F. The hypotenuse of each will be the length of the several jack rafters. The sketch which I send is for one-third pitch and the jack rafters are 2 feet apart, each increasing in length by 2 feet. Of course any mechanic who understands the rule can find the variations in the length of each jack rafter of any pitch roof by experiment. The sketch is intended to cover a house 28 x 32 feet.



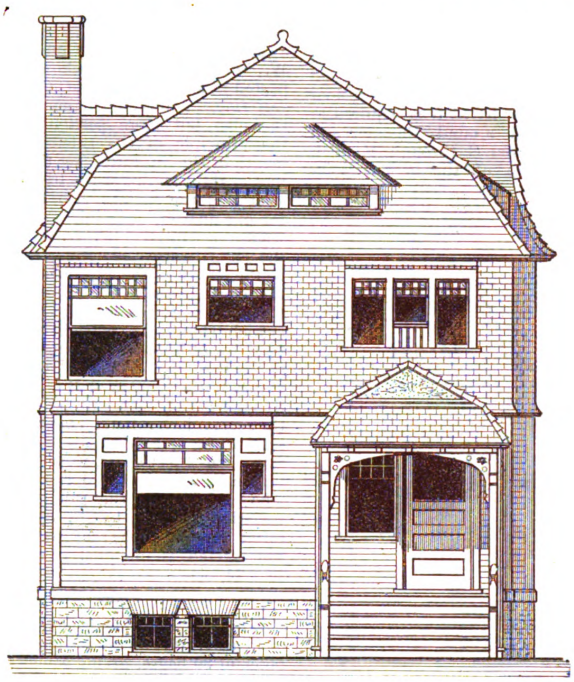
"J. H. P's." Method of Finding Lengths and Bevels of Rafters for Hip Roofs.

WE HAVE RECEIVED from the University of Pennsylvania an interesting little pamphlet of 30 pages, giving somewhat in detail the course in mechanical engineering at the college named for the year 1889–90. The little pamphlet contains all the information necessary for those who contemplate a course in the university, particulars being given as to the various courses of study, what is necessary on the part of candidates for admission, and the examinations which must be passed. A list of the work required of all students taking the regular full course leading to the degree of mechanical engineer is a feature. In the closing pages of the pamphlet is found a description of the steam laboratory, the provisions for shop work and remarks upon the department of electrical engineering.

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ATTRACTIVE STREET ARCHITECTURE.

IT WAS NOT VERY long ago that it was considered quite the thing to so design a block or row of dwellings that the external appearance of each individual structure should be severely like that of its neighbor, giving to them an effect which at the present day would be considered extremely monotonous. This practice, however, has gradually, but most surely, given way to a more attractive style of architecture, in which variety of effect is more largely sought. This tendency prevails not alone in the large cities of the country but also in the smaller ones as well as in villages and towns. The result is to increase the attractiveness of the street upon which the dwellings are erected, as well as to add to the beauty of the buildings themselves. In bringing about these desirable effects in external treatment, it often happens that one set of floor plans, with greater or lesser modification, is employed as the basis of operations.



Front Elevation.—Scale ⅛ Inch to the Foot.

The reason for this is found in the fact that while the general arrangement of rooms, as indicated by the floor plans, may suit the taste of a number of people who contemplate building, yet their views may differ widely when it comes to the matter of elevations and exterior architectural effects. This variation of external finish, especially in the case of moderate cost houses permits of very pretty architectural effects in a street where a row of dwellings are erected, involving practically the same floor plans. A very good illustration of the manner in which this plan is carried out is presented in the plate which forms our supplemental sheet this month. It shows a row of moderate cost houses erected in Detroit, Mich., from designs prepared by A. C. Varney & Co., architects, of that city, each house being based upon practically the same set of floor plans. The first design which is presented upon this and the following pages represents a neat eight-room house, which the architects state cost about $2100. Upon the first floor will be found four rooms, in addition to a large hall, which is entered directly from the porch. From this hall open the parlor and sitting room, while from the latter opens the dining room. The kitchen, it will be observed occupies an extension in the rear. Upon the second floor are four sleeping rooms and an ample bathroom. The stairway rising from the side of the house, near the center, permits of ready access to the various sleeping rooms, while comparatively little space is used by the hall. This design is worked out in the gambral roof style, with porch to match, making with the winke windows a very attractive house. The cellar extends under the whole build-



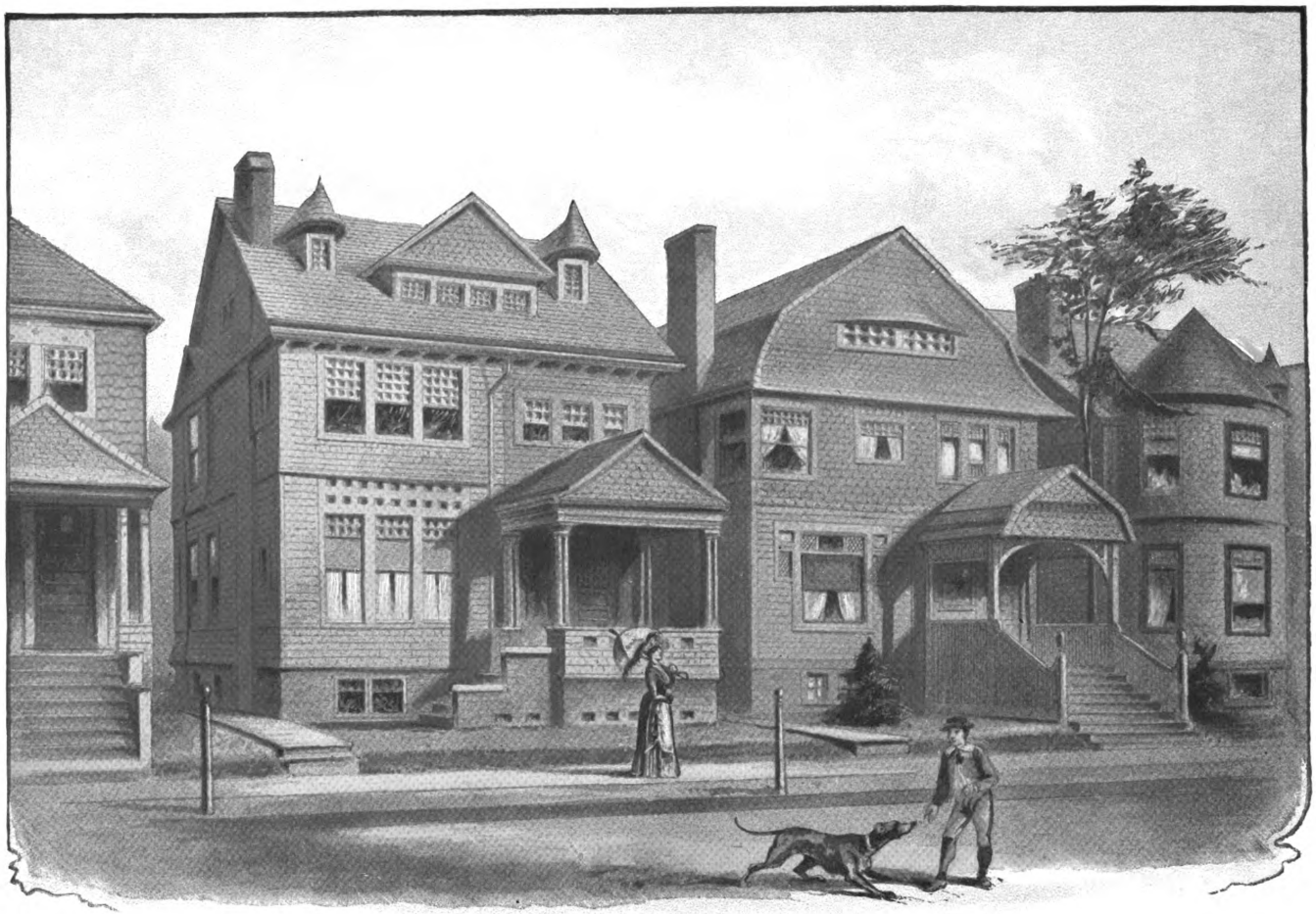
Side (Right) Elevation.—Scale. ⅛-Inch to the Foot.

Attractive Street Architecture.—One of a Row of Houses in Detroit.—A. C. Varney & Co., Architects, Detroit, Mich.

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ROW OF HOUSES IN DETROIT, MICH.

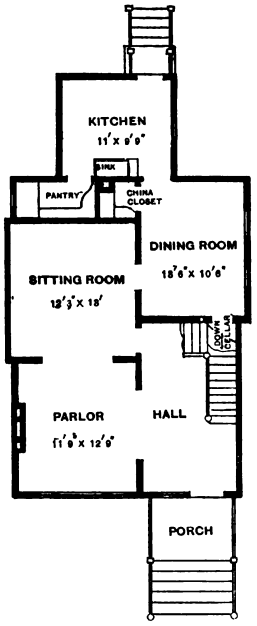
A. C. VARNEY & CO., ARCHITECTS, DETROIT.

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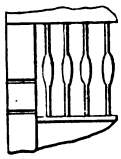
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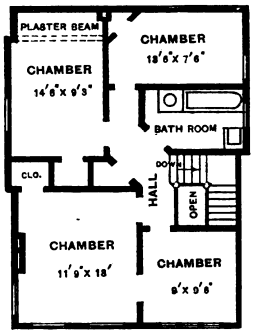
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First Floor.



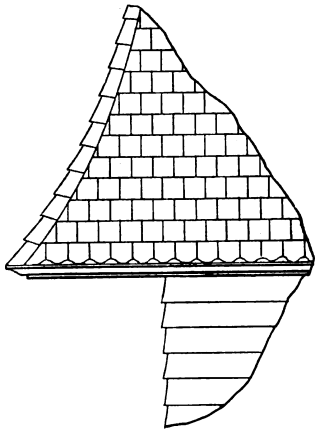
Spindles in Side of Porch.



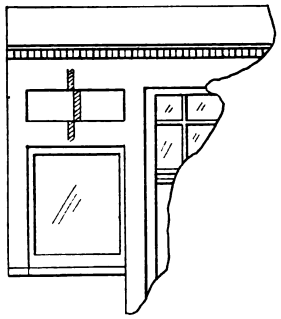
Second Floor.

ing, which is heated by a furnace. The bathroom is fitted with all fixtures for hot and cold water, and is finished in a style fully in keeping with the general design of the house.

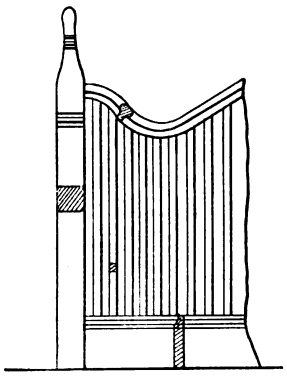
The second design, the elevations, floor plans and details of which are published upon pages 180 and 181 represents a house erected in Detroit for Mr. J. Connor, from plans prepared by the architects above mentioned. It will be observed by comparing the set of floor plans shown in connection with this design with those of the house first mentioned that they are practically identical, the only change being in the name of the rooms on the ground floor. In the present instance, the kitchen and shed in the rear occupy what in the other set of plans is the dining room and kitchen. This gives upon the first floor three rooms with a large hall, from which rise the main stairs. Upon the second floor are four sleeping rooms, together with bath room. The latter is furnished with tub, basin and water closet, and is supplied with hot water from the boiler in the kitchen. The house is heated by means of a furnace placed in the cellar. The first story of the house is covered with clapboards, while the second story is



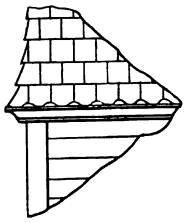
Detail of Main Cornice.



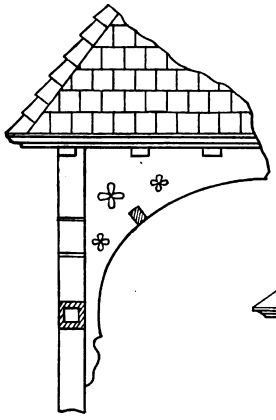
Top of Large Window.



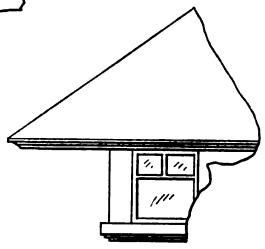
Detail of Side Steps.



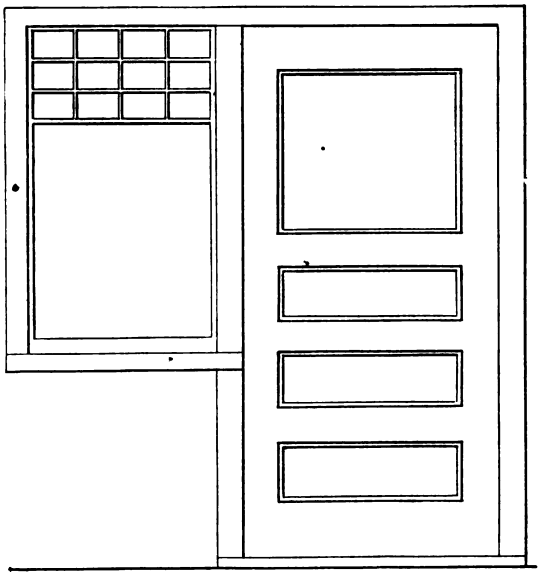
Belt Course.



Detail of Front of Porch.



Window in Gable.



Detail of Front Door and Window.

Attractive Street Architecture.—Floor Plans.—Scale 1-16 Inch to the Foot.—Details.—Scale ½ Inch to the Foot.

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shingled; the whole being painted in harmonious colors. It is stated that the cost of this house was $2,000.

Architect and Plumber.

The *Builder's Gazette*, of Pittsburgh, tells an amusing incident of the plumbers' strike in Pittsburgh that is not without its lesson for both architect and plumber, as it shows what a little determination, coupled with knowledge, at the right time may accomplish. It says the scene occurred in one of the new Westinghouse buildings at Wilmerding. At that time the plumbers' strike had been somewhat of an obstacle to the further advancement of the building, but Architect Peebles is one of those men who delight in overcoming obstacles. He is deeply learned in more crafts than that of architecture, possessing among other acquirements a practical knowledge of plumbing. On the day in question the work was delayed because a necessary connection between the pipe system was unmade. Mr. Peebles saw the difficulty and resolved to make the required connection himself. Accordingly armed with the necessary tools, he mounted a ladder and set to work in a business like fashion. Presently a walking delegate came along. He noticed Mr. Peebles at work, and asked him if he possessed a plumbers' union card. Mr. Peebles refused to reply. The man departed and returned in about ten minutes with a large delegation of plumbers, who demanded to see the architect's card. Mr. Peebles was now thoroughly roused. From his elevated position on the ladder he shouted: "I have no card. I am the architect of this building, which, until it is finished, is the same as my own house. I can tear it down or do anything I choose with it without asking the opinion of anybody." The delegation then took the floor and became highly argumentative and even threatening. Finally the superintendent, Mr. Walsh, discharged all the plumbers in the delegation. The baffled strikers marched off, glorying their martyrdom; while Architect and Plumber Peebles continued his pipe connection with a triumphant smile on his expressive features.

A Costly Gate.

One of the objects of interest to the visitor at Harvard College, Cambridge, Mass., is the gateway which connects Harvard and Massachusetts Halls, two of the oldest recitation buildings of the university. This gateway, which is of a style known as the "Flemish Band," comprises eight large square brick posts and two larger ones on either side of the driveway. These posts are capped with light sandstone, and are connected with sections of ironwork. Of course the driveway is in the center, and entrances for pedestrians flank each side. Each of these passageways is closed by a heavy iron gate, those in the driveway being double. The style is a reproduction of that prevalent in 1636, the year in which the college was founded. This idea is carried out by placing old fashioned square lanterns over the small entrances. Over the carriageway is an iron arch, bearing on its front the seal of the university, the date "1636" in bronze figures, with the date 1889 in similar but smaller figures below it.

In front of the entrance, which is so constructed as to form a recess from the street, are two large sandstone slabs, chiselled in old fashioned letters and with old fashioned spelling. One reads as follows:

By the General Court of Massachusetts Bay
28 Oct. 1636 Agreed to give 400 £
Towards a Schoale or Colledge, whereof
200 £ To Be Paid The Next Year & 200 £
When The Work is Finished & the Next Courvt
To Appoint Wheare & Wt Bvilding
15 Nov. 1637 The Colledge is ordered
To Be at Newetowne.
2 May 1638 It Is Ordered That Newetowne
Shall Henceforward Be Called Cambridge
13 Mch. 1638-9 It Is Ordered That The Colledge
Agreed Vpon Formerly to Bee Bvilt at Cambridge Shall Be Called Harvard Colledge.

The other slab bears this inscription:

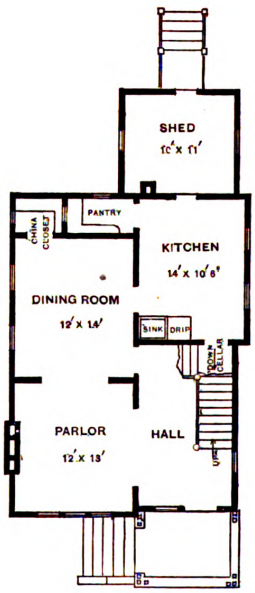
After God Had Carried Us Safe to New England and We Had Bvilded our Houses
Provided Necessaries For Our Livelihood
Reared convenient Places For God's Worship
and Settled the Civil Government
One of the Next Things We Longed For
And Looked After Was To Advanced Learning
And Perpetvate It To Posterity
Dreading to Leave An Illiterate Ministery
To The Chvrch When Ovr Present Ministers
Shall Lie In the Dvst
New England's First Frvits.

On the face of the large left-hand post is the seal of the Commonwealth, while on the back is the seal of the City of Cambridge. The right-hand post bears on its face the seal of Harvard University, and on the back that of Samuel Johnson, of Chicago, the alumnus who first gave the money to build the gate. Under each of the inscriptions outside there is a stone bench, while inside there are two drinking fountains.

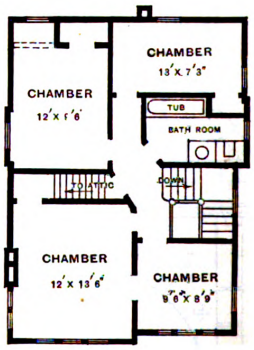
Mr. Samuel Johnson, who gave the college such a unique gift, is a graduate of the class of '55. He first gave $10,000, and when he learned that more was needed in order to carry out his idea, the sum was



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



First Floor.

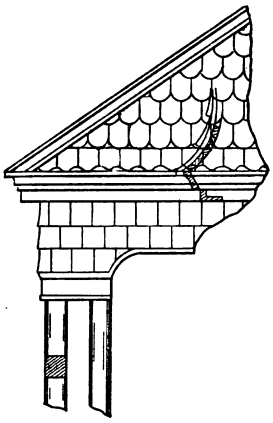


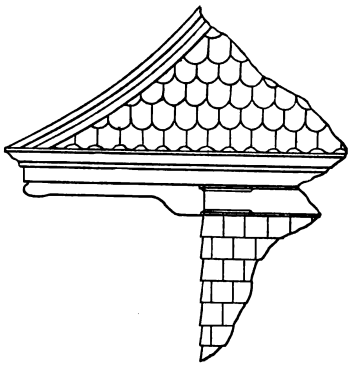
Second Floor.

Scale, 1-16-Inch to the Foot.

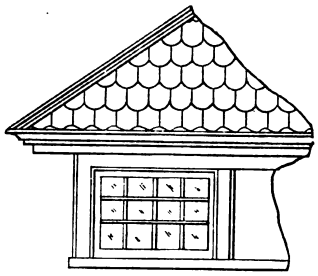
Attractive Street Architecture.—Another House in the Same Row.—A. C. Varney & Co., Architects, Detroit, Mich.

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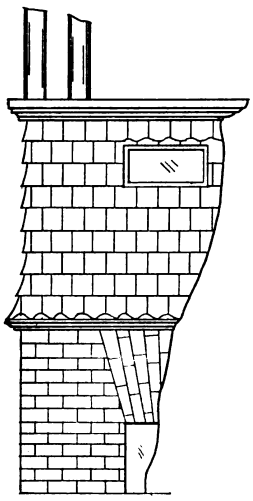




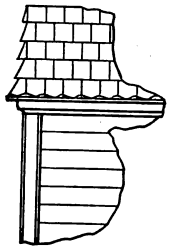
Detail of Main Cornice.



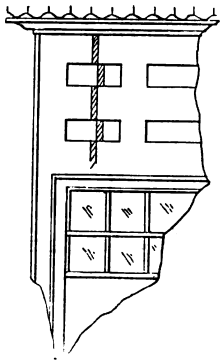
Large Dormer Window.



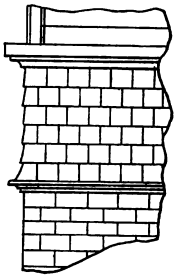
Detail of Porch.



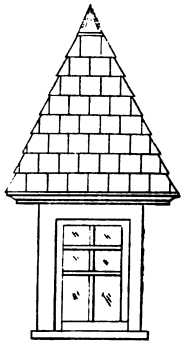
Belt Course.



Detail of Panels Over Windows.



Sill Course.



Small Dormer Window.

Details.—Scale, ½-Inch to the Foot.



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

Attractive Street Architecture.

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increased to $18,000. The architects were Messrs. McKim, Mead & White, of New York.

A Folding Chair.

Folding chairs are sometimes not at all comfortable seats, says a writer in an exchange, but the one at present under consideration cannot be classed with these, as it makes, perhaps, the finest lounge chair one could have. There is the most



A Folding Chair.—Fig. 1.—Chair Ready for Use.

perfect freedom felt whenever one sits down on it, so that one feels in no hurry to leave its pleasant embrace. As will be seen, it may be used at four different angles or positions, and when wanted put out of the way, may be folded quite flat, as seen in Fig. 2. Fig. 1 shows a sketch of the chair in its most upright form but one, while there are two other positions it may be put in with a great amount of inclination. To enable any one to work accurately, Figs. 3 and 4 give drawings of front and side view. All the pieces

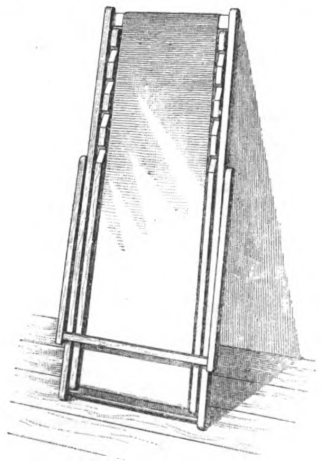


Fig. 2.—Chair Folded Flat.

shown in Fig. 4 measure 1½ inches by ⅞ inch, and have the corners rounded off, as shown in Fig. 5, which is drawn full size. The top rail and seat rail, over which two pieces the carpet or other material is stretched, are each 1⅞ inches by 1 inch, and are mortised into their respective posts. At the other ends of these posts are placed round or octagonal rods 1 inch in diameter.

In making up this chair it will be noticed that there are three frames. One has the front seat rail at one end, and a round rod at the other, which rests on the floor; on the upper surface of this frame, and at this same end, there are four notches cut, as shown in Fig. 6. Make the first notch 3 inches from the end, the next 6 inches, the next 9½ inches, and the last 13 inches from the end. The second frame contains the top rail at one end, and a round rod at the other. The third frame has two arms, connected at their lower end by a square rod, 1 inch square, with the "arrises" run off, to save them from being readily chipped or bruised; this rod rests in the notches already cut in the first frame described.

The three different frames are fastened together with long rivets, four of them are all that is required, and they should not be made too tight. A washer should also be put between each piece of wood, to prevent the pieces rubbing on each other. A

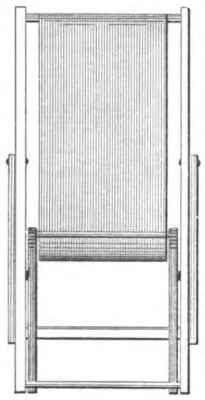


Fig. 3.—Front view of Chair.

strip of carpet, 1 foot 2 inches wide and 4 feet 6 inches long, is nailed to the top and seat rails, taking the carpet over and round the rails, and nailing it securely on the inner side. The different thicknesses, &c., given are for ash wood, this being sufficiently strong for its purpose. As everything is so light, it would be as well to see that all the joints are well fitted and firm, to insure a steady, firm and useful chair.

The Jerry Builder in Melbourne.

The greedy landlord is rampant in Melbourne as in other parts. The "land-grabber" appears to be as obnoxious and objectionable an obstructive to light and health as he is in the metropolis and our provincial towns. A writer in the *Building and Engineering Journal* of Australia and New Zealand, complains of the selfish policy of the "land boomer" as he has affected Melbourne. The so-called "land boomer" is the "jerry builder," and has done apparently as much damage to the suburbs of this once beautiful and charming city as he has in the neighborhood of most towns. Houses by the hundred are erected, but without a chance of letting, to the manifest injury of other houses in their immediate vicinity. Then we hear that in most of these houses sanitary laws are quite neglected, the consequence of which is that a virulent form of typhoid and diphtheria has broken out in one locality. The evil complained of is that which we deplore—the sacrifice of light area, the covering of every available space to gain more accommodation. The same writer criticises the plans submitted in the recent competition for the Commercial Bank of Australia. The offices were in many cases arranged in positions that could not be properly lighted, the object of the competitors to obtain office accommodation being gained at the expense of proper lighting areas. These comments are instructive as showing that in a comparative recent town like Melbourne, situated in a sparcely populated country like Victoria, the very same tendency of overcrowding is manifested, and that builders

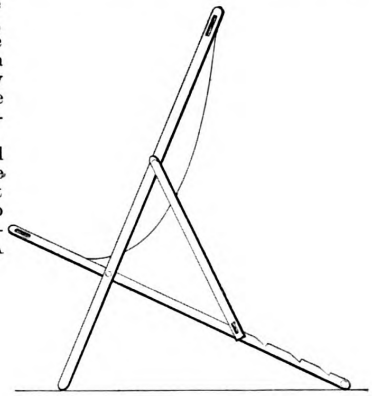


Fig. 4. Side View.

and architects are playing into the hands of speculators. The rectangular division of towns has certainly not been favorable to light and air, as the plots on which buildings are erected are reduced to the smallest area.

A Monster Tree.

Fred. W. Clough, a well-known engineer of the Comstock, has been spending some weeks in the wilds of the Sierras,



Fig. 5.—Showing Method of Finishing Corners.

says the Amador *Sentinel*. He was accompanied by Westley Warren, an old Comstocker, residing in Tulare Valley. Mr. Clough says that on the trip they discovered a tree of sequoia species, which he believes to be much the largest on the continent of America. Mr. Warren, who has seen the big trees of Mariposa, those of the Big Tree Grove in Calaveras County, and all the big trees of the Coast Range, says there is in no place in California a tree that approaches this one in size. Mr. Warren measured the tree with his

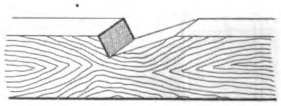


Fig. 6.—View of Notch Cut in Frame.

rifle, which was 4 feet in length. He found it to be 44 lengths of his gun in circumference at a point as nigh above the ground as he could reach. The top of the tree has been broken off, but it is still of immense hight. This monster tree stands in a small basin near the Kaweah, and is surrounded on all sides by a wall of huge, rugged rocks.

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The Builders' Exchange

CONDUCTED BY WM. H. SAYWARD.

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Valedictory and Salutatory.

One year ago an official paper was established by the National Association of Builders, with the secretary of the association, as editor, for the purpose of having a regular and systematic method of presenting the purposes, objects and work of the body to the members throughout the country. The plan was largely experimental, as it was somewhat a matter of doubt as to the interest that would be taken in it, as well as the power of the secretary to sustain the added weight of responsibility entailed. The year's experience has settled both of these questions most completely. Interest has been thoroughly awakened and the value of a regular medium of connection with the membership has been demonstrated beyond a doubt; but it has also been proven that the secretary could not continue to sustain the wear and tear consequent upon the maintenance of a separate publication, without serious embarrassment. To abandon entirely a means of keeping the membership informed as to work in progress, the conditions existing in localities where filial bodies exist, the methods which are being tried to secure better practices, as well as general dissemination of news peculiar and important to the interests involved, was a course not to be thought of, and the Executive Committee sought at once for a means of relief for the secretary, and at the same time a continuance of the good work so thoroughly established and so necessary to the association.

The opportunity they were seeking came at the fortunate moment, and from a quarter which seemed to offer peculiar benefits and most appropriate connections. A journal of high standing and thorough equipment, with interests already committed to the building fraternity, proffered a scheme for amalgamation which seemed to the committee most attractive and promising, offering advantages alike to both parties concerned.

An agreement has been consummated with the publication referred to, and the present number of *Carpentry and Building* begins an existence which is to comprehend not only a continued devotion on its part to those general interests of the building fraternity, which it has always been most actively and consistently befriending, but also a special and particular interest and concern in the work of the National Association of Builders, giving its influence to the promulgation and extension of the undertakings of that body through its columns, and by means of the wide and varied constituency which it addresses, embodying as it does all branches of business in any way connected with the building trades.

Under this new dispensation and with the peculiarly favoring winds which will now lend their aid to guide and advance the interests of the National Association, it is fitting that the secretary (who is to be aided personally by the arrangement referred to, and while relieved of much business detail, is still to have a liberal opportunity for editorial representation), should say a few words of parting and greeting.

Looking backward, then, the editor of *The Builders' Exchange* desires to express his gratification that his efforts to place before the membership at large the current news from local bodies, as well as give expression to thoughts in relation to reforms

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pressing for consideration, not only from his own pen but from the pen of others, have been so largely and warmly appreciated. It has been almost too encouraging, for the approval of one's constituency sometimes urges to over-exertion which is often fatal to the work and the person. This approval and appreciation has shown most surely that there is a large and ever increasing work for those connected with the business of building, and for all time to come the need will exist for special and persistent effort in the interest of builders.

Looking forward, the secretary congratulates himself and all future secretaries of the National Association, as well as the association itself, upon the great benefit accruing from the active co-operation of such a thoroughly established and powerful journal as *Carpentry and Building*. In this amalgamation of interests lies the greatest promise for future development, and by the aid of the counsels of its able editors and publishers, with the large staff of assistants constantly in service, all fields may be successfully cultivated and a rich harvest result therefrom.

The secretary simply transfers his labors, a division of the burden releasing him to greater freedom; therefore he feels the greatest satisfaction in bespeaking for the dual journal the patronage and favor of all filial bodies and all individual members of the National Association, promising them greater and better service under the new *régime*.

WM. H. SAYWARD.

The Fiat of the Freestone Contractors of New England.

After numberless attempts by freestone contractors to secure some kind of harmony between themselves and their stonecutters without avail, the members of the Journeymen's Freestone Cutters' Association were locked out by the Freestone Contractors' Association, of Boston, and for their own and the protection of their non-union stonecutters, the Progressive Association of Journeymen Stonecutters' was formed under a set of joint rules between the two—the employers and the employees—the result of which has been fully as successful as was anticipated.

The old Freestone Cutters' Association has been restive under the lockout, and their action, which has been fully discussed in the columns of *The Builders' Exchange*, has resulted in the sending of the following letter to them by the Freestone Contractors' Association:

To the Journeymen Freestone Cutters' Association of Boston, Providence, Springfield, &c.:

A letter from your association, under date of July 14, 1890, is hereby acknowledged. The substance and the tone of the communication show most unmistakably that you do not understand the position of the contractors as represented by the action taken by their association. The meeting with you of last Thursday, the 10th inst., was simply an interview granted at your request by the contractors for the purpose of listening to your questions, and informing you more definitely and fully as to the possibility for you, as journeymen, to obtain employment with us. This meeting was not a conference with power to treat with you or effect any settlement of differences pending between you and us. There are no such differences, and there can be no such conference; for, as stated to you in our letter of March 11, 1890, in the absence of any effort on your part to settle all matters at issue by arbitration on or before March 17, 1890, we should no longer consider you as a body of any authority in the premises. We do not ignore the existence of your association, for you have a perfect right to organize to your heart's content; but having long ago exhausted every means to secure through your organization just and equitable methods for the conduct of work, and having notified you that you had, by your refusal to arbitrate, forfeited your right to recognition as a proper body for us to treat with, we again emphatically reiterate the proposition and inform you that we propose to maintain it most forcibly and irrevocably. We desire you should understand that, having been forced by your obstinacy to aid in the establishment of a new society of journeymen, we have taken pains to see that it was founded upon principles of justice and honor, such as we could heartily support, and henceforth this union and others similar to it will be the ones which we, as contractors, will recognize as bodies fit to confer and treat with. The condition to-day is simply this: Journeymen stonecutters can obtain employment of us on the terms agreed upon by the joint committee of the Freestone Contractors' Association of New England and the Progressive Association of Journeymen Stonecutters of New England, and none other.

(Signed) W. J. SULLIVAN, Secretary.

The following firms were represented at the meeting and signed the letter: Estate of E. F. Meaney, Boston; James & Marra, Springfield; P. J. Campbell, Boston; F. C. Markham, Providence, R. I.; Hall & McCormick, Holyoke; R. J. Rutherford, Evans & Toombs, Charles H. Dodge, Jeremiah Carew, Carew & Dailey, W. J. Sullivan and F. G. Coughlin & Co., of Boston; J. P. Faltt, William Mitchell, Nims & Russell, Charles Burton and E. D. Stone, of Springfield; William Kaebell, O'Brien & Van Nostrand and Peter Small, of New Haven; Burns & Laughlin and Cutting & Bishop, of Worcester; Gervis & Gordon and P. F. Mead, of Holyoke; Charles Jackson & Son, of Waterbury, Conn.; McDougal & Cristy, of Bridgeport; Shea & Donnelly, of Lynn.

The stonecutters have brought this condition of affairs upon themselves by the most unreasonable and unjust course which they saw fit to pursue, refusing to assist in any way at an adjustment of the differences (so called) between them and their employers previous to the lockout, and maintaining a most arbitrary and dictatorial attitude toward the contractors.

The foregoing letter is the ultimatum of the Contractors' Association, and no stonecutters will hereafter be employed, save upon conditions named. The conditions have been published and the most favorable opinion has been expressed upon them as being just and honorable, and giving promise of a solution of the disturbances which have and are agitating the labor world. The conditions or joint rules are quite as applicable to other branches of the building business as to the freestone portion, and the general adoption of similar rules by associations of employers and associations of employees would immeasurably facilitate the establishment and maintenance of harmonious relations between the two, who have so much in common.

Exchange News.

Wheeling, W. Va.

The following agreement was submitted by the Builders' Exchange about the middle of June, to the conference committee of the trades council and was agreed to by them; but, upon the report of the committee to the council, they were informed that the strikers would not abide by their decision. The result has been that the strike is still maintained and apparently as far from settlement as ever.

Every possible means has been taken by the contractors to secure amicable settlement of the differences, but they have been met on every hand with stubborn refusal to every plan they have offered. The strikers have used the boycott as their strong weapon for forcing the contractors to yield to their terms.

Building has been entirely suspended ever since the beginning of the season and there is little prospect of its being resumed very soon.

The following is the agreement mentioned:

WHEELING, W. VA., June 9, 1890.

This agreement made this day by and between the Builders' Exchange of Wheeling, W. Va., as the first part, and all unions represented in the building trades known as the United Building Trades Council of Wheeling, W. Va., of the second part, is as follows:

The parties of second part agree to work on all work now being done and to be done during all the time this agreement is in force with parties of first part.

The parties of the first part agree not to object to all present employees joining such labor or trades union as their trade belongs to, provided the said employees join of their own free will and without being forced or intimidated to do so.

The parties of the second part agree not to interfere in any manner whatsoever, with the parties of the first part, in selling, contracting and furnishing material and labor necessary for the full completion of all work they may have or take.

The parties of the first part are to have the privilege of discharging any workman for neglect of duty or incompetence without any interference from parties of the second part.

The parties of the first part being master builders or contractors, are to have the privilege of working on their own work without interference from parties of second part.

The parties of the second part are not to demand trade cards of present employees of the parties of the first part, and are not to stop work by reason of no trade cards from these employees.

The parties of the first part and parties of the second part agree that nine hours shall be a day's work, and that workmen shall be paid by the hour. The parties of the first part agree to pay stonemasons and stonecutters 39½ cents per hour, of nine hours scale, and to take effect at once. The parties of the first part agree to pay to the carpenters an advance of 10 per cent., to go into effect July 1, 1890. The parties of the first and second parts agree that no further changes be made in the scale of wages for 1890, than those herein mentioned. The parties of the first and second parts are to arrange upon the scale of wages during the month of December, to take effect April 1 following.

It is agreed that all differences that may arise outside of this contract will be left to an Arbitration Committee from the Builders' Exchange and parties of the second part to settle.

The parties of the first and second parts agree that all past differences, boycotts and discriminations shall be removed from all members of the first part.

The parties of the first and second parts agree that all overtime be paid for at the rate of time and one-half time, and double time for Sunday.

The parties of the second part agree to not interfere with parties of first part in employing competent men in any trade, when such labor cannot be furnished by said labor union.

The following clipping from the Ohio Valley *Manufacturer* shows to some extent what the master builders have been obliged to endure.

The striking carpenters have at length placed themselves completely out of the pale of public sympathy and consideration. According, even to the most liberal parliamen-

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tary usage, and in conformity with a custom, which has by universal observance become a law, the majority report of a committee, authoritatively appointed and qualified with power to settle questions at issue, binds the body that appoints such a committee.

This being the case, what kind of consideration are unions or corporations entitled to that ignore established principles and refuse to abide by authoritatively determined questions, unless such determinations accord with their own prejudiced opinions. This the striking carpenters have done, and their action is one of gross discourtesy and coarse contumacy to their own committee, as well as to the Builders' Exchange and the public.

The Builders' Exchange has been patient and indulgent with the strikers, in the way of acceding to their requests for frequent conferences of committees, and in not one of these conferences have the strikers manifested good faith or straightforward purposes. Patience and indulgence can be abused, as we all know from experience and by precept, until they lose their amiable characteristics and become virtuous opponents of presumptuous imposition and arbitrariness, and it is not exceeding warrant to state that the patience and indulgence of the Builders' Exchange has been about worn down to the quick.

So far as the public are concerned, this arrogant refusal of the strikers to abide by the majority report of their own committee can be construed but in one way—that is, as an overbearing attempt to reject the cardinal principle of our form of government, which guarantees independence of thought and action to each and every citizen, because the only pretext for refusing to confirm the report was that it did not summarily deprive the non-union workers, now employed by the master builders, of the right to support themselves and those dependent upon them by honest but independent labor.

St. Louis, Mo.

Secretary Walsh, under the date of July 10, writes that the members are busy, and that the building business generally continues good. There had been a scarcity of brick and building stone during the past few months, which had delayed operations to some extent, but that difficulty is now past, and everything is in first-class condition for the rest of the season and late into the fall.

A handbook of the Mechanics' Exchange is being prepared, which will contain general information regarding matters of interest to contractors, building laws of Missouri and similar subjects. This is the first handbook ever issued by the St. Louis association, and will be ready for distribution in a short time.

At the last quarterly meeting the subject of the proposed building to be built by the Exchange was again taken up and carefully considered. It was decided to make a thorough canvass of the members before the next meeting, for the purpose of ascertaining the amount of stock that can be placed at once. It is hoped that the matter will be taken up and pushed ahead, so that its success may be assured and the project begun as soon as possible.

Boston, Mass.

The situation in the Boston building world still remains practically unchanged. On July 17, the stone masons decided to strike for 40 cents per hour, but up to the 21st no strike had taken place.

The striking carpenters are still out and refuse to work because the Carpenter Builders' Association do not deem it best to grant an official recognition of their union.

Affairs among the stonecutters is alluded to in another column. The new journeymen's association which was formed under a set of joint rules with the contractor's association, has proved most successful in providing employment for stonecutters and securing harmonious relations between them and the contractors.

Building in the various branches is progressing with but little delay, although the effect of the disturbed condition of the labor market is making itself felt.

Pittsburgh, Pa.

A letter from the Pittsburgh Exchange, dated July 17, says that building is progressing quietly and every evidence points to a continuance of business throughout the season.

The trades' unions, which practically control the labor market of the city, are making extended preparations for a concerted action to secure shorter hours on the 1st of next May. The journeymen plasterers have made a demand for $3 per day after August 1. The contracting plasterers have not, at this time, decided whether or not they will concede the demand.

Boiler makers and iron workers generally have been making serious trouble in that trade. They have been striking for shorter hours, which have been granted in some cases.

Omaha, Neb.

Secretary D. J. Collins writes that building interests are moving along favorably, and that they have entirely escaped any labor disturbances and do not anticipate any trouble. The prospects for the rest of the season are brighter and a busy fall is expected.

The uncertainty of the result of the prohibition question is having some effect upon the investment of capital, and has been holding operations back to some extent.

Notes.

The master masons of New Haven propose to protect their workmen from intimidations or injury by striking workmen. A reward of $100 has been offered for the apprehension of any person attempting to intimidate workmen.

During the past month a serious strike has been in force in Duluth, Minn., among the street laborers, which resulted in the calling out of other laborers. The carpenters all struck, to compel such contractors as were working more than eight hours to yield to the short day demand, and the plumbers went out to help the carpenters secure their end.

Australian Exchanges.

A recent letter from Mr. Edmund A. Hunt, editor of the *Building and Engineering Journal*, of Melbourne, who is very much interested in the establishment of builders' exchanges in Australia upon the lines which have proved so successful in the United States, says that builders are taking hold of the subject favorably, and that much promise is given of the institution of exchanges in the larger cities of Australia in the near future.

Builders' associations have long existed in that country, but in a manner entirely distinct from our plan, such as is in vogue in Philadelphia, Chicago, Kansas City, Boston and other large cities. The idea of a 'change hour, at which time builders can be found upon the floor of their exchange regularly each day, is entirely new and novel, and the full value of such a plan is not fully patent to them yet.

The following clipping from Mr. Hunt's journal indicates the activity with which the subject has been taken up:

The Committee of Management of the Melbourne Builders' Exchange have secured the premises in Flinders street, until recently occupied by Messrs. Robison Bros., for a term of three and a half years at a rental of £600 per annum. Plans have been prepared by Mr. Alan C. Walker, of 34 Queen street, and Messrs. Chas. Butler and R. C. Brown have generously volunteered to make the necessary alterations at cost price. The work will be proceeded with at once, and it is confidently anticipated that the building will be ready for occupation on or before July 1. A better site could hardly have been chosen, and now that the exchange is practically an accomplished fact, most of those members of the building trade who have not already signified their intention of joining will, doubtless, send in their names to the secretary, Mr. C. W. Miles, at his office, Victoria Buildings, Swanston street, especially as we understand that it is the intention of members to enforce an entrance fee immediately the building is opened.

A New Exchange.

A new exchange has been established in San Francisco upon the following lines, which we take from the *Pacific Lumberman and Electrician:*

1. To join in one association all mechanics, manufacturers and dealers of good repute doing business in the city and county of San Francisco, whose vocation connects them wholly or generally with the industry of building, either as an employing contractor in any branch of the building business, or as a manufacturer of or dealer in material used and employed in the erection of buildings or other structures.

2. To establish and maintain among the individuals thus associated a just and equitable system of dealing, and a uniformity in commercial usrges by rules and regulations. To acquire, preserve or disseminate valuable information regarding the business in which they are severally engaged.

3. To procure (either by lease or purchase) and furnish and maintain suitable rooms for the use of its members for meeting rooms, offices and other purposes.

4. To establish and enforce a system of arbitration for the settlement of disputes or misunderstandings which may arise between its members.

5. To collect from its members certain percentages upon the business transacted by them, to hold the same in trust and as security for the payment of all liabilities incurred by such members with the association, and to invest and manage the same in accordance with the provisions of the by-laws.

The admission fee for the first 30 days and until the membership reaches 200 will be $25, and from that time until the membership reaches 400 it will be $50; after that time it will be $100.

Annual dues, including use of rooms, stationery, &c., will be $24.

A Word From Pittsburgh.

The following clipping from the *Builders' Gazette*, of Pittsburgh, happily expresses just what the National Association of Builders has been striving for ever since its inception—the establishment of methods which shall surround the building business with conditions similar to those of any other mercantile persuit:

In the course of conversation a few days ago with a prominent member of the Builders' Exchange, the gentleman remarked to me that there was "a pronounced improvement and development in the general intelligence of the American mechanic." This is, assuredly, a fact. Proof exists in the elevated character of all the trades, and especially in the standing and influence—both from social and commercial standpoints—of master mechanics. The outgrowth of this advancement is a federation such as the exchange represents, and through which the expanding influence of interchanged thought produces that condition of fraternity, liberal mindedness and laudable aspiration that has gradually elevated an undefined plan to the dignity of a power. There appears no good reason why the subordinate bodies of the National Association of Builders should not take character with the board of trade, boards of commerce, mercantile exchanges and kindred institutions. The mechanical arts at the present time are fostered by a literature that is scholarly, and their operations are measured by a standard that affords scope for the employment of the richest brain material in the land. In every city where spires, domes and turrets denote the skilled handicraft of the conscientious artisan, will be found assemblages of mechanics who are united in a purpose for mutual advancement and protection, and whose future prosperity depends upon the safeguards of that prudence and intelligence which underlie the constitution of all the builders' exchanges throughout the United States.

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THE INTERDEPENDENCE OF MEN.*

BY EDWARD ATKINSON.

THE SUBJECT of this address has been given you, under the title of "The Interdependence of Men." In dealing with my problem I shall take what I believe to be the true, but somewhat unpopular, position in justifying what is commonly called competition, and in presenting the competitive principle to you as the most potent form of mental energy in promoting human welfare. Neither capital nor labor, nor both combined, would be capable of changing the apparent law that population tends to gain upon the means of subsistence, were it not for the aid or support which is given to both capital and labor by the mental factor which enters into the production of material products and gives the right direction to natural forces. The means of subsistence have gained rapidly upon the increase of population, especially during the present century, which has been, on the whole, a century of commerce rather than of war. I am most fully convinced that greater and greater progress in material welfare will be developed in the future, as compared to the past, for the very reason that human life itself is sustained by a conversion of material forces over which the mind of man has been given dominion even more fully than over the beasts of the field. It is a profound mistake to attribute the production of material substances wholly, or even mainly, to labor. Witness the fact that the more the physical labor is saved in production, the more abundant becomes the product in ratio to the amount or intensity of the labor required.

HOW TO GET A LIVING.

I suppose that some of you have begun to treat the problem of how to get a living. The way to get a living is to do something for your neighbor better than he can do it for himself. He will pay you, not according to the amount of work or the kind of work that you do for him, but according to the amount of work that you save him from doing. That is the law of competition, its fundamental principle, and it is a most important principle, which is very seldom considered. The so-called labor reformers are apt to claim equal pay for equal work, and they are very apt to measure the work by the time required to perform the manual or mechanical work, rather than by its effectiveness. The whole conception is a false one. Every man makes his own rate of wages and his own rate of earnings, whatever they may be and however gained, only by his power to save other people a part of the time and of the effort which they must otherwise devote to getting a living, or to securing what they want for their own enjoyment. All commerce is of necessity altruistic, however selfish its motive may be. No man deals with another except the other man gains in what he wants more than what he parts with.

Now, there are many excellent persons who conduct their business strictly for the well being of others, without in the least degree comprehending that in so doing they are obeying the very precepts of Christ, and are meeting the conditions of that saying which includes the whole of the law and the gospel. The vast body of men and women who do the work of the world must serve each other in their day and generation by totally different methods. In the exchange of services by which civilized man now exists, the work must be done for value received. This is the necessary rule in the conduct of all commerce. No matter what one's desire may be, no matter how one's emotions may be stirred by observing the arduous struggle for life among those with whom he deals, every man must conduct his business transactions under this stern rule for value received; he must render service for service in equivalent measure. Unless that rule is established, society might be reduced to anarchy and even to starvation. One must deal with those whom he employs or whom he serves in the ordinary sense only in this way.

DISPOSITION OF TIME.

There is but one factor in human life which all may or must enjoy in common, and that is time. Each man controls 24 hours in each day. What will he do with them? Within this limit of time all that the State can do in providing for its disposition is to assure to each man and each woman an equal opportunity to devote as much time to the work of getting a living as the condition of each person may require. In the disposition of the time of adults the State may rightly establish the number of hours which shall be considered in law a day's work in cases where no specific number of hours has been named in the contract. When the State goes beyond this and undertakes to limit the hours which any one person may devote to a given occupation, the State then of necessity interferes with the individual freedom of contract. If the State possesses the power, is this expedient? I do not undertake to say that there may not be some extremely noxious or arduous conditions of work which are so bad that none but very incapable persons can be induced to undertake them; therefore the State, in its function of making police or sanitary regulations, might perhaps be justified in imposing a limitation on the hours of such noxious, but necessary, work. You will observe that through the competition of inventors noxious and dangerous conditions of necessary work are being gradually removed. But noxious work is an exception which does not constitute a rule. Moreover, the arts which are most noxious in their conditions are generally the very ones which are conducted on what may be called the individual principle, and not the factory principle or collective method, to which restrictive laws are commonly applied. There are other kinds of work on which limits cannot be put, but which must of necessity be continuous, like the work of the iron furnace. Men are induced to take up such work of their own free choice, notwithstanding the long and arduous hours, because the earnings which they attain are more than they can get in any other way. Should they be forbidden?

(To be continued.)

* Extracts from an address before the Phi Beta Kappa Society, of Dartmouth College, June 25, 1890.

Reduction in Hours of Labor.

The following is the current report of the progress being made in the effort to secure shorter working days for carpenters and builders, published in the last issue of our contemporary, the *Carpenter:*

FORT WORTH, Tex.—Union carpenters here established the nine-hour day July 1.

ATLANTIC CITY, N. J.—On June 18 Union 428 established its demand of $2.50 per day for nine hours.

LANCASTER, Pa.—Union 208 inaugurated the nine-hour day in all the planing mills of this city July 1.

HAMILTON, Ohio.—Union 637 organized this spring; since then the contractors have advanced wages 25 cents per day.

BELLAIRE, Ohio.—Carpenters at Dubois and McCoy's Planing Mill have got an advance of 25 cents per day in wages.

DAVENPORT, Iowa.—Union 554 has established the nine-hour day Saturdays, and is getting ready for a full nine hour day in 1891.

MANOR, Pa.—Union 569 has only been a short time in existence, yet it has increased wages 25 cents a day this season and got the nine hours a day.

NEW BEDFORD, Mass.—On June 2 after one week's strike, the union carpenters of this place establised the nine-hour day, and the masons and painters also fell into line and got the nine hours.

SAN JOSÉ, Cal.—On July 1 Union 316 went on strike for the eight-hour day and got it. Some contractors held back, wanting to reduce the pay. We then arranged that no union man shall work for less than $3 per day for eight hours.

CINCINNATI, Ohio.—On July 9 and 10 the carpenters of this city went back to work victorious after holding out a month. They established the nine-hour day and organized the city thoroughly. All the building trades struck work to aid the carpenters. This is one case where the bricklayers deserve credit.

EAST ST. LOUIS, Ill.—After a noble stand for two weeks the mill men of this city, under jurisdiction of Carpenters' Union 169, have gained the eight-hour day for all bench hands and nine hours a day for machine hands and laborers. They formerly worked ten hours a day. All the union carpenters are also working eight hours a day.

DALLAS, Tex.—Nine hours a day and $2.50 per day on all outside work.

A Bricklayer to His Trowel.

BY A. MORTON.

Bright, gleaming blade,
Thy praise I sing
As at my trade
I make thee ring.
With music sweet
Unto mine ear
While I repeat
The blows that fear
You not to rain
On brick so hard,
Nor temper strain
As I regard
Each brick I wish to try thee on.

As now I raise
Thee, swift on high,
And with thee blaze
And break away.
Or square the piece
I wish to lay
Of brick, nor cease
Till close of day,
Making thee ring
With tuneful sound
As thee I swing
And you rebound
From brick thy mettle's tried upon.

Well tempered steel,
Thus oft I've tried
You that I feel
An honest pride
In thee, bright tool,
That earns my bread
Since thee from school
My footsteps led.
At tender age
I did begin
My daily wage
With thee to win,
And with thee half the world have gone.

And may the hand
Wherein you've served
Each foreign land,
Only deserved,
Cast you aside
In naught but love
Till God shall guide
Me home above.
While life shall last
I'll love thee more
And more for past
Till life is o'er
And all my earthly work is done
And I am gathered to my home above.

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MEASUREMENT OF ROOFS.*

BY TRIANGLE.

IN FIG. 62 IS SHOWN a roof that is sometimes used on bay windows, and as shown in plan is one-half of an octagon. Fig. 65 shows the roof in perspective. Those that have followed the various articles on the measurement of roofs thus far would have little difficulty in determining the area of the roof from the plan and elevation, although the plan is different from any that have been used thus far in the illustrations.

In the elevation, *n b* gives the hight of roof, and *a b* the length corresponding to *e m* of plan. To obtain the shape of *f e m* of plan, proceed as follows: Draw *c d* in length equal to *a b* of elevation, and at right angles to *c d* draw *c g* in length equal to *e f* of plan, then by connecting *g d* we have the desired shape. For the shape of 3, 4 or 5 of plan, as shown by the dotted line in 5, they are composed of two triangles similar to *f e m*, and by extending *g c* to *h*, so that *g h* will equal *k l* of plan, and by connecting *h d*, *g h d* is the shape of 3, 4 or 5 of elevation or plan. By the rule previously given, to obtain the area of a triangle, we multiply the base by one-half the altitude or hight, or what is the same thing, multiply the base by the altitude and divide by two. Then to obtain the area of the triangle *g h d*, we would multiply the distance *g h* by one-half of *c d*, or multiply *g h* by *c d* and divide by two.

In Fig. 64, the same plan, an elevation has been used as in Fig. 62, only in place of part 5 of plan and elevation, a pediment has been introduced as shown by *a b e* of elevation, Fig. 64, and *f d a c e* of plan, also by *f b a d* of side elevation. Fig. 63 shows the roof in perspective. As 1, 2, 3 and 4 of plan are the same as in Fig 62, we will only obtain the shape of 6 and 7, which form the pediment. This could be done from the plan and elevation by extending *a c* and making *a b* and *b c* equal to *a b* and *b e* of elevation, then drawing *a d* and *c e* and connecting *d f* and *e f*. This method has been followed in obtaining the shape of roof under the side elevation. As shown by the dotted lines, *f b* of shape is the same as *f b* of side, and *a b c* of shape is the same in length as *a b e* of elevation. An inspection of the figures will show that *f d* of roof shape in Fig. 64 is the same as *g d* of roof shape in Fig. 62.

While the various shaped roofs that have been so far illustrated may cover a great part of the subject, there are many shapes that are worthy of attention, not so much on account of any difficulty the reader might have in estimating the various surfaces, but because the shapes are used in such a variety of ways that at first glance it might appear that the rules previously given would not apply to them. The reader who has followed these articles thus far must have come to the conclusion that there are few, if any, shapes that cannot be resolved into triangles, and as it has been shown that it is about as easy to obtain the area of a triangle as of a square, there should be no difficulty in obtaining the area of any shape. In treating of roofs they are considered as solids, the object being to obtain the area of the various surfaces. There are other shapes that have not been introduced into these articles that it might be well to consider, as there is no knowing what form the architects may give various parts of buildings.

A polygon is a figure having several angles and sides, as a hexagon or octagon. A prism is a solid having two faces that are polygons of equal size and parallel, which are called bases; all its other faces

* Continued from page 158.

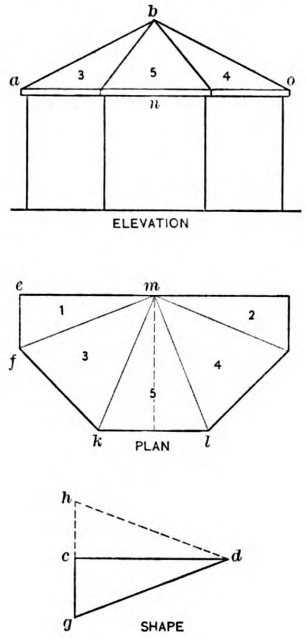


Fig. 62.—Elevation and Plan of Roof of Octagonal Bay Window.

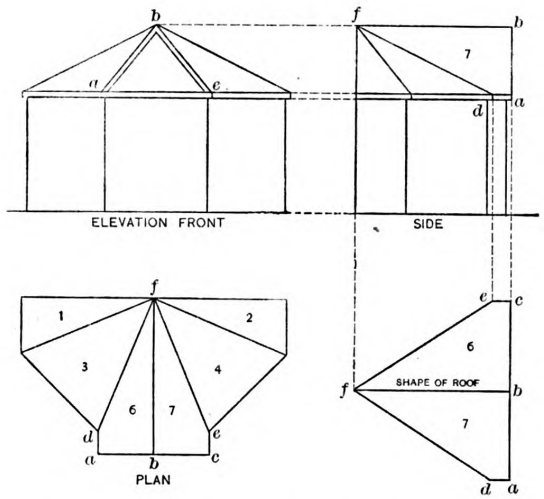


Fig. 64.—Pediment in Roof of Octagonal Bay Window.

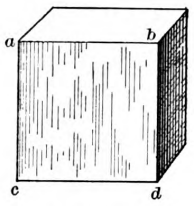


Fig. 66.—Cube.

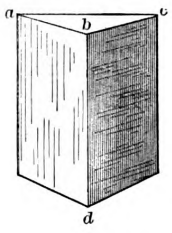


Fig. 67.—Triangular Prism.

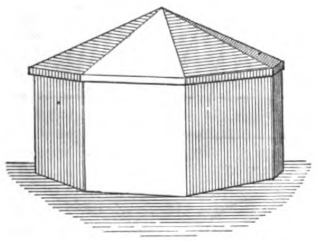


Fig. 65.—Perspective of Roof shown in Fig. 62.

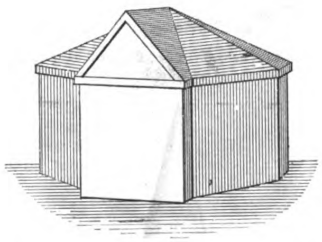


Fig. 63.—Perspective of Roof shown in Fig. 64

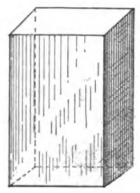


Fig. 68.—Quadrangular Prism.

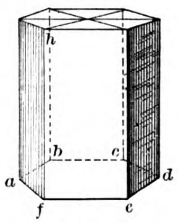


Fig. 69.—Hexagonal Prism.

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are parallelograms. A cube is a prism, all the faces of which are equal, as shown in Fig. 66, and if each of its faces, as *a b c d*, was 1 foot square, it is evident the entire surface would be 6 square feet.

To find the surface of the sides of a prism, we multiply the perimeter of the base by the hight. Then to find the surface of the sides of the triangular prism shown in Fig. 67, we would multiply the 4, 6, 8 and 7 feet respectively, would be obtained as follows: 8 + 5 + 4 + 6 + 8 + 7 = 33 × 10 = 330 square feet.

Steeples, spires, or pinnacles, can be considered as pyramids, cones, or frustrums of the same. A pyramid is a solid having a straight-sided base and triangular sides terminating in one point or vertex. Pyramids derive their name from the polygon forming the base. The slant hight of a pyramid is the distance from the vertex to the middle of one side of the base. The altitude and axis of a pyramid or cone is the length of the perpendicular let fall from the vertex to the plane of the base, all as shown in Fig. 70. In Fig. 71 let *a b c d* represent the plan of a quadrangular pyramid, and *f k h* the elevation. The point *e* in plan corresponds with the vertex *k* of elevation. To obtain the surface of the sides of a pyramid, multiply the perimeter of the base by half the slant hight. This has been partly done in the diagram by making *l m* equal to *f h*, and *s n* equal to the slant hight *h k*. The area of one side is shown by *n' r' x' s'*; *n' o' p' s'* being equal to *l o p m*; *n' r' o'* to *o n r*, and *s' p' x'* to *r n p*. The area of *n' r' x' s'* being taken four times, would give the surface of the sides of the pyramid. The dotted line *k n*, which is parallel with *f n*, shows the difference in hight between the elevation and slant hight of side.

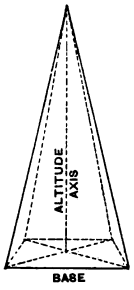


Fig. 70.—Quadrangular Pyramid.

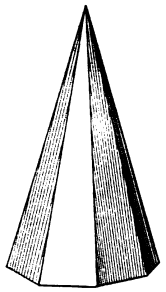


Fig. 74.—Octagonal Pyramid.

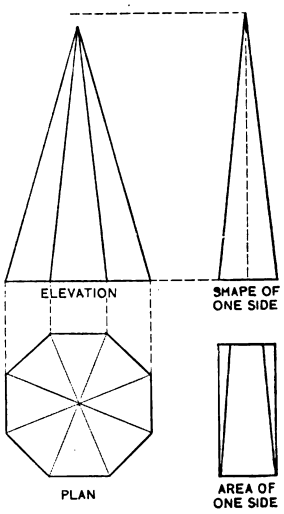


Fig. 75.—Elevation, Plan, &c., of Octagonal Pyramid.

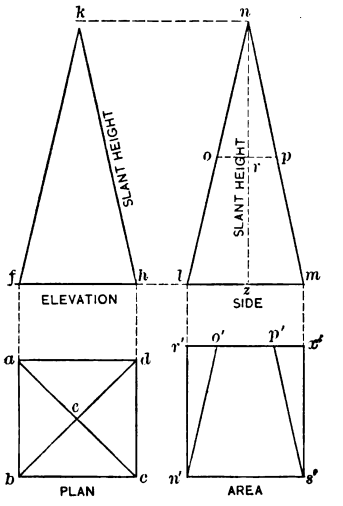


Fig. 71.—Elevation, Plan, &c., of Quadrangular Pyramid.

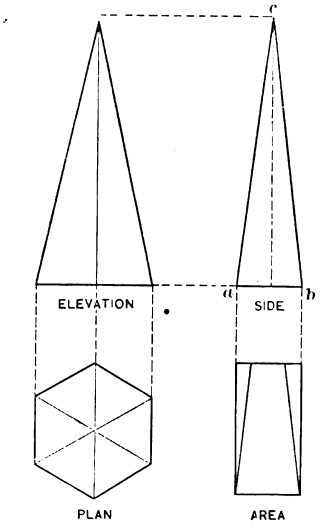


Fig. 73.—Elevation, Plan, &c., of Hexagonal Pyramid.

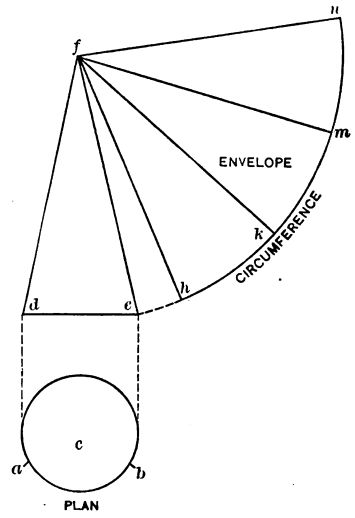


Fig. 77.—Elevation, Plan and Envelope of Right Cone.

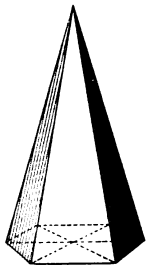


Fig. 72.—Hexagonal Pyramid.

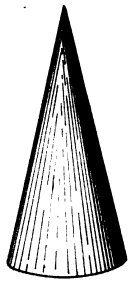


Fig. 76.—Right Cone.

Measurement of Roofs.

perimeter *a b c* by the hight *d b*, and to find the entire surface add to this amount the area of the bases. In Fig. 68 is shown a quadrangular, and in Fig. 69 a hexagonal prism. To obtain the surface of the sides of the latter we would proceed as in the previous instance and multiply the perimeter (stretchout) of base *a b c d e f* by the hight *f h*, the entire surface being found by adding the area of the two bases to the above. The surface of the sides of a hexagonal prism, whose altitude is 10 feet, and the sides of whose base are 3, 5,

In Fig. 72 is shown a hexagonal pryamid, and in Fig. 73 the elevation, plan, shape of side and area of one side, which are drawn as previously explained. Just what use the shape of side *a b c* would be put to in practice would depend upon circumstances. The carpenter could use the shape in connection with the plan if the pyramid was to be constructed of wood. The worker in sheet metal would consider the side as a pattern, six of which would form the pyramid, while the slate roofer could cut the slate the proper size and

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angle by its use. An octagonal pyramid is similarly illustrated in Figs. 74 and 75.

A cone is a solid, having for its base a circle, and tapering uniformly to a point at the top called a vertex, Fig. 76. To find the convex surface of a cone we multiply the circumference of the base by half the slant hight, and, as with paramids, the entire surface is found by adding the area of the base to the convex surface. In Fig 77 let *a b* represent the plan, which is drawn from the center *c*, and *d f e* the elevation. To obtain the envelope of the cone, with *f e*, the slant hight, as radius, strike an arc from any convenient point as center, as *f*. From any point on the arc, as *h*, space the circumference of plan, as shown by *h k m n*; then, by connecting *h f* and *n f*, *h f n* will be the envelope or convex surface of the cone shown in plan and elevation. The area of the envelope *h f n* can be obtained by dividing into triangles, as has been previously explained.

LAW IN THE BUILDING TRADES.

THE FOLLOWING SUMMARY of recent decisions of the courts relating to matters in the building trade will be found of interest to our readers:

FRAUDULENT CERTIFICATES ISSUED FOR MATERIALS.

A township trustee contracted with the assignor of plaintiff for certain materials for the school houses of the township, and to fraudulently issue certificates to a greater amount than the materials called for. The certificates having originated in an unlawful and corrupt attempt to defraud a public corporation, is void. Boyd *vs.* Mill Creek School Tp., Supreme Court of Indiana, 24 N. E. Rep., 66.

SERVING NOTICE OF MECHANICS' LIEN.

When one claims a mechanics' lien and it appears that the materials furnished were used in the erection of the building on which a lien is claimed, unless it is shown that they were intended for another purpose, it will be presumed that they had been contracted for to be used in the building. The Kansas statute giving 60 days to file claim for lien and give notice of same to owner does not require the notice to be given within the 60 days, but only that the lien shall be filed within that time and the notice given within a reasonable time after such filing. Deatherage *vs.* Henderson, Supreme Court of Kansas, 28 Pac. Rep., 1052.

DEFENSE OF SURETY ON BOND.

The surety on a bond under seal cannot avail himself of the fact that the money was advanced by the party loaning prior to the execution and delivery of the bond upon which suit is brought. Union Building and Loan Ass'n *vs.* Hull, Supreme Court of Pennsylvania, 19 At. Rep., 949.

NOTICE UNDER MECHANICS' LIEN LAW.

To entitle one to the benefit of the mechanics' lien law of Pennsylvania, he must give notice of his intention to file a lien under the provision of the law, to the owner, or reputed owner of the property or his agent, at the time of furnishing the materials, or performing the work. Appeal of Stoner, Supreme Court of Pennsylvania, 19 At. Rep., 949.

GUARANTY IN OBTAINING CREDIT.

Certain contractors threatened to give up a contract on account of inability to obtain supplies, the superintendent gave them a letter to plaintiff, who furnished the supplies, charging to defendent, and informed the superintendent that he was furnishing them solely on defendant's credit. Afterward, when the job was completed, the defendant's superintendent claimed the goods still on hand. The defendant's promise to pay was not that of a mere grantor and not within the statute of frauds. Hagadom *vs.* Stronach Lumber Company, Supreme Court of Michigan, 45 N. W. Rep., 650.

WHEN A HOUSE IS PERSONAL PROPERTY.

Where one person erects a building on the land of another by permission, under such circumstances as to show that it is the mutual intention of the parties that the person making the erection shall have the right to remove the building, the title to the building will not pass to the land owner. The dominion which the law gives every property owner over his property invests him with power when he sells part, whether it be realty or personalty, to reserve such rights in the part sold for the benefit retained as he may think proper Mayo *vs.* Newhoff, Court of Chancery of New Jersey, 19, At. Rep., 836.

AFFIDAVIT IN CASE OF MECHANICS' LIEN.

An affidavit under the mechanic's lien law of Florida, that describes the property upon which the lien is claimed as a steam saw mill, located at a town or place called "Emerson," on the S., F. & W. Railroad, 14 miles south of Live Oak, Suwaunee County, Florida, is sufficient, no lien being claimed on the land. Emerson *vs.* Gainey, Supreme Court of Florida, 7 S. Rep., 526.

MECHANICS' LIEN NOT DEFEATED BY AGREEMENT AS TO PAYMENT.

In a suit to foreclose a mechanics' lien the defendant claimed that the contractor was to receive certain town lots in payment. The evidence failed to show that the material man, who is seeking to foreclose the lien, ever agreed to accept anything but cash for his materials, and he is therefore entitled to his lien. Morris *vs.* Willits, Supreme Court of Nebraska, 45 N. W. Rep., 784.

FORECLOSURE OF MECHANICS' LIEN.

While the Georgia statute requires the claimant to show compliance with his contract in order to enforce his lien, such compliance need not appear of record in the lien as filed. There is no statutory intimation that material men are not to have a lien as well when they take personal security as when they do not. Ford *vs.* Wilson, Supreme Court of Georgia, 11 S. E. Rep., 559.

FAILURE TO DELIVER MATERIALS CONTRACTED FOR.

Failure to deliver materials for the completion of a building within a reasonable time, no time being specified for their delivery, entitled the owner of the building to recover damages to the extent of a reasonable rental value of the building during the time its completion was delayed by such failure to deliver goods. Scribner *vs.* Jacobs, Supreme Court of New York, 9 N. Y. Supp., 856.

CONSTRUCTION OF PARTY WALL CONTRACT.

Where a contract for the erection of a party wall provides that a person on whose land it is to be partly built shall not have the right to obstruct the light from any window which the other party shall build into said wall, such other party has by implication the right to build windows in such wall. Whereby mistake, such party wall is built entirely upon the land adjoining that of the builder, a promise by the owner of the land upon which it is built to pay one-half the cost thereof is a good consideration for a new contract, as he is under no legal obligation to pay for it. Grimley *vs.* Davidson, Supreme Court of Illinois, 24 N. E. Rep., 439.

COURT HOUSE CONSTRUCTION IN INDIANA.

The statutes of Indiana vest in the County Commissioners entire discretion as to the necessity which may arise for the construction of court houses, and their decision that a new court house is necessary is not subject to revision or appeal, unless there is evidence of palpable fraud. The provision of the statute that commissioners shall not make any contract for the construction of any court house until plans and specifications have been adopted does not prevent the incorporation in the adopted specification of a provision that commissioners may alter the details of the work, with corresponding changes in the contract price.

Kitchell *vs.* Board of Commissioners of the County of Union, Supreme Court of Indiana, 24 N. E. Rep., 366.

NEW PUBLICATIONS.

STEEL SQUARES AND THEIR USES, Part II. By Fred. T. Hodgson. 80 pages; 65 illustrations; bound in stiff board covers with gilt side title. Published by the Industrial Publication Company. Price $1.

The author of this work is well known to the readers of *Carpentry and Building* from his treaties upon the "Steel Square and Its Uses," which has met with wide popularity. This new book, he states, is in no sense a substitute for the first, which remains as originally issued. It is an extension and enlargement of it, giving new problems, new methods, and new schemes for shortening work, while also increasing the accuracy of the workman. The volume gives attention to the various steel squares and their uses in solving a large number of mechanical problems in constructive carpentry, joinery, sheet metal work, cut stone and brick work. It also shows how a great variety of geometrical and other problems may be solved by the use of the steel square. The work is amply illustrated by means of engravings and diagrams.

EXPERIMENTAL ELECTRICITY. By Edward Trevert; 164 pages; profusely illustrated; bound in stiff board covers. Published by the Bubier Publishing Company. Price, $1.

The object of this little volume is to give the reader, in a simple way and without the use of technicalities, practical instruction and directions for performing simple and easy, as well as interesting experiments in electricity; also for making electrical apparatus by which may be obtained a considerable amount of practical information relating to the general subject indicated. The kind of apparatus described is such as may be made in the home without the necessity of an expensive kit of tools. The apparatus, though roughly made, will give good results, and prove an excellent substitute for the highly finished appliances turned out by electrical companies having at their command large factories fully equipped with the latest improved machinery and tools. The work is divided into 12 chapters, the first of which relates to simple and easy experiments in electricity and magnetism. The following eight chapters tell successively how to make electric batteries, galvanometers, induction coils, electric bells, magneto machines, telegraph instruments, electric motors and dynamos. Chapter X gives simple practical information for amateurs, relative to electric gas lighting and bell fitting, while chapter XI contains information in regard to electric lamps. The closing chapter of the book consists of a glossary of electric terms.

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HOW COPPER ROOFS SHOULD BE LAID.

BY AN OLD ROOFER.

COPPER ROOFING is a hackneyed subject. There is very little that is new that can be said about it, and yet when I notice the poor work that many make of copper roofing when first called upon to do it, I am impressed with the idea that about all there is to copper roofing must be new to many of the men that try to lay it. If, therefore, what I submit at this time is in effect only a rewriting of much that has appeared in the past, it may still be of service. All that I offer is based upon long experience, and for that reason alone cannot be new.

The possibility of cheaper copper in the near future may stimulate its use as a roofing material, as it has already brought it into demand for cornice work. Copper is a soft and durable metal, easy to work, and if properly managed possesses many features to recommend it as a roofing material. A sheeting of copper if properly laid is one of the most durable roof coverings that can be found anywhere. But copper is so easily affected by changes of temperature it is essential that due allowance should be made for expansion and contraction. To do this the joints should not be made with solder, and therefore the roof must have sufficient pitch to carry off the water without depending on solder for tight joints. While a flat copper roof—referring now particularly to the method of jointing and laying—may not be any worse than one of its kind constructed of other materials, copper should never be applied excepting when there is sufficient pitch to carry off the water readily. With reasonable pitch, the question of joints and seams is easily settled. Unfortunately, however, the roofer has very little to do with the pitch, but is usually required to apply a certain kind of material to a certain roof, according to the plans and specifications provided, no matter if all the principles of construction are therein violated.

There is one important point to be considered when applying a covering of sheet metal to a roof, and that is the condensation of moisture underneath. The first step is to place some material between the sheathing-boards and the metal that is waterproof, so as to keep the moisture from the metal and at the same time serve as a non-conductor of heat. As a further precaution the roof should be so arranged that the space above the ceiling can be ventilated when so desired. While the roofer may not be responsible for the condensation of moisture under a roof, providing it has been put on according to contract, it is sometimes difficult to convince people when the under side of a roof is wet that there is no leak.

One of the most important parts of a roof, regardless of the materials from which it is constructed, is the flashing, or finish where the covering joins the wall. These connections should be firmly made and the joints filled with some water-proof cement, as for example sand and thick iron paint. In Fig. 1 is shown the perspective view of roof and flashing, the joint be-

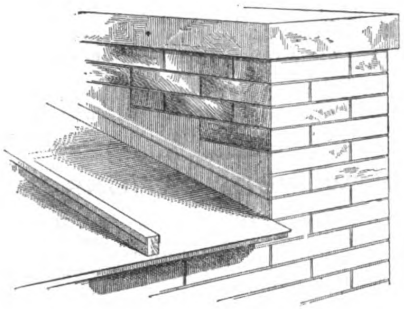


Fig. 1.—General View of Portion of Roof, Showing Finish Against Fire Wall.

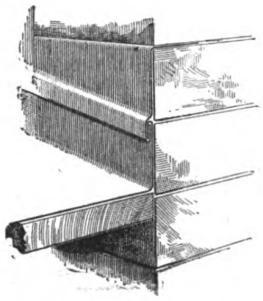


Fig 2.—Detail of Flashing Joint.

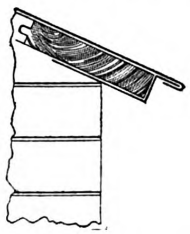


Fig. 3.—Suggestion of Finish at the Eaves.

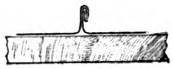


Fig. 4.—A Common Standing Seam.



Fig. 5.—Section Through a Cross Lock.

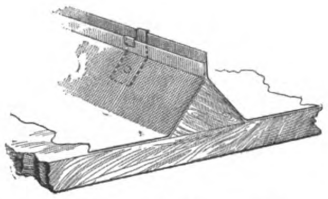


Fig. 6.—Cleating a Seam Made Over a Triangular Batten.

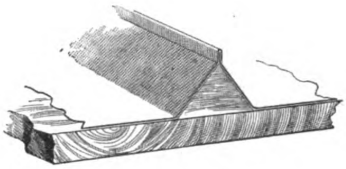


Fig. 7 – First Step in Closing.

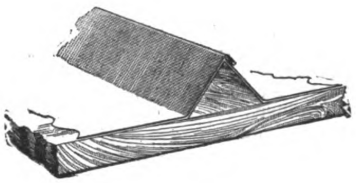


Fig. 8.—The Finished Seam.

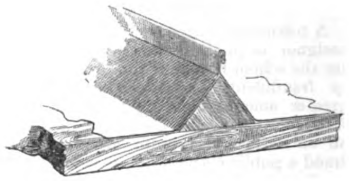


Fig. 9.—Another Way of Finishing the Seam.

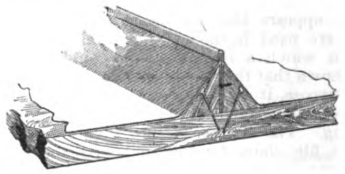


Fig. 10.—Two Triangular Battens Employed, the Cleat Being Nailed to the Perpendicular Face of the First.

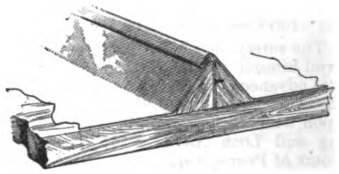


Fig. 11.—The Finished Seam.

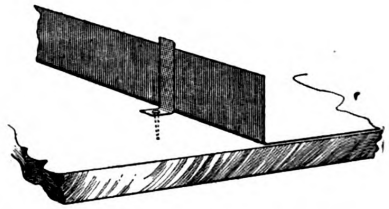


Fig. 12.—First Step in Cleating Where a Square Batten is Employed.

How Copper Roofs Should be Laid.

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tween the two being further shown in Fig. 2. The edge is turned down on the roof-sheet so the flashing can be hooked on as shown. This form of construction enables the joint to be made without soldering and also allows for the necessary expansion and contraction. The construction in this particular is good for tin and iron roofs as well as for copper roofs.

The joint at the eaves of a copper roof can be made as shown in Fig. 3 if convenient. This construction is also applicable in other forms of sheet metal roofs. The space between the brick and bent piece A should be well filled with mortar or cement so as to prevent wind or fire from entering the building. This form of joint is given simply as an example, for various other forms of joints can be used in the same place, the choice depending upon circumstances.

Assuming that the roof has sufficient pitch to drain off the water readily, one of the simplest ways of applying the copper is by the use of the standing seam shown in Fig. 4, proceeding in about the same general way as with tin, only that under no circumstances should the cross-seams be soldered. The cross seams may be made with a single or a double lock, as may be best under the circumstances, but if the sheets are put together so that each sheet can expand and contract at the cross seams, as in Fig. 5, there will be less danger from buckles or cracks. Care should be taken in making the side bends that the angle between the flat of the roof and the standing seam is as rounding as possible—that is, not bent sharp, as at a right angle—so that each sheet will have abundant room to expand and contract without injury to the roof as a whole. In fact, the points to be aimed at in applying a copper roof are to manage each sheet so it can expand and contract without injury to itself or neighbors. Each sheet or section should be well cleated to place. It is well to have the standing seams somewhat higher than with tin on account of making the side bends with rounding corners, as already mentioned.

Another way of making the longitudinal seams, which is used to advantage under some circumstances, is to employ triangular strips of wood over which to construct the seam. In Fig. 6 is shown the manner of fastening the strip to the roof and method employed for cleating the sheets, using a separate cleat for each sheet, or one notched cleat to be bent each way and hold both sheets, as may be preferred. This view is reversed from the others in order better to show the shape and position of the cleat. The highast edge is then bent over as shown in Fig. 7, and then the two are doubled over on to the strip as shown in Fig. 8. If for any reason the seam is desired to be higher than this makes it, it can be finished as shown in Fig. 9.

Another plan for forming the side seams in a copper roof and one favored by architects and roofers in various parts of the country at the present time employs two triangular battens in the place of one, as previously shown. The cleats that are used to hold the copper in place are nailed to the vertical side of one of a pair of battens before the second is put in place, as shown in Fig. 10. The copper is then laid in position and is bent so as to extend up the inclined side of the batten. The two edges of adjacent strips are unequal in hight, the difference being the amount to be folded over as indicated. The next operation is to bend the wider flange over the narrow one, as shown in Fig. 10, after which the two together are bent down into position, as shown in Fig. 11. The cleat may be either bent over the narrow flange or it may be depended upon to hold the plates in position by reason of the bend that it receives in being malleted down.

Another plan which finds favor with many roofers and one that has been adopted for covering many important buildings in various parts of the world makes use of strips of nearly square wood. These strips may be of any desired shape or size, ranging, say, from 1½ to 2½ inches square, according to the requirements of the job. When putting on a roof with square strips, the copper sections are first turned up, as shown in Fig. 12, care being taken to so turn the edge as to allow material for the subsequent turning of another edge for the cap, as shown further on.

The cleats are applied as shown in Fig. 12 and turned over the edge of the first sheet as shown in Fig. 13, in which the strip of wood over which the seams are to be made is shown in position. After nailing the strips in place, care being taken that they are in line, so as to avoid crooks, the second course of cleats is nailed in position as shown, or, if it is so desired, the second course of cleats can be nailed to the roof before the strip is nailed on. This would have the effect of bringing the nailed end of the cleat under the strip, similar to the first nailed, as shown in Fig. 11. The next strip of bent copper is placed in position, as shown in Fig. 15, the ends of the cleats turned over and the edges of the copper sheets turned for cap, as shown in Fig. 16. The cap formed, as shown is in shape, ready to be slipped over the two turned edges, as in Fig. 16, after which the edges are turned over and double seamed, as shown in Fig. 17. Some roofers dispense with double seaming and use a cap which slips over the upturned edges of the sheets, as shown in Fig. 19. This method is hardly to be recommended, as there is no means of fastening the caps in as secure a manner as is the case when they are double-seamed. In case the right-angled strips and bends should be objected to, the strips can be got out with beveled edges, as shown in Fig. 20. With this form of strip the cleats can be nailed to the roof as previously shown or to the sides of the strip, as in Fig. 20.

Regarding the weight of copper required for roofing purposes, it is held by many roofers that 16-ounce copper will give the best satisfaction, for while the metal itself is very durable, yet there can be no doubt that it should be of a reasonable thickness in order to give the best results.

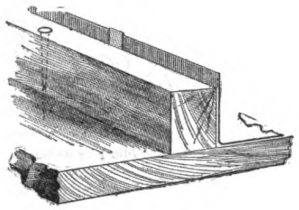


Fig. 13.—The Batten Put in Place.

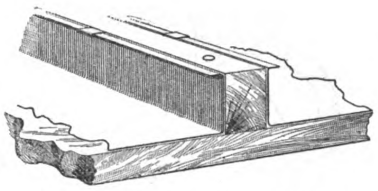


Fig. 15.—Copper Cleated in Place and Edges Bent to Receive the Cap.

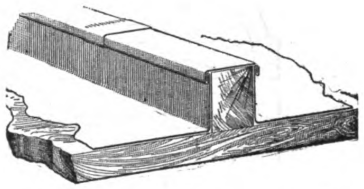


Fig. 18.—The Cap Seamed Down at the Sides.



Fig. 16.—The Cap.

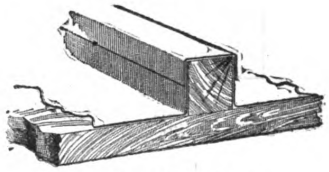


Fig. 19.—A Loose Cap.

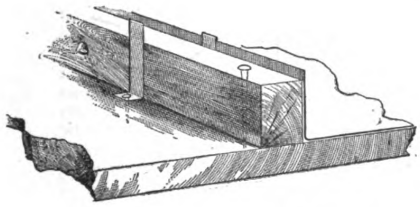


Fig. 14.—The Second Row of Cleats.

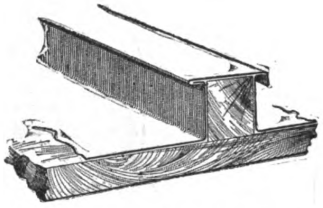


Fig. 17.—The Cap Slipped in Place.

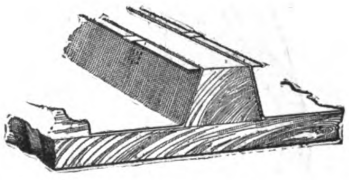


Fig. 20.—Suggested Use of a Batten With Inclined Sides.

How Copper Roofs Should be Laid.

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MASONRY AND STONE CUTTING.*

WHEN A GROIN is formed by the intersection of two vaults crossing one another, the vault cannot stand before it is completely built; but when the vaults form a coved ceiling, as in Fig. 86, the structure can be stopped at any level on condition that the last course of stones be constructed in form of a straight arch, as shown in our drawing, to prevent the several stones of the course slipping down inside. This precaution is not required for the courses below, as the pressure of the courses above prevents the stones slipping.

Any number of vaults may, as in Fig. 87, meet round an irregular polygon, and if they are all of elliptical section springing from the same level and rising to the same hight at the crown the plans of the groins formed by their intersections will be straight lines. In Fig. 87, four vaults meet around the polygon A B C D, the smaller vault is semicircular; the others are elliptical. In a central position we select a point O, which in this case we have taken at the intersection of the lines V Y and X Z, which connects the centers of the opposite sides of the quadrilateral. Now, suppose four ellipses, all having their minor axes equal to O′ X′, and their major axes on A B, B C, C D, D A respectively, the four vaults of which the above ellipses are the guiding lines, and of which the generators are parallel to the lines X Z and V Y, will intersect one another along groins straight on plan, such as O A, O B, O C, O D. As the center line O X of the cylindrical vault from O to X is not in the direction of the center line X O′ of the semicircular arch, there will be a groin formed above the line A B similar to the groin at the return angle of a cloister—that is, it will form a projecting arris from A to X, and a valley from X to B. The same applies to the groin lines on B C, C D, D A, formed by the other vaults. The joints of the several vaults comprised in this structure must be normal to the soffit of the vaults.

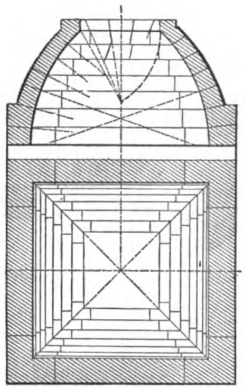


Fig. 86.—Coved Ceiling.

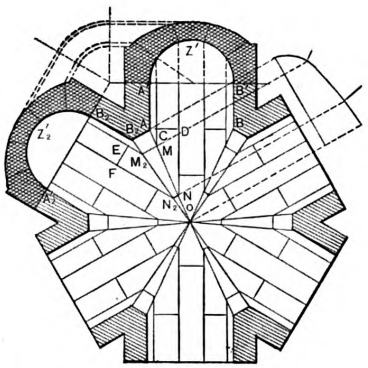


Fig. 88.—Groins Formed by Six Barrel Vaults.



Fig. 89.—The Keystone.

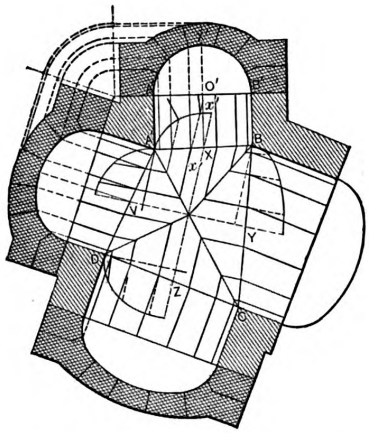


Fig. 87.—Four Vaults Meeting Around a Polygon.

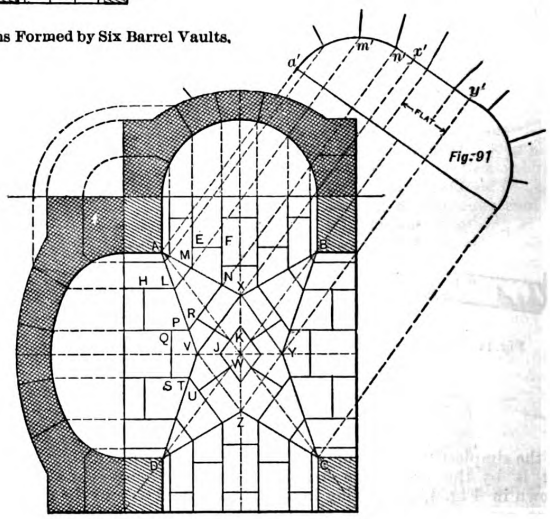


Fig. 90.—Double Groins Forming a Star.
Fig. 91.—Diagonal Section of Vault.

Masonry and Stone Cutting.

We shall begin by drawing the jointing on the semi-circular section A′ X′ B′ of the smaller vault, and the joint lines are then carried all round the other vaults at the same level. Then we draw the right section of the cylinder of center line O X; this is an ellipse of which the axes are Ax and x x' = O′ X′. On this section we mark the divisions of the joints, and draw the joints normal to the ellipse; the planes of the bed-joints are completely determined by the joints on section and by the joints on plan. The intersections of the beds and the bed molds will then be found by the same methods we have used for the return angle of a cloister.

In Fig. 88 we have groins formed by the meeting of six barrel vaults, in which a splay has been provided to cut off the sharp angles which otherwise would exist between each vault. The splay A B_2 is made to be the side of a cylindrical vault of elliptical section, which rises from A B_2 to its crown in O; the intersection of this vault by the two neighboring barrel vaults $A'_2 Z'_2 B'_2$ and A′ Z′ B′ gives two groin lines which meet in O. Thus every barrel vault is separated from its neighbor by double groin lines, which comprise a piece of cylindrical surface. Everything that has been said about the jointing in other cases of groining applies to this; but it must be noticed that one stone must comprise the figure C D N N_2 F E M_2 M C so that this stone has three cylindrical soffits. The working of the stone is done by any of the methods used before in the return angle of cloister. The keystone, Fig. 89, is cut as that of any ordinary groined vault, beginning by producing an hexagonal prism, on the faces of which the head molds are placed.

In Fig. 90 we have double groins which diverge from the point of springing so as to form on plan the figure of a star. To produce this, a parallelogram V X Y Z is first drawn with sides parallel to the diagonals A C, B D. Then the groins are made to meet two by two at the points V X Y Z. The triangular spaces between the groins are filled by cylindrical vaults of elliptical section, starting from the angles

* Continued from page 70.

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of the walls, such as A, and rising to the same level as the barrel vaults at their crown V X. The parallelogram V X Y Z is formed of a flat arch, or, if small enough, by one stone, which may be decorated as a pendant keystone. The diagonal section of the vault is shown on Fig. 91, by which it will be seen that the voussoirs around the keystone have soffits partly flat, partly cylindrical. The outline K R P Q S T U W S K comprises the soffit of one stone, and E F N P G H L M E that of another. The jointing is done in the same way as for the other groin vaults, and so is the working of the stones, which we need not, therefore, describe again.

The Year's Building.

Reports from most of the large cities, says *Bradstreets*, indicate that there has been a considerable increase this year over last in the number of permits for the erection of buildings. From all appearances the present season bids fair to "beat the record." Much new work is now coming on, especially in the way of mill and shop extension. In the construction of lofty office buildings and apartment houses the West is at present taking the lead. Seven and eight story structures are growing more numerous in such cities as Denver and Omaha, as well as at Chicago.

Brick is the almost universal material for these buildings, and, indeed, it is being more generally used in all city work this year than ever before. The lesson of the big fire in Boston last Thanksgiving Day was taken to heart, and stone has perceptibly diminished in favor. The way granite and sandstone then yielded to the flames showed that buildings constructed of them cannot rightly be called fire-proof. The granite stood the fierce heat for a while, and then crumbled so badly that most of the walls made of it have had to be rebuilt. The porosity of the sandstone led to such ruinous results when the moisture in it was turned to steam that blasting powder could hardly have been more disastrous. This fire confirmed many architects and insurance men in the belief that burnt clay is the best fire resister yet found, which, combined with ease in handling, it is argued, makes it the best material for big city buildings. Recent improvements in brick manufacture, too, have made its use compatible with architectural effect, and, indeed, some of the handsomest new buildings are of brick and terra cotta. Ornamental and molded brick are coming into general use, and already there are five or six colors recognized as "standard." The making of special designs in brick is coming to be as usual as the carving of stone has been.

The use of iron for walls is not spreading rapidly, and some assert that the day of iron buildings has passed. Yet numerous iron fronts are still going up, especially in the South. For beams, iron still holds its own. Concrete threatened its popularity, but the lack of tensile strength has proved a powerful objection to concrete beams. This objection does not hold in the matter of fillings and linings, for which use concrete has gained many partisans in the last few years. Experts say that concrete as a fire resister is most useful when used as a coating for wooden beams.

Speaking of iron in buildings it is worth while to note that a Belgian firm recently offered to supply the structural iron for the Minneapolis court house 25 per cent. cheaper than Pittsburgh people were willing to furnish it. It has been intimated that the tariff is too low, or that the Belgians had found some way to evade the duty. A Chicago architect, however, has pointed out what he thinks is the real explanation, viz., that "prices of structural iron and steel in the United States are too high, owing to a 'combination' of all the mills that roll beams of the sizes used in buildings." He further says: "In the fall of 1888 the 'combination' price was reduced for plain beams from $3.30 per 100 pounds to $2.90, f.o.b. Chicago, which induced owners to allow their architects to use more steel in their buildings, and change from ordinary construction to fire-proof, and in general to build in a more substantial and durable manner, to the improvement of our cities. About a year ago the 'combination' thought the consumption warranted an advance and put the price to $3.20, an advance of $6 a ton. As some of our largest Chicago buildings use 5000 tons, it increases the cost of such buildings $30,000."

The only notable innovation of the year in building materials is plaster boards, the idea of which has been brought from Germany. They are composed of ground cork, plaster, hair and wood fiber, with reeds running through them. The reeds are found in New Jersey, and are said to be very tough and strong. This compound is cast in slabs 8 feet long and of varying thickness and widths. They can be sawed off and nailed directly to the furring of brick walls or the studding of partitions, and take the place of lathing. The advantage is that they are fire-proof, and dry from the moment they are put up, thus obviating the tedious delays inseparable from the use of lime plaster. It is claimed that with their use a house can be finished in one-third the time required by the old method. Some architects think the material likely to have a prominent place in the construction of dwelling houses.

TRADE NOTES.

THE CANTON STEEL ROOFING COMPANY, Canton, Ohio, have recently booked a contract involving 350,000 square feet of H. W. Smith Patent Fold Lock Seam Steel Roofing, together with a large amount of galvanized steel, corrugated steel cornice work, &c., for 26 large buildings belonging to the Northern Pacific Railroad Company and located at Tacoma, Wash. The statement is made by the company that their business, excluding the contract just referred to, for the first half of 1890 shows an important increase over the corresponding period of 1889.

THE PULLMAN SASH BALANCE COMPANY, Rochester, N. Y., state that on account of the rapid increase in their business they have been compelled to occupy more commodious quarters. They have accordingly removed to No. 177 West Main street, where they desire all communications to be addressed.

THE J. F. PEASE FURNACE COMPANY, Syracuse, N. Y., are distributing an interesting catalogue of something over 30 pages, illustrating and describing their line of Economy Heaters. These are designed for warming dwellings, churches, hotels, school buildings, stores, warehouses, &c., and include both warm air furnaces and combination steam and warm air heaters. They are fully illustrated and carefully described, and numerous testimonials presented showing the estimation in which the goods of the company are held by those who have practically demonstrated their merits. Accompanying the catalogue is a little pamphlet devoted especially to the Economy Direct and Indirect Hot Water Heater, patents for which are now pending. This heater has been brought out to meet a well-defined demand from certain sections for a construction to carry hot water radiation. Another pamphlet which the company have issued consists of a number of pages presenting opinions regarding the correct systems of heating and ventilation. Among other things attention is called to the fact that some time since the company established a general Eastern office at New Bedford, but the business increasing so rapidly demanded better facilities, and they found it desirable to move their office to Boston, where, at 75 Union street, they carry a full line of Economy Combination Heaters and Economy Warm Air Heaters.

IN ANOTHER PART of this issue the Bostwick Metal Roofing Company, 38 Park Row, New York, present a view of their specialty and invite the trade to send for illustrated pamphlet and samples. The advantages of metal roofing are so well known that they need no argument in support of them from us. The pamphlet this company is sending out is attractively illustrated and contains much information that is of interest to architects and builders in general.

THE NEW EDITION OF "The Builders and Traders' Handbook," compiled by James John, secretary of the Builders and Traders' Exchange, of Chicago, is a volume of 230 pages, containing a large amount of information of interest to local builders, as well as particulars concerning the organization in whose interest it is prepared. The contents include an article on the Builders and Traders' Exchange, a reference to the library rules of that organization, a catalogue of its library, the by-laws of the organization, a list of Chicago architects who hold admission tickets to the Exchange. The officers of the Exchange, including the list for the different years since the organization in 1884, rules of measurement of masonwork, arranged by the Chicago Mason and Builders' Association, the laws of mechanics' liens of Illinois, builder and fire ordinances of Chicago, also the sanitary ordinances of the same city, and other matter of the same general character.

WILLIAM P. WALTERS' SONS, 1333 Market street, Philadelphia, Pa., call attention in this issue to an improved tool rack, which they are supplying to mechanics and others for holding different tools in a way to make them convenient, while also keeping them out of danger of harm to their edges. Two styles are shown, one having a bit rack and the other showing device adapted for holding chisels, files, screwdrivers and the like

W. J. BURTON & Co., Detroit, Mich., send out to their friends in the trade a descriptive catalogue of Eastlake metal shingles for roofing and siding, which they manufacture. The catalogue is a modest publication of a dozen pages, but contains much information of interest and value to those who make use of the Eastlake shingle. The first two pages contain a summary of the advantages of this form of shingle, and they are followed by two more pages addressed to architects, builders and others, in which the especial features of the Eastlake shingle are dwelt upon at some length. Next follow directions for laying shingles, the text being illustrated with several cuts. At the close of the pamphlet is a price-list of the shingles and also of roofing sundries, including gutters, valleys, ridges, hips, &c.

THE FIRM OF JOB T. PUGH & Co., manufacturers of Pugh's Black Twist Augers and Bits, at Philadelphia, Pa., state that their business for the current year has been greater than that of any corresponding period since the establishment of the house. The orders for their specialties are said to show a very large increase over those of last year.

THE WESTERN SAND BLAST COMPANY, located at the corner of Jackson and Clinton streets, Chicago, Ill., have issued a large sheet of designs of ornamental glass for vestibule doors, transoms, bank and office counters, &c. The company are in a position to offer other designs, either wheel cut or prepared by the sand blast process, which cannot fail to attract attention. The designs are of great variety, and upon the circular before us are full explanations with directions how to order the glass.

"THE COURSE OF ARCHITECTURE of the Cornell University," Ithaca, N. Y., is the title of a pamphlet which has just reached us from the institution named. The pamphlet consists of 11 pages of text, and constitutes a circular of information for the collegiate year 1890-91. The conditions of admission are presented, together with the course of study for the several years. Instruction and lectures are given, among other branches, in building materials and construction, mechanics, modeling in clay, heating, decoration, mechanics and structural details, designing, and the history and theory of architecture.

WE HAVE RECEIVED from the National Cornice and Iron Company, 217 and 219 Elm street, St. Louis, Mo., a copy of a catalogue and price-list which they have just issued. It is something different from the stereotyped cornice catalogue, consisting as it does of 16 large pages, neatly printed in such a way as to give the publication the appearance of a trade paper. Attention is directed to house front construction and to the galvanized iron specialties which they are prepared to furnish. Numerous illustrations are given, consisting of ground plans and front elevations of buildings, together with engravings showing how old fronts may be remodeled in a manner to justify the expense. Numerous designs of window and door caps, finials, skylights, cornices, &c., are given, which will be found of more than usual interest in this connection.

J. M. STUTZMAN, 181 William street, New York City, is offering carpenters and machinists' steel stamps for the purpose of marking tools. This gentlemen has been in the business for the past 21 years and understands it thoroughly in all its branches. The steel stamps which he is prepared to furnish are adapted for marking steel, iron or wood.

WE HAVE RECEIVED from the University of Virginia a catalogue for the session of 1889-90 and announcements for the session of 1890-91. It has 60 pages of text, presents a great many interesting particulars relative to this institution, and covers all the points upon which information is likely to be desired by those contemplating a course of study under its management.

THE NEW BUILDINGS of the Egan Company, Cincinnati, Ohio, are rapidly approaching completion, and the company expect within a comparatively short period to occupy their new quarters. A department will be reserved for the display of their recently im-

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proved woodworking machinery in operation, and performing exactly the work it is designed to execute. The company feel that this scheme will be of great value to all who are interested in obtaining time and labor saving machines and for doing rapid and satisfactory work.

THE PRESCOTT HARDWARE MFG. COMPANY, 78 and 80 Randolph street, Chicago, Ill., are distributing a number of testimonials relative to the merits of the Prescott Patent Trackless Door Hangers which they manufacture. These hangers are adapted for use in connection with houses and barns, and by those who have practically demonstrated their merits are said to give very satisfactory results in operations.

THE WARREN-EHRET COMPANY, 432 Market street, Philadelphia, Pa., are sending out an announcement relating to their Star Rosin Sized Sheeting, otherwise known as the Contractors' Favorite. It is said that 1 pound of this sheeting will cover 20 square feet of surface, and each roll is guaranteed to contain 800 square feet. Each roll is 36 inches in width.

THE HARRISBURG BOILER AND MFG. COMPANY, Harrisburg, Pa., send us a circular illustrating the Star Gas Burner Steam and Hot Water Boiler which they are offering the trade. Attention is called to the fact that the boiler contains sufficient water to generate steam enough to fill all the pipes and radiators without lowering the water level and necessitating filling; that the water spaces are so distributed as to leave no large body at any point except above the gas chamber, and that the latter gives an amount of direct heating surface equal to the fire-box surface while serving as a retainer of the heat. The flues are large in diameter; the fire-box capacious and adapted to slow combustion, while the heating surface is in diameter rather than toward the chimney. The company have just issued a new catalogue containing a full description of the Star Water Tube Boilers.

THE TAYLOR MFG. COMPANY, Chambersburg, Pa, issue a catalogue illustrating and describing the Beck Automatic Compound Engine, which they claim is a new and important departure in steam engineering. The device is fully illustrated and described, attention being called to many of the important features embodied in the construction. Accompanying the catalogue is a circular giving a list of the names and addresses of some of the users of Beck Automatic Engines. These cover a wide range of territory and indicate, in some measure, at least, the estimation in which this engine is held by those who have become acquainted with its merits.

EBERTS BROS., Detroit, Mich., favor us with an assortment of advertising matter relative to the specialties which they are prepared to furnish the trade. Attention is directed to their part steel and iron Ready Roll Cap Roofing, designed for roofs of ¾ inch up to 1½ inch pitch to the foot. Illustrations are given, showing the applications of the Ready Roll Iron Roofing, also of their Double Cap Roofing in process of laying. The circulars give a great deal of information that is of interest to the roofer, and applications for copies are solicited by the firm.

THE GLEN COVE MACHINE COMPANY, Limited, with offices and works at 24 to 34 Clay street, Brooklyn, N. Y., have issued a hanger relating to some of their improved planing mill machinery. The device is bound at the top and bottom with metal strips for the purpose of rendering it more durable, and is provided with a metal eye for hanging upon the wall. The company's No. 46 Glen Cove Double Decker, a two-board flooring machine, is illustrated by means of a perspective view, side elevation and ground plan, giving a very good idea of the construction of the machine. The statement is made that the company make a specialty of improved fast feed sizing machines, planing and matching machines, flooring and ceiling machines, inside molding machines and double surface machines.

AMONG THE ADVERTISING MATTER recently distributed by the Willer Mfg. Company, Fourth and Cedar streets, Milwaukee, Wis., is a publication relating to the Willer Sliding Blinds, and known as "Catalogue No. 9," being designed for circulation among architects and builders. This work, which is voluminous in character, consists of 132 pages, 9 x 12 inches in size, and contains full instructions for ordering and fitting full-size sections of window frames, guide ways, &c. It is profusely illustrated with designs of various descriptions and is of interest and value to the professions addressed. Following a comprehensive index which occupies the second page of the cover, is a colored perspective of a residence in Milwaukee, fitted throughout with the Willer Sliding Blinds, while the interior woodwork was also furnished by the company. Attention is given to sliding blinds, patent folding blinds, sliding window screens, stair work, newels, rails and balusters. The various specialties of the company are carefully described and beautifully illustrated, and convey to the reader a very clear idea of the manner in which the blinds operate. The Willer Adjustable Balancing Spring, used in connection with the Willer Blinds, is illustrated by means of sectional engravings, while extended attention is given to guide ways, which are shown in great variety. Fully half of the catalogue is devoted to interior woodwork designed for first-class residences and other buildings. The catalogue is printed on good paper, bound in attractive covers, and will prove a valuable addition to the architect's library of trade publications. Accompanying the above catalogue is another known as "No. 10," and of pocket size. This is designed for general distribution and copies will be mailed to any address upon request. Catalogue No. 9, known as the "Architects and Builders' Edition," is mailed free of charge to architects only; but to others who may desire a copy it will be sent, bound in paper covers, on receipt of fifty cents in postage stamps, and in stiff cloth binding with gilt lettering, on receipt of 75 cents. The company are also sending out a show card of large size lithographed in colors, and representing a lady standing at a window and drawing down a section of the Willer Sliding Blinds.

GEORGE MERTZ'S SONS, PORTCHESTER, N. Y., favor us with a very attractive catalogue of patent turned art moldings and spindles, which they manufacture in great variety. The catalogue is oblong in general shape, is printed in tinted ink upon a good quality of white paper, and is bound in very neat paper covers. In their introduction to the trade, they say that "in the present day of progress, when competition enters so actively into any line of trade, the question of cost of production becomes one of prime importance in every line of manufacturing enterprise. The introduction of machinery and the application of new devices and tools have relegated the older and more costly methods to the shades of the past, and have brought into general use more artistic designs and articles of finer finish than were possible in former times. The art of wood turning is one which has been circumscribed in its operations, because difficult of perfecting machinery adequate to the demands of the work." In offering this catalogue to the trade the company call attention to some of the many advantages which they possess for producing turned work of various kinds. They state that by the aid of recently patented machinery they are able to produce molding in lengths ranging from 3 to 13 feet, and at a greatly reduced cost as compared with hand turning. Their work is produced in any kind of wood to match the material in connection with which it is employed, the turnings being regular in size, smooth and ready for the finish, and the distances of members accurate. Several pages at the opening of the catalogue are devoted to illustrations showing many of the uses of art moldings and spindles furnished by the company. A great variety of designs are given, together with directions for ordering moldings, prices for different kinds of wood and directions for ordering spindles, with prices of different varieties.

THE TAYLOR MFG. COMPANY, of Chambersburg, Pa., report a gratifying demand for their products, and state that during the past few weeks their sales of the Beck Automatic Engine have been increasing, and that they have shipped the following: One 12½ x 15 inch engine to the Reeds Lake Electric Railway Company, of Grand Rapids, Mich., for electrical railway service; one 7½ x 8 inch engine to the Norfolk and Western Railroad Company, Roanoke, Va.; one 15 x 18 inch engine to the South Baltimore Foundry Company, Curtis Bay, Md.; two 10½ x 12 inch engines, with boilers, &c., to the Citizens Electric Light and Power Company, of Lansdowne, Pa.; one 16 x 18 inch engine to the Tiffin, Ohio, Edison Electric Illuminating Company; one 16 x 18 inch engine to H. A. & T. C. Gooch, Louisville, Ky., making the second order to this party; one 12½ x 15 inch engine to the Virginia Electric Light and Power Company, Richmond, Va.; one 7½ x 10 inch and 5 x 6 inch vertical automatic engine on combination base for dynamo to J. M. Badger, St. Paul, Minn.; one 11 x 12 inch engine, with complete steam plant, for Cedartown, Ga., Ball Electric Light Company; one 12½ x 15 inch engine to Sears' Building, Boston, Mass.; one 9½ x 12 inch engine to Read & Hovalt, Weatherley, Pa.; one 10½ x 12 inch engine, with boiler, to P. E Blalack, Newton, Miss.; one 8½ x 10 inch engine, with complete steam plant, for Elephant Club, Brooklyn, N. Y.; one 10½ x 12 inch engine for steamer Grand Republic, New York City; one 8 x 8 inch vertical style automatic engine on plain base for the Luchmann Hotel, Memphis, Tenn.; one 15 x 18 inch engine, with boilers, &c., for the Scottdale Electric Light and Power Company, Scottdale, Pa.

WE HAVE RECEIVED, with the compliments of Samuel Cabot, 70 Kilby street, Boston, Mass., a copy of an illustrated catalogue entitled "Sketches." It consists of a number of oblong sheets of white paper of rather coarse texture, fastened together at one corner by a silken cord. The right hand pages are devoted to illustrations of buildings of various kinds which have been treated with Mr. Cabot's Creosote Shingle Stains. The houses were planned by leading architects in different sections of the country and show the style of architecture to which the Stains are peculiarly adapted. Upon the left-hand pages are testimonials from those who have used Creosote Wood Preserving Stains. The printing is done in tints, producing a sketchy, yet very neat, effect. We understand that a copy of this catalogue will be sent to all applicants.

WE ARE IN RECEIPT of the prospectus of the Academy of Architecture and Building, of St. Louis, Mo., which contains interesting remarks on the course of study pursued at this institution, the requirements of admission, the cost of tuition and other information of value in this connection. We also have several sheets constituting additions to the prospectus, the third one of which tells how to become an architect. To the young mechanic desirous of taking a course in architecture and building construction, the circulars which this institution send out will be of interest and value.

C. E. JENNINGS & CO., 79-81 Reade and 97 Chambers street, New York, announce elsewhere in this issue that their topic for the month of August is Iron Planes. In their space they present illustrations of the perfected Iron Plane with new adjustment, the statement being made that the bottom of the plane is inlaid with rosewood stripe firmly and immovably dovetailed into the iron and so combined as to prevent the wood from wearing away.

THE EASTERN PLASTER BOARD COMPANY, 52 Broad street, New York, present in their advertising space this month some of the merits claimed for Mackite, which is said to be an improvement upon the present method of rough plastering. This material is manufactured in any length of slab from ½-inch to 6 inches in thickness. It is stated that the material may be employed for deadening, back plastering, non-conducting or isolating partitions, furring floors, roofs, &c.

THE ARCHITECTURAL ASSISTANT COMPANY, with office at 7 Warren street, New York, have recently issued an announcement, of especial interest to architects, calling attention to the class of work which they are prepared to furnish. The company prepare architectural drawings of all kinds from rough pencil studies, and furnish assistants to architects whenever required. The object of the company is to assist architects in their work, the statement being made that they will not undertake any job unless through a practicing architect. A drafting department is set aside from the business office, enabling the strictest privacy to be maintained in all matters intrusted to the company, while patrons may have access to the work in hand at any time by giving brief notice.

WE HAVE RECEIVED from the Gage Tool Company, Vineland, N. J., samples of the quality of lead pencil which the company propose distributing to the trade. We understand that it is their intention to send a carpenter's pencil free, together with circulars of their planes to all applicants who mention *Carpentry and Building*.

WE HAVE RECEIVED from I. P. Hicks, Omaha, Neb., a sample copy of a little work of 26 pages entitled "Builder's Guide and Pocket Companion," designed for the use of carpenters, contractors and builders. Within its covers will be found interesting information for all those engaged in the building trades. We also have from the same address a copy of "Hick's Handy Estimate Blanks," intended for the use of builders and carpenters in estimating material and labor. It consists of a number of blank sheets with suitable rulings arranged in paper covers. The purpose for which each column is intended is designated at its head. The sheets are so arranged that they may be easily torn out if desired without disturbing the others

THE GRAND RAPIDS HAND SCREW COMPANY, of Grand Rapids, Mich., manufacturers of hand screws, cabinet clamps and benches, issue a circular in which these goods are illustrated and described. Particular attention is called to the manner in which their spindles are made. The threads are described as sawed by a patent process, which leaves the wood solid instead of cutting the threads with a V tool, which is referred to as weakening or straining the grain of the wood. We are advised that they use only second growth hickory, thoroughly dried, for all spindles, and the best selected hard maple and birch for jaws. The company are having a gratifying trade on their cabinet makers' bench, which was recently put on the market, having shipped within the past few weeks to San Francisco, Fort Worth, Texas, Atlanta, Ga., and New York, as well as to numerous points nearer home.

THE GURNEY HOT WATER HEATER COMPANY, 163 Franklin street, Boston, Mass., issue a pamphlet entitled "How Best to Heat Our Homes." Perhaps the most striking feature of the work is the queer colored cover, the yellowish-green hue of the paper making it a very conspicuous object. In an introductory note the Gurney Hot Water Heater Company speak of the increasing use of hot water for heating dwelling houses and public buildings, and state that they receive so many inquiries from all parts of the country in regard to the merits of their system that they thought it best to issue a pamphlet describing this system of heating. The work, therefore, begins with an account of the fundamental principles of hot water circulation and continues with a very thorough description of the Gurney Hot Water Heater aided by numerous illustrations. The Gurney Hot Water Radiator is also illustrated and described at length. At the close is a list of reference and a price-list of the Gurney Boilers.

WILLIAM P. KELLOGG, Troy, N. Y., is putting upon the market a boring machine adapted to work either upright or angular, a distinctive feature of which is an improved depth gauge. This gauge is so arranged as to insure uniform depth and a smooth bore to the mortise, causing less work in chiseling out. The gauge is adapted to be set to bore to any depth by moving it up or down on the graduated slide and tightening the set screw. When not in use it can be dropped entirely out of the way.

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CARPENTRY AND BUILDING.

A MONTHLY JOURNAL FOR THE BUILDING TRADES.
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DAVID WILLIAMS, - - PUBLISHER AND PROPRIETOR.
A. O. KITTREDGE, - - - - - EDITOR.
JOHN S. KING, - - - - BUSINESS MANAGER.
66 & 68 DUANE STREET, NEW YORK.

SEPTEMBER, 1890.

The Western Union Building.

For the most part the student of the building business has little opportunity to study the construction of modern buildings, except as they are put up. He seldom sees them laid bare by reason of alterations or because they are being taken down. Old houses and buildings out of date are the ones that are ordinarily torn down, and the student studies them because they reveal the peculiarities of the builders of the remote past. The Western Union Building, New York, is, however, an exception to the general rule. It is in a sense a modern building of the first class, and yet it is being torn down. We gave an account of the fire which injured the upper stories of this structure in a former issue, and also presented an outline of the company's plans for removing the steep roof that characterized the old building and carrying the structure up square some three or four stories above the old cornice line. In the interval the tower, the roof and other high parts have been in process of removal, and the work has been the center of a great amount of interest, both upon the part of builders, architects, engineers and others engaged in the building business, and also upon the part of the general public. The tearing down and removal of old material has been very carefully managed, and the work has proceeded with the same regularity and precision as characterizes the erection of modern city buildings. The structure has been systematically reduced to its original elements, and many of the parts—just as good as new—will ere long be doing duty in new buildings. For them it is simply a change of position.

The Pennsylvania Station.

Another change in buildings which necessitates the destruction of the old to make place for the new occurs in the Pennsylvania station, in Jersey City. That building, unlike the Western Union Building, above referred to, is almost entirely of wood. In reducing it to parts of a size to permit removal the student finds very little to interest him. Very little of it has been saved fit for any other future use than kindling wood. The difference in the material used and the difference in construction employed make the two results of tearing down as different as we have described them. The new building which is to do duty as a terminal for this great railway system will be altogether unlike its humble predecessor, now being destroyed. It is to be a building first class in materials and construction and also in all its appointment. It is to take high rank among the great railway stations of the world. The tracks of the Pennsylvania road are being elevated to avoid grade crossings in Jersey City, and, accordingly, passengers will be landed in the new station in the second story. Two story, or rather double deck-ferry boats, are also being provided, and it is asserted that the ferry houses of the New York side are to be similarly reconstructed in connection with bridges across West street. If this is done the traveler will be saved climbing up and down stairs going to and from the cars, and also the nuisance of crossing between teams in the crowded street which runs in front of the ferry houses. These plans of the Pennsylvania Company mark an important change in building matters, not only in the general scheme of station buildings and ferry accommodations, but also in various details necessary in working out the plan.

Labor Affairs.

This issue of *Carpentry and Building* will be found to contain an unusually interesting assortment of articles, whether considered from the standpoint of the architect, of the contracting builder, or of the mechanic engaged in some branch of the building trades. The news of the builders' exchange movement is given in considerable detail, and there is likewise presented some account of what the organizations among the carpenters have recently accomplished. The story of the brick boycott in New York is told, and there is also reference to the action of the Knights of Labor in railway matters and in other directions. The great multitude of men engaged in the building trades are at the present time divided between two camps, veritable armies, ready for aggressive and defensive action. Each watches every movement the other makes, and each stands ready to take advantage of any change in the conditions prevailing. Each may demand more than public opinion will grant, for public opinion, after all, is the arbiter in every question between capital and labor, between builder and mechanic; but the outcome at the end will be that which is fair to both parties in interest. *Carpentry and Building* is deeply interested in the struggle. It sees both sides, sympathizes with both, and would help both by giving each an understanding of the other's position and reflecting alike the news of the entire campaign. Labor and capital become at one with each other when both comprehend all the facts and each stands ready to deal fairly with the other.

Technical Matters.

While the struggle between organized labor and organized capital is progressing, business is not being neglected in the large majority of cases. Strikes and boycotts are the exception, not the rule. The every day affairs of the building business still continue to have very careful attention almost everywhere, and therefore this issue of *Carpentry and Building*, after giving the news from the camps, devotes the largest share of space to technical questions. Two exceptionally interesting house studies are presented. The correspondence department is replete with important bits of experience, and the general articles are of a character to command the favorable attention of the average reader. The supplemental plate is an attractive addition to the gallery which many of our subscribers are forming by framing our monthly house studies. By comparing the successive issues it will be seen that we have succeeded in securing pleasing variety.

A Lesson of the Census.

Much interest attaches to the census from whatever point of view the results may be considered. Just at present the rivalry among the larger cities, and even among cities of the second and third classes, is quite conspicuous, but the newspaper attention which these matters receive, large though it is, does not entirely cover up other and more important questions. The change that is slowly but surely taking place in the character of the population of New England, and which has been variously discussed by different writers for many months past, without definite figures upon which to base conclusions, is now shown to be as various newspaper correspondents have described it. The result of the census in Massachusetts illustrates this very fully. In the last ten years the number of inhabitants has increased 411,501; in the last five years, 252,445. This is considerably below the average rate of increase of population in this country. The increase, moreover, is entirely confined to the large manufacturing centers. Thus Essex County, the home of the shoe trade and other manufacturing industries, has gained 49,262 since 1880, or 20 per cent. Worcester County shows an increase of 32,870, or 15 per cent. Bristol County, which includes Fall River and Taunton, gains 47,613, or 35 per cent.; Hampden, in which Holyoke, Springfield and Chicopee are situated, 30,400, or 30 per cent. All of the agricultural counties report actual decrease in population. In the counties above mentioned, moreover, population is concentrated into the manufacturing cities. Except for Pittsfield, Adams and North Adams, the fertile Berkshire County would show an actual falling off. Outside of the cities of Worcester and Fitchburg, the county of Worcester would have reported a decrease of more than 5000. Probably the increase in a dozen cities more than covers the total net gain of the State. When it is considered that this increase in the cities is largely due to the influx of foreign laborers, and that the people from the country districts, the survivors of the traditional New Englanders, are in large numbers ge-

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ing to other States, these figures bring a startling illustration of the change which time is bringing to New England. Maine has increased barely 10,000 in ten years, and New Hampshire shows an actual loss of a few hundreds.

The New York Brick Embargo.

A brief summary of the double-headed boycott in the brick business of New York City, which is in progress as we go to press, will be of interest and importance to our readers.

The situation seems to be substantially this: New York builders and owners are to be cut off from all supply of that most necessary of all materials in building operations—namely, brick. This is to be brought about by a combination of manufacturers, principally at Haverstraw, who agree together not to load any brick for delivery in the city of New York until certain restrictions enforced upon certain of their number by labor organizations be entirely removed. The facts leading to this concert of action upon the part of the manufacturers are as follows:

Messrs. King & Lynch, Avery & Mackey, O'Brien & Vaughey and Cyrus Travers, makers of brick at Verplank's Point, Haverstraw, incur the displeasure of labor organizations because their workmen happen to be almost entirely drawn from the ranks of non-union men, and a boycott of the output of the said firms is ordered by the labor unions, in which they secure the co-operation of the Carters' Union, so that if by any chance the manufacturers should be able to get their bricks as far as the piers, they would be effectually prevented from delivering by the refusal of the carters to move them.

A consultation of all the brick manufacturers of Haverstraw is called and the conclusion is reached that such high-handed interference, carried to such an extreme, is so manifestly threatening to the safety of the whole trade that heroic measures must be adopted, and a practical illustration given of the result of such methods if carried to their logical conclusion.

The manufacturers, therefore, agree that they will neither sell nor deliver another brick, after a certain specified date, in the city of New York, until the boycott placed upon the above named firms be removed.

This appears to be no idle threat, for at the present writing the brick famine has actually begun and the delivery of brick in the metropolis may be said to have practically ended for the present.

The magnitude of this latest manifestation among the various complications brought about by the demands of labor organizations, can hardly be conceived, for it means not only the stoppage of one trade but virtually all trades that are directly or remotely connected with the building interests. Thousands of manual workmen must perforce remain idle, and establishments that deal in the various materials must suffer an irretrievable loss. Without giving an opinion as to the responsibility for such widespread disaster as is threatened, it is proper that the most serious thought should be given to the dangers which underly organized effort through an undue and unwise exercise of power. Labor organizations have fully placed before the community the benefits and advantages to accrue to the individual through their united effort, and it would seem by many recent manifestations that they are also illustrating most forcibly the dangers, disadvantages and almost criminal results that may follow from uncurbed effort and unrestrained desires.

What the result is to be is a hard matter to determine, but it is plain enough to be seen that if the brick embargo continues but a short time the result will be most unfortunate for all concerned, while if it continue for a month or two, as now seems possible, the result will be disastrous in the extreme, and will carry its effects far beyond the limit of the actual time involved, and will seriously affect the business interests of the city.

Little relief can be expected from a supply of brick from other sources, for there is no market which can spare anything like a fiftieth part of the requiremements of this great city from its own local demand. It is to be hoped that the shortsighted policy which has demanded of the manufacturers more than they can honorably or safely grant will be speedily abandoned, and that the labor organizations involved will do their part toward relieving the community of the result of their headstrong action.

The Chicago Convention of Carpenters.

The sixth general convention of the United Brotherhood of Carpenters and Joiners of America was held in Plasterers' Hall, Chicago, during the week beginning August 4. According to *The Carpenter*, the official paper of this organization, there were four general officers and 199 delegates present, most of whom were from Western States. The work of the convention was opened by addresses of welcome from Mayor Cregier, Judge Tuley, Counsellor Maher and R. B. Hall, of Chicago. The first day's session was devoted to speeches of welcome and the preliminaries of examining credentials and framing rules of order for the government of the convention. On the second day the morning session was consumed in the appointment of committees and the consideration of communications from various local unions, together with the presentation of reports of the general president and general secretary.

The report of the general secretary showed that the number of local unions now under the jurisdiction of the United Brotherhood of Carpenters and Joiners of America is 697 in good standing, with 77,596 enrolled members and a roster of 53,769 beneficial members. This is a net gain in the past two years of 259 new unions and 25,353 new members, or a gain of 39 per cent. in new unions and 36 per cent. in membership. The report showed that in the past two years the United Brotherhood had expended $57,842.49 for death and disability benefits, making a total of $111,517.65 paid out in benefits from the general office in the seven years the system has been in operation. Over $235,000 more were paid out for sick benefits at the same time by local unions. During the last year $71,327.48 were expended in the support of trade movements, in strikes and against lockouts where only $4170 were expended the year previous. The report also states that the present year the Brotherhood won 144 strikes involving 57,420 union and non-union men and lost eight strikes involving about 2300 carpenters. Last year they won 78 strikes out of 82 engaged in. In four years, the report states, the Brotherhood has advanced the wages of carpenters in 413 cities 25 to 75 cents per day, besides which it has reduced the hours of labor to eight hours per day in 36 cities and to nine hours per day in 234 cities, not counting 260 cities which now have the rule of eight or nine hours a day on Saturday.

Another feature of the biennial report of the general secretary relates to the extent of the organization. It says that the United Brotherhood, with its 697 local unions, now covers every State and Territory in the United States and the leading provinces of Canada, having jurisdiction in 604 cities. Thirty-nine of the unions do business in the German language, 11 in French, 5 in Bohemian, 5 in Scandinavian, 1 in Polish and 1 in the Holland tongue; 21 of the unions are composed of planing mill hands, and 8 of these are made up exclusively of sash, blind and door makers, while 5 more are composed exclusively of stair builders. Of the 697 local unions, 21 are in Canada, 47 are located on the Pacific Coast, 107, of which 17 are composed exclusively of colored men, are in the Southern States, 85 are located in the New England States, 208 in the Middle States, and 229 in the Western States. The report deals with the personal affairs of the United Brotherhood, the system of benefits employed, briefly describes the strikes and lockouts in which members of the Brotherhood were engaged, points out its relations to other organizations and concludes with a number of recommendations.

In the afternoon of the second day the report of the Committee on Finance was accepted, and the work of revising the constitution taken up. This matter occupied the greater part of the period during which the delegates were assembled, consuming as it did three and one-half day and two night sessions. The whole of the constitution was entirely revised and condensed, and, including the rules for local unions, contains 183 sections. All conflicting clauses were stricken out, and, when adopted by the local unions, will go into effect November 1, 1890. Many of the severe clauses in the old law on benefits have been striken out and the old law remodeled with a view to giving more privileges to the members. In cases of strikes and lockouts the new law makes better preparations in advance for trade troubles and for their effective support or settlement after due investigation.

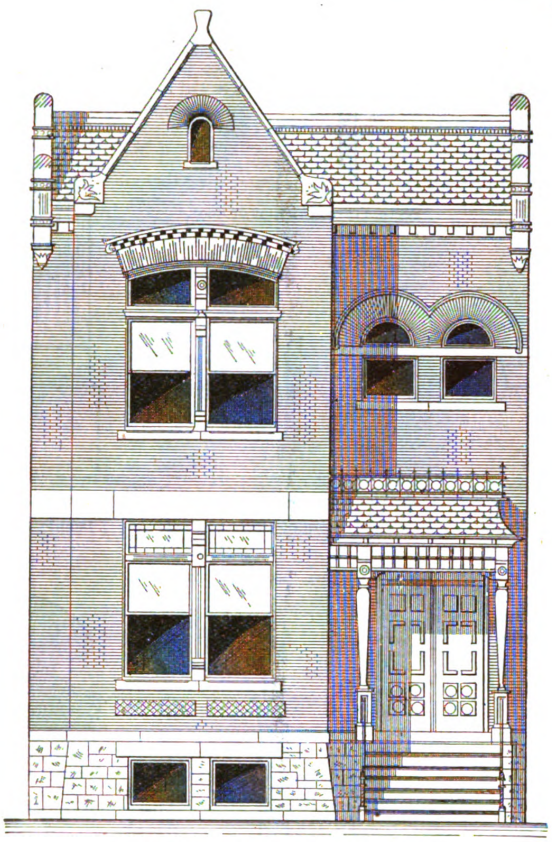
In the election of general officers W. H. Kliver, of Chicago, was made general president, and P. J. McGuire was re-elected general secretary; P. M. Wellin, San Francisco, Cal., was made first vice-president, and P. W. Birck, of Brooklyn, N. Y., was made second vice-president; A. M. Swartz, of Pittsburgh, Pa., was made general treasurer. The members of the General Executive Board include Hugh McKay, of East Boston, Mass.; Charles E. Owens, of New York; E. A. Stevens, Louisville, Ky.; W. F. Abrams, and S. E. Kent, of Lincoln, Neb. The headquarters and general office of the United Brotherhood remain in Philadelphia, Pa. The convention adjourned to meet in seventh general convention in St. Louis, Mo., on the first Monday in August, 1891.

Multiplying Drawings.

To multiply all kinds of drawings, says an exchange, let a sheet of paper float for two minutes on a warm solution of 6 grams gelatine and 3 grams bichromate of potassium in 6 cubic inches water; dry it, float in again and dry it again, but this time so that the side which was up the first time is under now; in this way a uniform coat will be obtained. Or the bichromate may be omitted from the solution, and just before using the paper may be floated in a solution of 3 parts bichromate to 100 parts water. The drying must be done in the dark. The dry paper is then exposed to the light under the drawing in the copying frame in the usual way, and afterward placed in a dilute solution of alum water. When the greater part of the bichromate has dissolved, place the picture on a glass or zinc plate, dry it with blotting paper, and with a soft roller ink it up with lithographic ink. The drawing will appear white on a black ground. When this is finished wash again in water till the drawing has lost all its yellow tinge. Such a print will yield 40 to 50 good copies in a copying press, if the inking up has been done with lithographic printing ink.

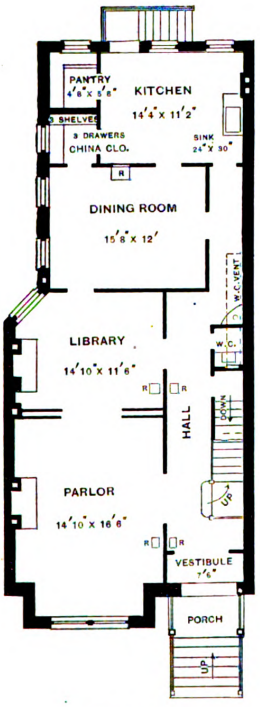
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DESIGN FOR A CITY RESIDENCE.

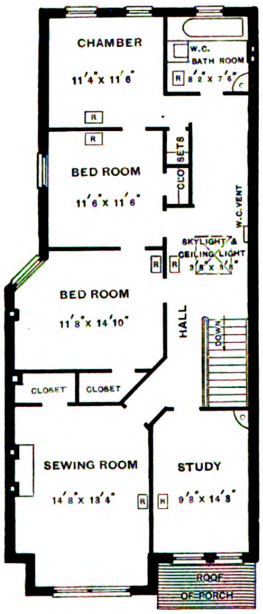


Front Elevation—Scale, ⅛ Inch to the Foot

WE TAKE PLEASURE in laying before our readers this month the front elevation, floor plans and some miscellaneous details of a house intended for erection upon a city lot. The drawings were designed by James N. Rezny, of the Evening Public Manual Training School of Chicago, Ill. The front of the house, which is two stories and basement in hight, is of pressed brick, so constructed as to present a pleasing architectural effect. The basement is divided in such a way as to give a variety of apartments, such as laundry, store room, furnace room and coal bins. Upon the first floor provision is made for a parlor and library connected by folding doors, while beyond is the dining room and in the rear of it the kitchen. The arrangement of the rooms is such as to permit of a person passing from the kitchen to the front door without the necessity of going through any of the principal rooms. Communication between the kitchen and dining room is obtained by means of a china closet, and also by means of a door opening directly from one room into the other. The second floor of the house shows three sleeping rooms, a sewing room located in the front, while the space over the front hall and vestibule is utilized as a study. The bathroom is in the rear of the house, at the end of the hall. The design of the author is to heat the house by means of a furnace, the location of the registers being indicated upon the first and second floor plans.

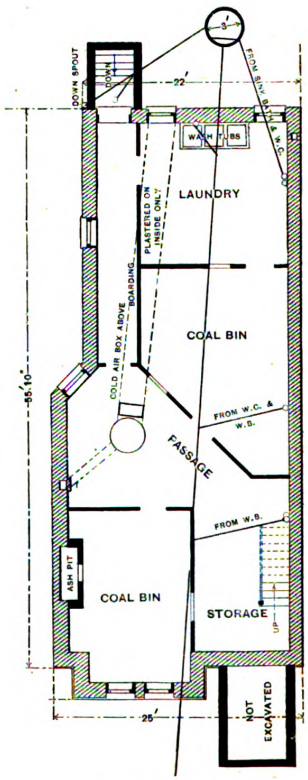


First Floor.



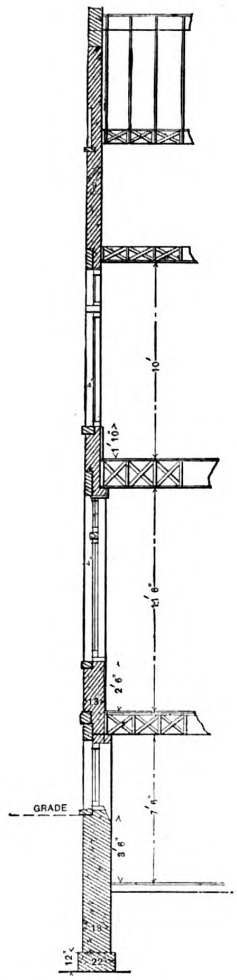
Second Floor.

Scale of Floor Plans, 1-16 Inch to the Foot.

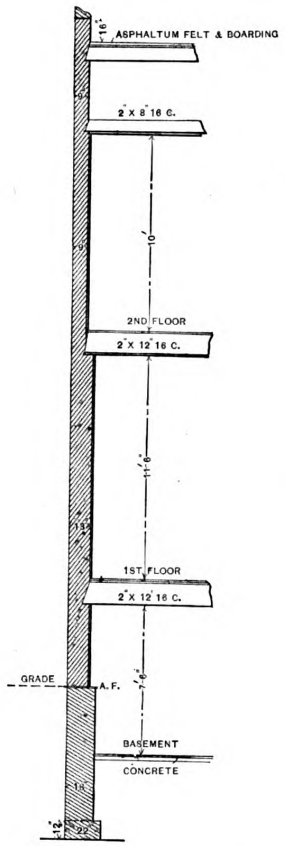


Basement.

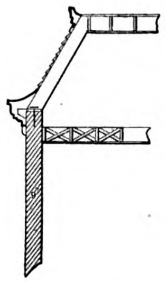
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Section through Bay Window.



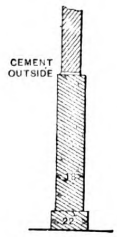
Section through Side Wall on Lot Line.



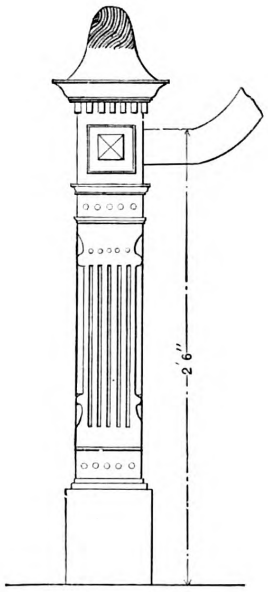
Section through Front of Roof.



Section through Wall under Front Stair.



Section through Side and Rear Walls.

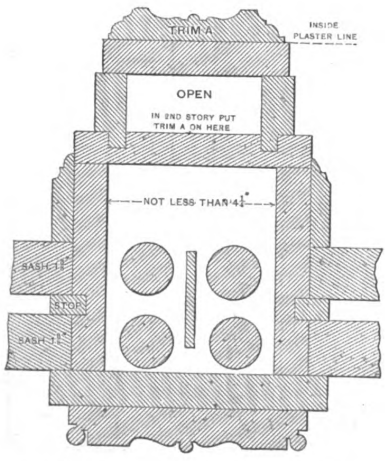


Iron Newel Post.

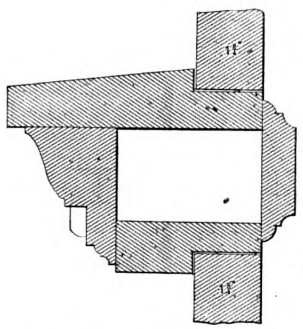


Detail of Handrail.—Scale, 3 Inches to the Foot.

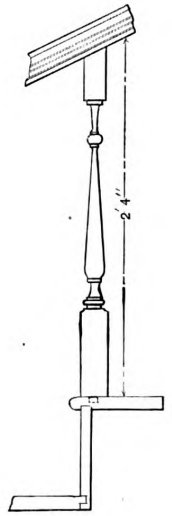
Scale, ⅛ Inch to the Foot.



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



Detail of Outside Door Transom Bar.—Scale, 3 Inches to the Foot.



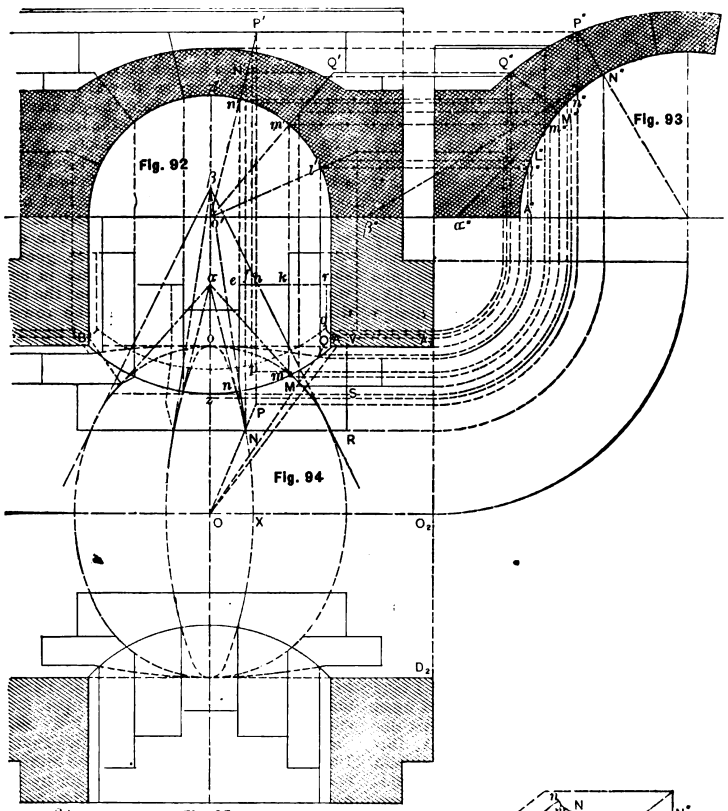
Detail of Baluster and Stair.—Scale, 1 Inch to the Foot.

DESIGN FOR A CITY RESIDENCE.—DETAILS.—(*See Page* 197.)

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MASONRY AND STONE CUTTING.*

THE WELSH GROIN or lunette is formed by the intersection of a barrel vault with another which does not rise to the same level at the crown. Here the groin is a line of double curvature (Fig. 94) projected on plan in the form of the hyperbola Az B, as we have studied before in the penetration of a concrete vault. All that we have said, then, relative to drawing the groin line with the help of tangents to the curve, applies again here. As in the former groined vaults, the stones forming the groin belong to both barrel vaults; but the horizontal joint lines of both vaults then we divide the smaller vault in such a way that the first joint line l' be on a lower level than L''. This is essential for getting a neat looking arrangement of joints, for when l' is lower than L'' it follows that m' will be lower than M'', n' than N'', and every bed of the smaller vault will intersect the soffit of the larger vault; whereas if l' were higher than L'' the bed of the larger vault would intersect the soffit of the smaller at that point; but the joint m' would probably be lower than M'', and then the bed of the smaller vault would intersect the soffit of the larger,



Masonry and Stone Cutting.—Figs. 93 to 97 inclusive.

can no more be at the same level, for this would give variable widths for the stone courses of the larger vault, such as l'' m'', m'' n'' (Fig. 93). In designing the jointing, we must proceed as follows:

We draw (Figs. 92, 93) the sections of both vaults, springing from the same line, but the section of the larger must be considered as being on the line A_2 O_2 D_2 at right angles with the center line of that vault. We begin by drawing the jointing of the larger vault in A'' L'' M'' N'', and thus producing an alternative direction in the jointing most unsightly.

Now, from the point (n n') where the joint line of the smaller vault reaches the groin, the bed joint of the smaller vault cuts the soffit of the larger vault along a portion of an ellipse until it reaches the level of the joint N on the large vault. The point N is determined by the horizontal plane N' N'' (Figs. 92 and 93), which intersects the plane of the bed joint of the smaller vault along a horizontal line projected on elevation in point N', and on plan on the line f N. The same operation would give intermediate points of the curve, but we may observe that the ellipse to which it belongs has the axes O o and O X, by means of which the curves may be trammeled. We can also get the tangents to n and N, which will pass through the points α and β, where the planes n'' α'' and N'' β'' tangent to the larger vault intersect the center line of the smaller vault. Another useful remark is that if we complete the ellipses formed by the intersections of the larger vault by the other beds of the smaller vault, then the tangent to these curves taken at the same level as n and N will all cut the center line at α and β, for all these ellipses have the same axis O o in common.

After having reached the point N on the soffit of the vault the bed joint of the smaller vault is intersected by the bed joint N'' P'' of the larger vault. The point P on the extrados is found by a horizontal section such as was used for finding the point N on the soffit. P N is the projection of the intersection of the two beds. We should notice that this line prolonged must pass through the point O where the two center lines of the vaults meet, for the center lines O o and O O_2 are the traces of the planes of all the bed joints. If the vaults given were not semicircular then P N would not pass through O where the center lines meet, but it would pass through the point where the traces of the planes of the bed joints meet.

From P the bed joint of the smaller vault cuts the extrados of the larger vault until it reaches the point p on the groin formed by the intersection of the two extrados surfaces; then it cus the extrados of the smaller vault along the line p h parallel to the joint line n e. The entire horizontal projection of this joint is therefore the figure e n N P p h. By a similar operation we find the figure k m M Q q r projection of the bed joint m of the smaller vault, and if we limit the groin stone at the joint R S on the larger vault the entire plan of the stone will be the figure e n N R S V Q q r e.

For working the stone we must get a development of the soffit of the smaller vault, as in Fig. 96, by the same method described in Fig. 16. The molds giving the exact shape of the bed joints are drawn by rotating all the points thereof round their lower edges, or by simply setting off their points by means of the plan and elevation. To draw the curved outlines N_3N_3, p_3P_3, the tangents will be found useful; the tangents are found by rotating the center line, as we have explained in Fig. 16, and drawing the tangents through α_3 and β_3.

To cut the voissoir, we begin by working a prism, Fig. 97, the base of which is equal to the plan of the stone, Fig. 94, and the hight of which is equal to the difference of level between the lowest edge of the stone in the smaller vault and its highest edge in the larger vault. The cutting is then carried out by placing the head molds in their proper positions, then working the soffit of the smaller arch, delineating thereon the groin line n m.

The soffit of the larger vault is worked by placing the ruler successively on the curves M'N'', Mm, mn, nN as guiding lines. The extrados of the small vault is then worked far enough to place thereon the development of the extrados, by means of which the extrados groin line is determined; then the extrados of the larger vault can be worked with proper guiding lines. When great accuracy is not required masons can work the cylindrical surfaces of the extrados by simply sighting their straightedge with the edges of the beds, and keeping its direction about parallel to the same. Lastly, the back of

* Continued from page 193.

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the stone is most often not worked at all, the operation planes being simply left.

If the difference of level between the two vaults at the crown is small, then it will be better to place the joint lines in both vaults at the same level, for in that case the difference of widths $A''l''$, $l'm''$, $m''n''$ of the several courses will be imperceptible. If the springing line of the smaller vault be raised so that the crown of the smaller vault be placed on the level of the crown of the larger vault, then we shall have the ancient Roman groin, which we can thus construct in hewn stone instead of concrete.

Estimating by Cubing.

We have had occasion at different times in the past to refer to the plan of estimating buildings by simply taking their cubic contents. This method, which many builders claim is sufficiently accurate for rough estimates, and under certain well defined conditions, cannot be depended upon as the mainstay in making estimates. It has for its principal recommendation the fact of being applicable where buildings very nearly resemble each other. Where a close record of cost has been maintained on a number of structures of the class previously erected, there is no question that the plan of cubing, as a measure of comparison, may be of value. There is danger, however, in depending upon it. An article which appeared a short time since in one of our English exchanges bears upon this point and presents a number of arguments, together with facts and figures that cannot fail to interest our readers. We append it in full, without attempting to substitute American money for the English currency in which the prices are stated. It will be seen that the conclusions reached by the writer in the case are essentially the same as indicated in our remarks above. The article is as follows:

The plan of obtaining approximate estimates by the method of cubing has now attained to something like a system. At first it was a very tentative and by no means reliable method of estimating buildings. Surveyors and architects of the past generation used to carry in their pocket books a few of these golden rules of calculating, little imagining that in later times the rough and ready cube unit would become a general mode of arriving at approximate estimates, and be introduced into text books and figure in Government reports of Select Committees. The experiences of a generation or two have enabled the profession to arrive at tolerably accurate rates of cubing for different classes of building, though it ought not to be overlooked that a particular locality may very materially impair the correctness of this mode of estimation. The rates must be taken as general guides in forming an estimate of cost, and in all cases the experience of the architect can alone give value to the system. Then the cube rate cannot be relied upon for work of exceptional elaboration. The cubes generally published are intended to apply chiefly to buildings of a plain character in their several classes, and it would be of value if this circumstance were taken into account in fixing upon the rate. Precision can, however, only be attained by a generalization from extensive experiences, and the evidence which appears in the report of the Select Committee on the Admiralty and War Office sites affords some very useful information from an official source. We may here allude to the instructive evidence given by Mr. John Taylor, the surveyor of public buildings in Her Majesty's Office of Works. In his examination on the estimate for the new blocks of building behind the present Admiralty, that gentleman is reported to have said that the cost of a plain brick building would be at the rate of 1/ per cubic foot.

Now this may be taken as a fair rate for a large public building on an open site such as that alluded to. In this plan a large quadrangular court is shown with a screen or colonnade, which we recently described in referring to Messrs. Leeming's able alternative design, prepared at the suggestion of the committee. This court is not included in the superficial area taken of building, though it would have to be drained and paved, and the colonnade would also be a rather expensive item. The actual building area covered in this estimate is 46,250 superficial feet, while the open court is 195 x 155 feet. We leave our readers to make the average rate per cube foot under these circumstances; the actual building or covered space would, of course, work out something less per foot than 1/. We simply refer to the figures given. Messrs. Leeming's design was also taken at the same rate, with certain additions for portions that could not be cubed conveniently, such as the ornamental portions, which are lumped. Mr. Taylor stated that taking the work all round, including the extras, the rate was 1/ or thereabouts. Then, comparing the rates for a five-story and a four-story building, the additional story somewhat reduces the cost per cube foot, so that an ornamental exterior like that of Messrs. Leeming's first design would not be necessarily more expensive per foot than a plain building one story less in hight, as was elicited by Mr. Shaw-Lefevre. A great deal of valuable evidence was given as to the matter. Further on in the report we find that 1/2 is taken as the cost per foot cube for a plain building, but including all arrangements for ventilation, electric lighting and other provisions.

We may quote a portion of the question of Mr. Isaacs and reply thereto as relating to this question of cubing. "Having regard to the character of Messrs. Leeming's building, and the fact that the whole of the facade is to be in stone as against the facade being in brick, does it strike you that the figure in one case bears no comparison with the figure on the other—1/2 against 1/? But I take it that if everything in the nature of open spaces and courts were taken in this design, as they have been in plan A, this would come to more than 1/ per cubic foot on the actual measurement of the building." Again, Mr. Taylor, replying to another question, observes the first design is a complete structure; the other one, to which very considerable additions are proposed, and where alterations and new buildings are combined, the cost per foot cube would be higher than in the case of building on a site entirely cleared, where the contractor could proceed from the foundation upward with out hindrance. With respect to buildings erected on Northumberland avenue, Mr. Isaacs stated that the buildings there have cost as much as from 1/4 to 1/6 per foot cube. But there is no comparison between a large block of offices and an elaborately fitted up hotel. The one is comparatively simple to the other; the decoration to the hotels in the avenue would alone increase the cost per foot. The evidence upon the relation of size and dimensions to cubing rates is of interest. It is certainly a difficult point. Mr. Taylor, in his evidence, remarks: "I think the probabilities are that the cubing of a building 100 feet high would be higher than that of a building 50 feet high. It altogether must depend upon whether the larger building and the higher building has rooms of nearly the same size as the smaller building. No doubt the higher building would require thicker walls, but immediately you get away from comparatively small rooms into very large cubic spaces, then the difference in price is not great."

In a fewer words we may say that the cost per cube foot of a building depends mainly upon the divisional internal walls and floors; the more numerous the rooms into which the space is divided the greater the cost. Hight is certainly a factor of cost, as a high building requires thicker walls; scaffolding and labor become expensive. But if we take two buildings, one twice the superficial area of the other, but of the same hight, the difference per foot would entirely depend on the interior divisions and elaboration of plan. But to say that the cubing of a bigger and higher building is pro rata higher than for a smaller and lower one is a proposition that does not always hold. It is so only when the rooms are about the same dimensions in both cases. It would, for instance, be absurd to cube a large public hall with the usual rooms at a higher ratio than a small villa residence because it was larger and higher. In plain English, the greater the internal space and vacuities the less charge must be placed on the cube foot.

With regard to ornamental façades of wrought stone, a considerable addition per foot must be made upon the cost of a plain brick front. To cube both at the same figure would be wrong. The evidence in the report, for instance, goes to show that a considerable saving in cost would be effected in carrying out the first design for the Admiralty if the towers were cut off and the engaged and separate columns of the façades were dispensed with, though at a material sacrifice of architectural character and dignity. A plain gauged brick front with stone dressings like that of the old building is estimated to cost about 2/6 per foot superficial, though the difference between such a facing and the stone front would make a difference per foot cube of only 1d. The Home and Foreign Offices cost, it is stated, 1/ and $\frac{1}{12}$ of a penny per foot cube, or practically 1/ a foot. Other rates are given that are of value. The General Post Office new building cost 8¼d. per foot, the Bow Street Police Court 11d., the Marylebone Police Court 9d., all by Mr. Taylor; St. Thomas' Hospital cost 9d.; the Royal Exchange is said to have cost 11d. The Houses of Parliament cost as much as 2/6 per foot cube, the British Museum 1/6, and the recent additions under Mr. Taylor 10d.; the 8d. in addition to the original cost of the latter is made up for by the expensive colonnade. Those who know these public buildings will see how materially the cubic space tends to reduce the unit of cost per foot cube.

In speaking of estimating by the cubing system, it must not be understood that we really think it prudent to calculate the cost of buildings in this way, but only for the sake of comparison, and as a very useful and often safely approximate guide. Government architects and surveyors have generally adopted the system, and in the departments of the public service there are excellent opportunities for making comparisons and tabulating results. Sir William Harcourt in his questioning was too sceptical to believe that such a system could be depended on, and asked whether any builder in the world would take a contract upon an estimate founded upon cubing. We may answer that half the estimates now made by architects and surveyors in their private and public capacities are made by cubing, and that contractors are to be found who would willingly take the risk of carrying out work in that manner. The two most perilous rocks upon which the cuber comes to grief are those of taking a figure without the verification of experience, and not making any allowance for internal elaboration of plan and decoration.

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ROOFS OF ALL AGES.

THE HISTORY OF the roof, from its most ancient form down to the various styles common at the present day, constitutes an interesting study, not alone for those actively engaged in the roofing buisness, but for the general reader as well. That the general public is taking a more active interest in topics of this kind is evident from the gradually increasing space devoted to them by the daily newspapers, it being a well recognized fact that the amount of space given by a paper to any particular subject may be regarded as a fair index of the interest taken in it by the readers of that journal. A forcible illustration of this growing interest in trade topics upon the part of the public is an article entitled "Roofs of the World," which appeared in the St. Louis *Post-Dispatch*, and which is of such a character as to justify its presentation herewith, together with the illustrations accompanying it. It is but proper to state that some of the references to modern roofing should not be read too critically.



Fig. 1.—A Hut Roof.

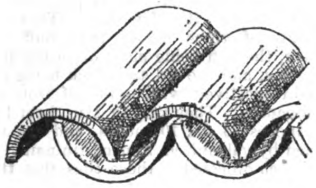


Fig. 2.—Spanish Tile and Method of Laying.



Fig. 3.—Cheap Roman Pan Tile.

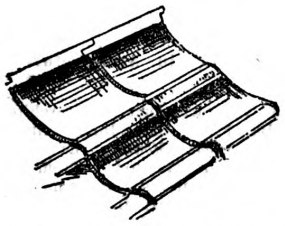


Fig. 4—Old Roman Clay Tiles, Showing form of Joint.



Fig. 5.—Bronze Tiling



Fig. 6.— Form of Mediæval Tile.

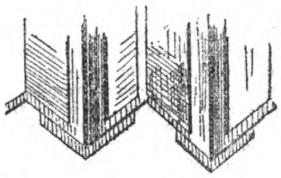


Fig. 7.—Early English Ridge Tile.

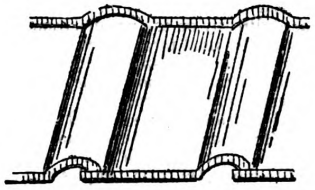


Fig. 8.—Italian Pan Tile.

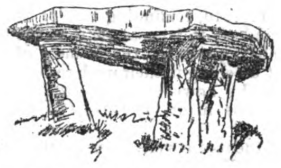


Fig. 9.—Roof of Ancient Times.



Fig. 10.—Chinese Roof.

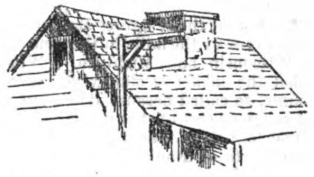


Fig. 11.—Old-Fashioned Shingle Roof.

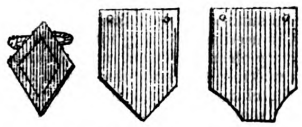


Fig. 12.—Forms of Modern Shingles.

Man is an inventive animal. When the ancient Arya, or the Arya's progenitor, or whoever else it was, formed the first tool, that moment witnessed the departure of the human current from the broad stream of animal existence. One of the first necessities of this manlike animal's existence was shelter from the fury of the elements, and as necessity was then, as now, the mother of invention, we may say that the first offspring of this ancient necessity was some sort of a roof. If all the roofs ever invented or used by man, from that made of a few spars united together with twigs and covered with mud, Fig. 1, to the iron shingle roof, Fig. 12, recently put on the market in St. Louis, could be brought before us we would have a pretty good history of civilization.

This latter promises to take the place of the ordinary shingle, or slate roofing. The enameled shingle, as it is called, is simply a thin iron dipped in a solution of granite mixture. The iron sheet is placed first in a pickle of acid for 12 hours. This eats away all unevenness due to rust or other causes, and leaves a perfectly smooth surface. The shingle is then dipped into a solution of chemicals for eight or ten minutes and then baked. This has been subjected to enormous heat, but, it is said, resists the action of fire. It is of course waterproof, and therefore proof against the action of the atmosphere, as the metal is never exposed. Besides, the many colors made possible in the process of enameling make it ornamental, and hence desirable in all buildings which pretend to an architectural character.

In all probability the first roof that man had was a cave which he shared with his first cousins, the Simians, or perhaps it was nothing more than the thick branches of a tree. Out of these natural roofs came the imitative forms, the artificial cave called the cromlect and the hut of brushwood. The first attempts were merely erections of a few spars united together with twigs. In a more advanced stage walls of dried turf were erected and those walls connected by means of timbers laid horizontally, covered with weeds and boughs. Rain storms soon set the primitive man to thinking, and the first fruits of this thought was the inclined roof covered with clay to carry off the rain. Vitruvius, who wrote in the time of Julius Cæsar, says that roofs were so constructed in his day by the uncivilized inhabitants of Gaul and Spain. The old Ayras are said to have used clay dried and laid on the timbers in this way. The Chinese, especially favored by nature, used nothing but bamboo, out of which alone they constructed their houses, except occasionally when they used stone for foundations. Great roofs were made of thick bamboos bent and covered with reed very ingeniously disposed. This made a very close roof and afforded a perfect shelter from the rain and heat. The Assyrians, likewise having no forests, resorts to canes. These were formed into arches, the curvature of which was fixed by a wicker frame work made of reeds placed vertically, horizontally and diagonally under the arch. On the arch were placed smaller canes, and then a layer of soft clay was placed on the top of the wall on which the arch rested. When this was dry another layer was added, and then another, all following the curvature of the arch until the whole was covered. After this the canes were no longer of use, and were usually removed. Although the supporting principle was the arch, the roof itself was flat. These structures are of the grander sort. Other Assyrian roofs were of strong beams covered with tiles or flat bricks. The Greeks covered their houses with marble tiles or terra cotta ribs. Rome was originally roofed with shingles, which constituted a

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standing invitation to the great conflagrations which so often swept over the city. About the time of the war with Pyrrhus tiles of burned clay were introduced. These were flat and thin—thinnest at the lower end. The joints were covered with a semi-circular or angular joint tile, the whole having the appearance shown in Fig. 4. The tiles were accurately fitted and securely fastened to the rafters with bonze nails. Where cheapness was required a shallow pan tile was used with a semi-circular joint tile, as shown in Fig. 3.

With the introduction of the Gothic style of architecture came necessary developments of roofing. The Norman roofs were usually of steep pitch, showing the whole of the cross framing of the timbers used in them, and sometimes boarded on the under side so as to form a flat or slightly canted ceiling. Slates or tiles were used as the outer covering. The Chinese roofs all have a peculiar hollow dip, Fig. 10, reminding one of the tent, and indeed it is possible that the Chinamen have preserved the memory of an ancient dwelling in their modern houses. It is said, however, that the umbrella sug- gests many of these Chinese house forms.

Of the roof coverings in use the common shingle, Fig. 11, is the most familiar to Americans. It has been used for a long time in all parts of the world. The shingle, however, has been replaced by other and better materials in most countries. It still lingers in the United States, principally in the South, but the business of shingle making is not a growing one. In 1880 there were 45 shingle factories in the United States, of which 25 were in Kentucky, and others scattering through Indiana, Missouri, Pennsylvania and New York. The capital employed was very small—$17,000—while the value of the product amounted to only $48,000. But of course those statistics do not include the whole shingle products. Like all statistics, they omit the greater part of the truth. It is probable that these figures are multiplied many times by the mills in the pine forests ot Wisconsin and Michigan. What is called the shaker is simply an enlarged shingle, so called because it was used by the religious sect of that name.

The old-time thatch is still used in many parts of England, although it has been largely replaced by slate. It is not without merit, being a non-conductor of heat, and therefore warm in winter and cool in summer. By English farmers it is largely used as a roofing for dairies. It is not very clean, however, and attracts vermin, making frequent changes necessary. In thatching, ordinary straw is first laid on the roof beams in bundles and fastened with spars. These spars are twigs of willow, pointed and made pliable by being dipped in water. A twist is given them and the pointed ends are thrust into the straw foundation. After the reed bundles have been so secured the edges are combed and cut and the eaves trimmed off smooth. The ridge is sometimes made of mud, in which plants and grasses are insersed to prevent the earth being dissolved or washed away by rain. On the western coast of England and Ireland, where the wind blows from the Atlantic, the whole roof is saved from being blown away by being anchored down with rocks fastened to ropes or chains thrown over the cabin.

Tin has been used in this country as a roof covering, but it cannot resist the action of the climate. Although painted twice a year it often happens that if the coat of paint be broken the tin will be found rusted away and the wooden structure below exposed to the action of the water.

At present slate is the most important roofing material, or rather the material most in demand. It is argillaceous, sedimentary rock which was deposited as clay during the early geologic ages. Subjected to enormous pressure the layers were squeezed together in dense masses, while by subsequent convulsions the particles were arranged in fresh planes perpendicular to the directions in which the pressure was first exerted. Along these the slate splits easily, and thus is furnished a natural roofing material which is very hard, and which absorbs little or no water. A slate roof is one of the neatest possible roofings, but though hard, is brittle and easily broken. Besides, though called an incombustible, it cracks and falls to pieces at no very high temperature. Besides they are not wind proof, and frequently become loosened from their fastenings.

Lead, zinc and copper are used to some extent for roofing purposes, the countries in which they are in vogue outside the United States being Russia, Canada and many new settlements all over the world. Although the first cost is considerable, copper seems to be the cheapest of all roofing material, except, perhaps, iron, if the experiments in iron roofing are successful. Many copper roofs are found in the East in good condition 50 or 100 years old, while in Europe roofs of that material 500 years old can be found.

Tiles are a roof covering of very ancient lineage, being used by the Assyrians and Romans, as mentioned above. They are used to some extent in England, but the great tile roofed towns are in Italy and Spain. The old Spanish tile, Fig. 2, was very heavy, weighing sometimes as much as 10 or 12 pounds. It is made of brick clay about ¾ inch thick, and is in the form of a semi-cylindrical trough about 18 inches long. The pitch of the roof on which these tiles were placed was slight, and indeed it could not be otherwise, considering the manner of laying the tiles. The roof timbers being in the tiles were laid in parallel rows, face upward, the run of the lines being from the eaves to the pole. Then on these were laid other tiles with the curve up. It is the simplest kind of roof covering, and with another row laid lengthwise along the pole it becomes very effective, especially in snowless climates. But being very heavy it required sturdy walls and stout timbers to support it. Sometimes the tiles were laid in a bed of mortar, but more often were placed directly on the wooden framework. All the tiles used formerly in Mexico and other parts of Spanish America came from Spain, but they are now made extensively in Mexico and California.

In localities which supplied laminated stone the Romans roof their buildings with stone tiles fastened with iron as slates are used to-day. On their temples and other magnificent buildings tiles of thickly gilded bronze, Fig. 5, were used, which produced a magnificent effect. Those of the Temple of Vesta are especially mentioned by Pliny as having been of Syracusan bronze, an alloy in great repute among the Romans. Bronze tiles for small buildings, such as this, were usually of a pointed oval form something like the feathers of a bird. Pope Honorius I, in 638, robbed these heathen temples of their bronze tiles to cover the Basilica of St. Peter. From this they were stolen by the Syracens, in 846, during their invasion. In mediæval times lead or copper in large sheets was used for the chief churches and places in Europe, but in more ordinary work clay tiles, Fig. 6, of a very simple form were used. In this so called pan tile each tile has a double curve, forming what is known as a tegula and imbrex or gutter and ridge both in one. Stone tiles were also very common throughout the middle ages. Pan tiles were first used in Flanders, the wavy surface lapping under and being overlapped by the adjacent tiles. The early English tile, Fig. 7, was an angular ridge, the mode of laying being precisely the same as the Spanish tile, gutter and ridge being alternately placed in position. A graceful form of pan tile, Fig. 8, was used by the Italians. Each tile showed a flat basin and curved ridge.

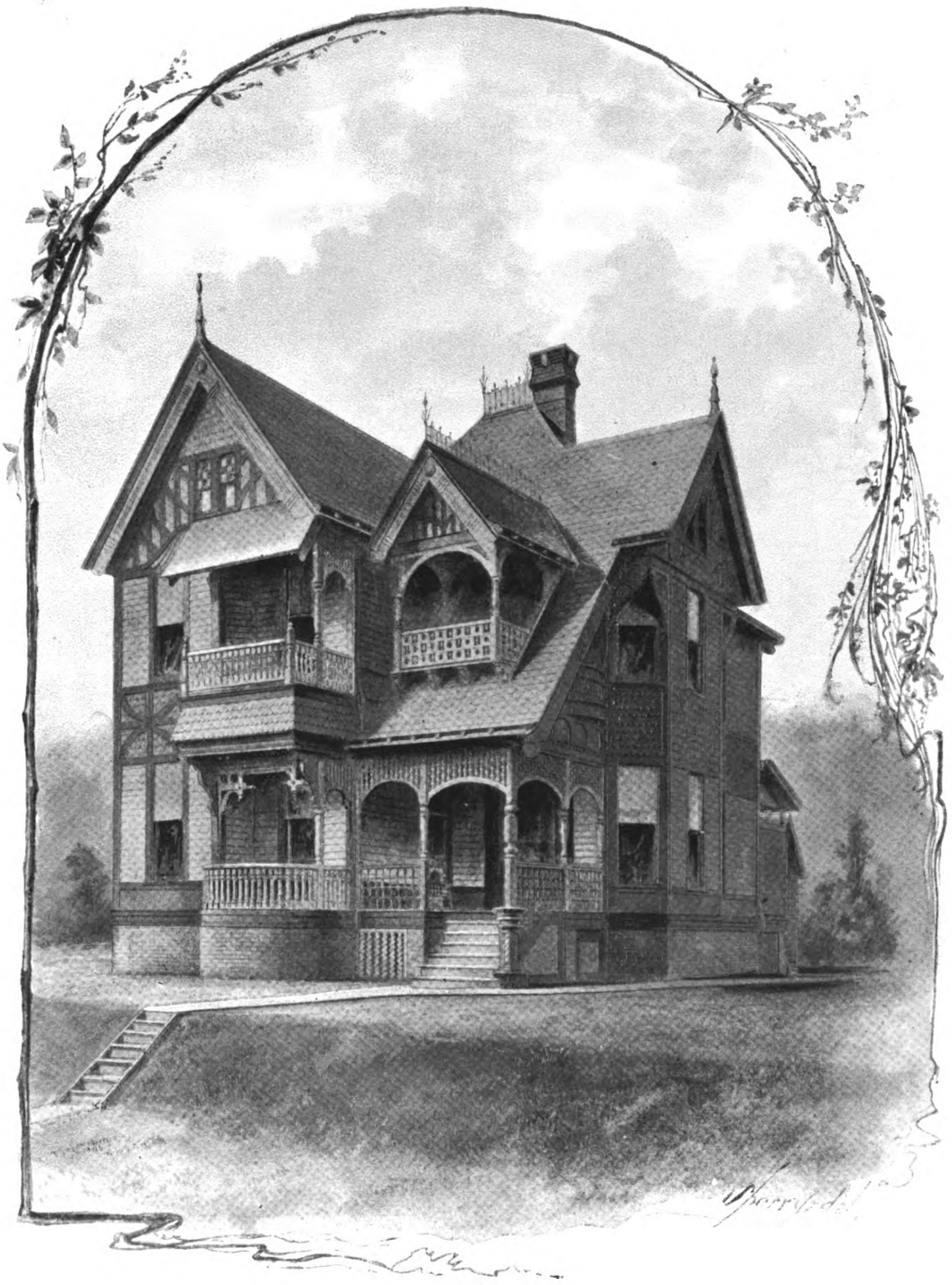
At the present time clay tiles are the ordinary roofing of England, and many complicated forms have been invented to keep out the rain. These are, however, costly and do not on the whole answer better than a plain, rectangular tile of about 9 x 6 inches, fastened by two copper or zinc nails and well bedded on mortar mixed with hair. The English tilleries are not only the largest in the world, but the masters pay particular attention to the preparation of the clay. The first stage in this preparation is the weathering, the clay being thrown into pits, covered with water, and softened. After being taken out of the pits the clay is kneaded and completely mixed by a revolving cast iron spindle which carries a series of flat steel arms, so arranged as to form by rotation a worm-like motion upon the clay. In this way great cohesive power is given it and the clay is then ready for the molds. After molding and shaping they are put in ovens for 38 hours.

In this country the manufacture of roof tiles is a comparatively new industry, but it is growing rapidly. With us, however, the tiles are not of the pan or ridge shape, but are flat and of various patterns, the shield being the favorite. They are usually of three colors, red, buff and black, the buff being made of nearly pure fire clay, and the red and black being colored respectively with oxide of iron and manganese. They vary in size from 14 x 8½ inches to 6 x 10 inches, and are fastened by galvanized iron or tin nails. It has been objected to those tiles that they are heavy and made of coarse clay, and that, therefore, they will absorb moisture so that freezing and thawing would cause them to crumble. But these objections have been met by improvements in manufacture. One of the greatest advantages of the tile roof is that it is a non-conductor of heat, and, therefore, cooler in the summer and warmer in the winter than any other.

Utility in Architecture.

The very art element of architecture, says Barr Ferree, in the June number of the *Popular Science Monthly*, has been the cause of its degradation. From the most useful of arts, it has become mostly ornamental. From meaning and expressing the utility of an edifiec, it has come to refer to its appearance only. The people have forgotten that it arose from the necessity of man for shelter, and view it as a product of the study or of the studio in which beauty and æsthetic effects are the only ends sought, while utility, convenience, expression of intention, have all become secondary considerations. Nothing could be more erroneous, nothing more fatal to the production of sound architecture. Architecture is not the product of the imagination, but the result of experience and foresight. The painter in his studio, or the sculptor in his, has nothing to dictate to his thoughts or force them into certain channels. His fancy is free, and he allows it to carry him where it will. The architect, on the other hand, is limited by innumerable requirements and difficulties, all of which are real and physical, and all of which must be overcome before his work can be a success. His creations are not intended for the decoration of a gallery, or to be preserved under glass, but they must stand the test of time and of climate, must bear a relation to the manners and customs of the day.

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A RESIDENCE IN KNOXVILLE, TENN.

GEORGE F. BARBER, ARCHITECT, KNOXVILLE.

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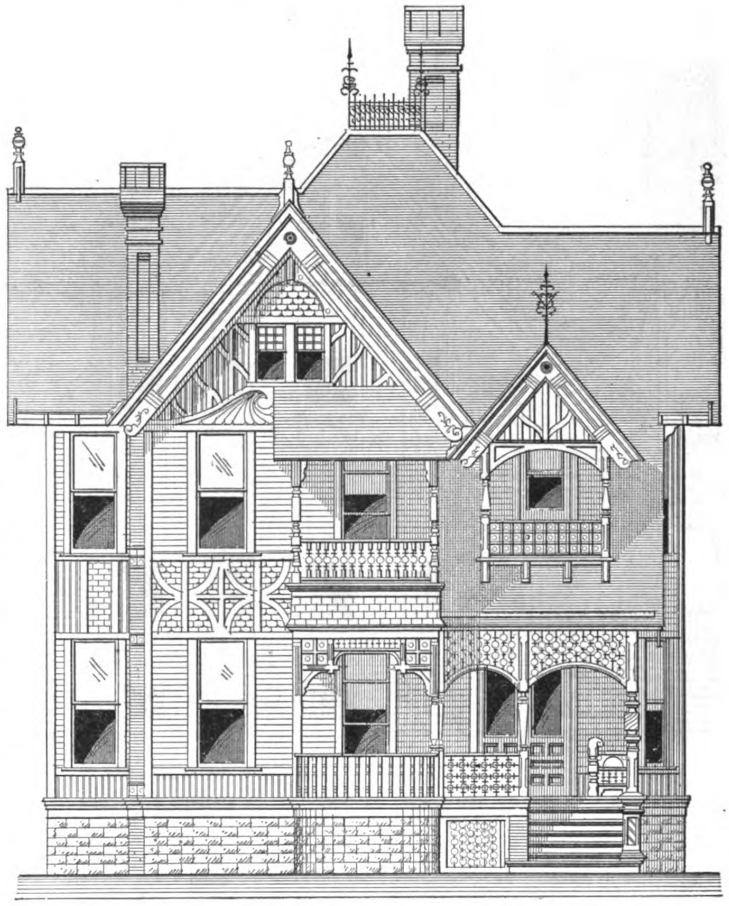
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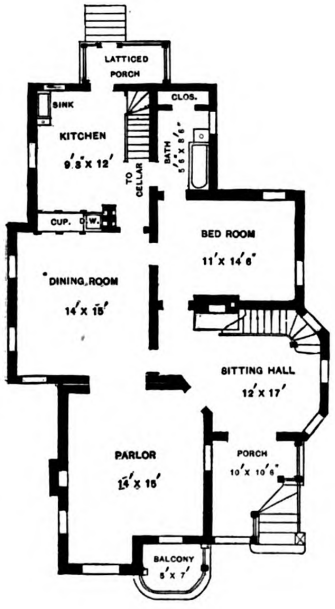
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A RESIDENCE IN KNOXVILLE, TENN.

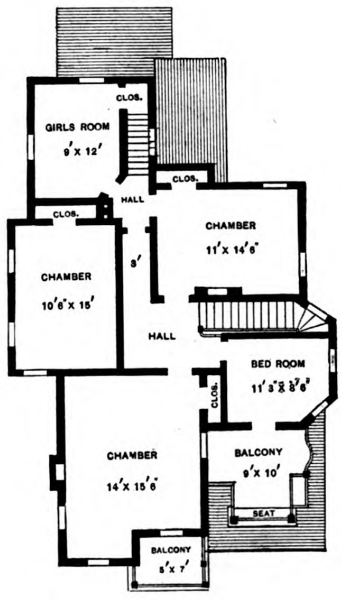
A VERY CONVENIENTLY arranged house of moderate cost is that shown by means of the elevations, floor plans and details presented upon this and the following pages. The designs were prepared by George F. Barber of Knoxville, Tenn., for Mr. George R. Wright, of that city. The size of the house is 32 x 49 feet, the first story being 10 feet and the second 9 feet 4 inches in the clear. From an inspection of the floor plans, it will be seen that there are four commodious rooms and a reception hall upon the first floor, while upon the second are five sleeping rooms. The reception hall, from which rise the main stairs, opens directly upon the porch, while from it the three principal rooms may be reached It will be noticed that the room directly in the rear of the hall is intended to be used as a sleeping room, and has opening from it the bathroom. The reception hall is of good size, measuring 12 x 17 feet, and is finished in oak. The parlor, dining room and bedroom on the first floor are finished in hard pine. The remaining portion of the interior of the house is painted. Four of the rooms are provided with mantels and fireplaces. The foundation is of brick, the cellar extending under the entire house. The joists for both first and second floors are of 2 x 10, 16 inches from centers, while the studding is 2 x 4, also 16 inches from centers. The entire house is sheathed and covered with building paper, making it warm and tight. The roof is covered with slate. A novel feature is the arrangement of the front steps, which come under the main porch roof. The chimneys are topped with pressed brick in cement mortar. This house was erected for Mr. Wright in Knoxville, in the year 1889, at a cost of $2900. A perspective view of the dwelling forms the subject of our supplement this month.



Front Elevation—Scale, ⅛ Inch to the Foot.



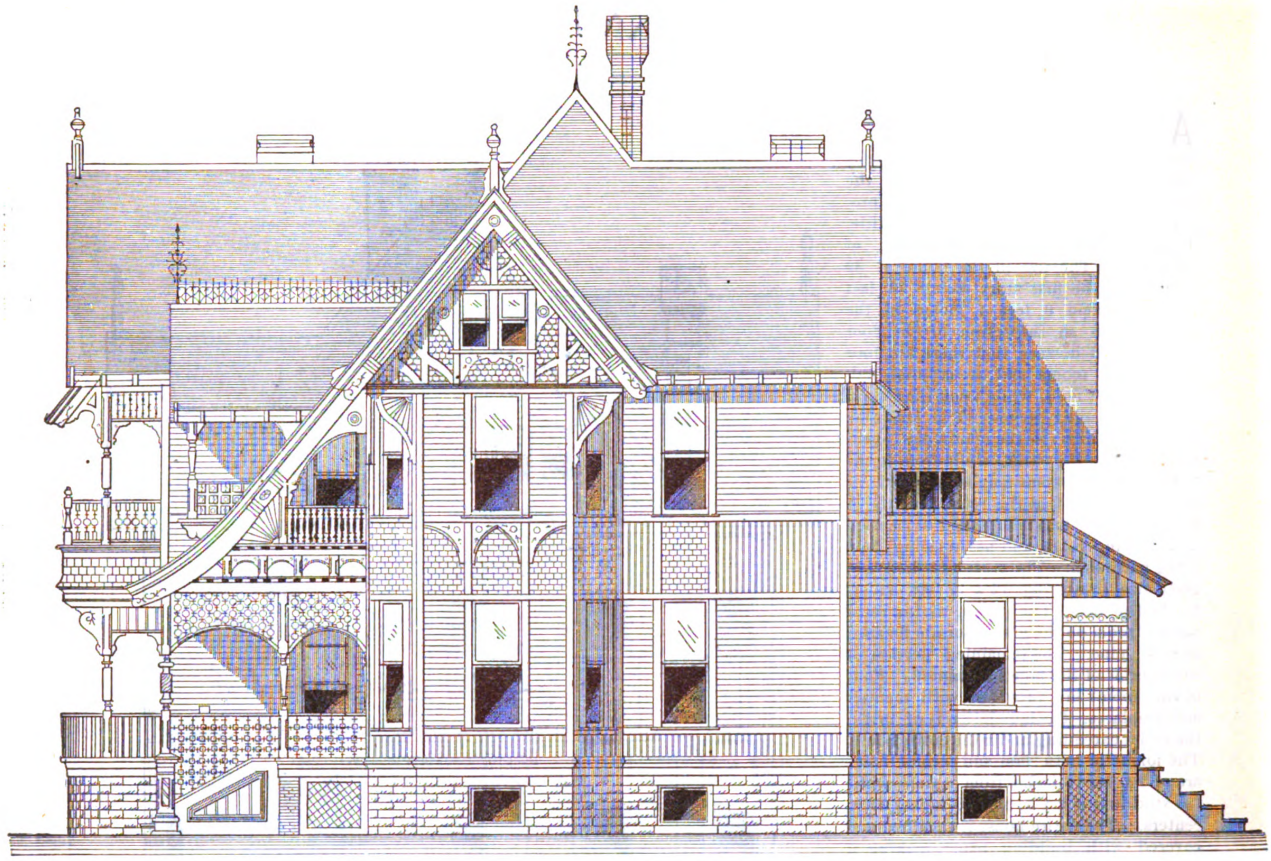
First Floor.



Second Floor.

Scale of Floor Plans, 1-16 Inch to the Foot.

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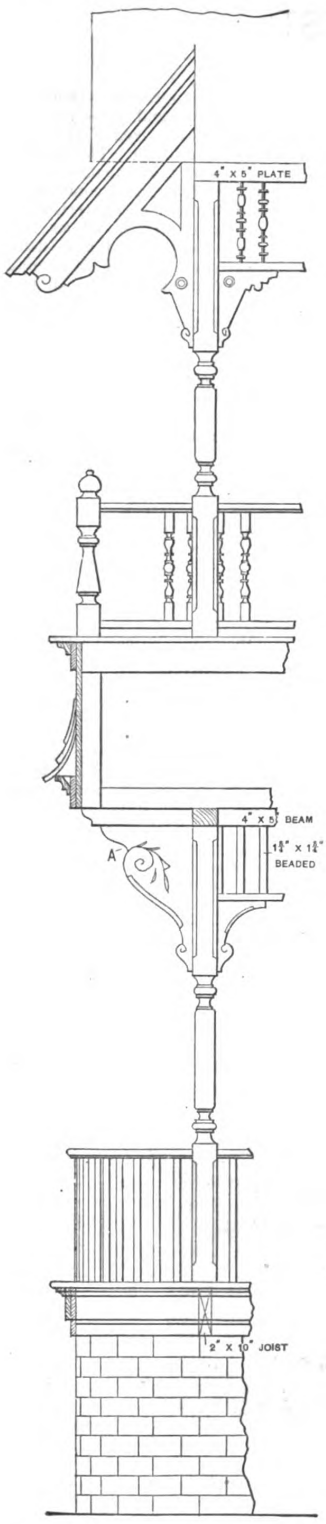
Side (right) Elevation.



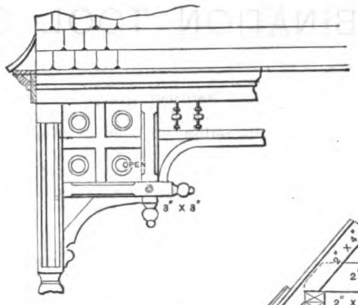
Side (left) Elevation.

A Residence In Knoxville, Tenn. *(See Page 203).* *Elevations.—Scale, ⅛-Inch to the Foot.*

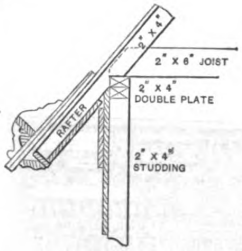
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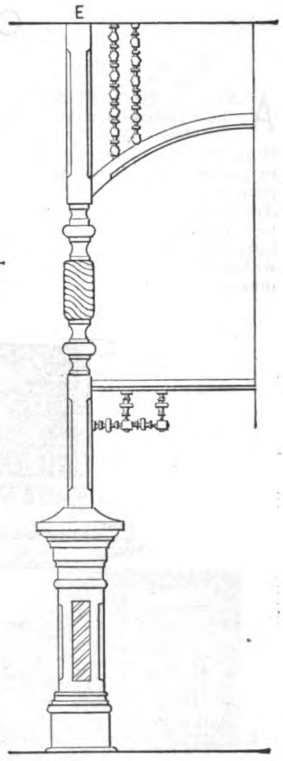
Detail of Front Balconies.



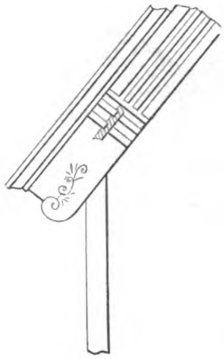
Front of Balcony Finish at A.



Main Cornice.



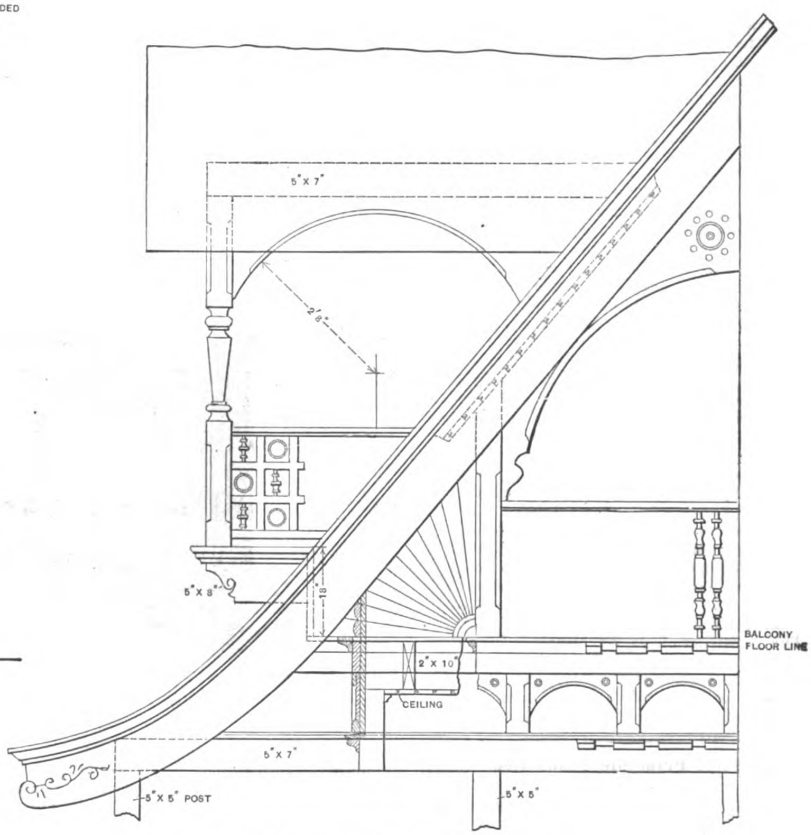
Corner Post of Front Porch.



Verge Board.



Octagon Bracket in Hall Gable.



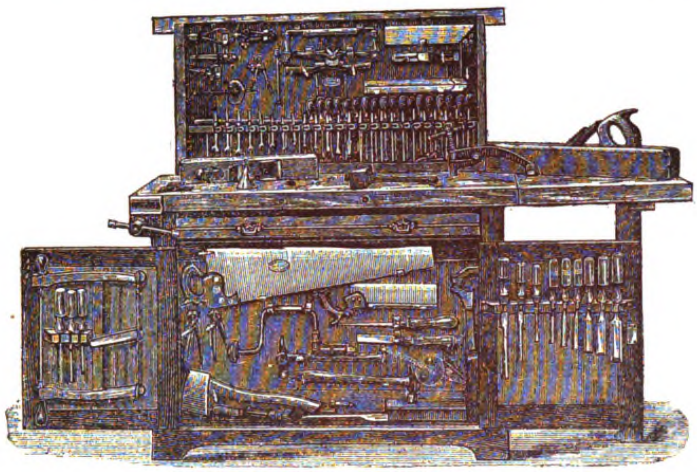
Detail of Front Porch and Balcony Roof.

A Residence in Knoxville, Tenn. *(See Page 203.)* *Details.—Scale, ⅜ Inch to the Foot.*

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COMBINATION TOOL CHEST.

A NOVEL TOOL CHEST has recently been placed upon the English market by Messrs. Moseley & Sons, of 323 High Holborn, London, which is likely to possess more or less interest for carpenters and builders in this country. An idea of the arrangement of this tool chest may be gathered from an inspection of Fig. 1 of the illustrations, which represents the chest open. As indicated in the engraving, the device is a



Combination Tool Chest.—Fig. 1.—Open View.

tool cabinet with a carpenter's bench on top 3 feet 6 inches in length, and, by the addition of an extension piece at one end, a practical carpenter's, joiner's or cabinet maker's bench 5 feet in length is secured. When the back tool rack is lowered it is practically flush, leaving a full, clear surface upon which to work. The lower portion of the chest is closed by two doors, the inside of which are fitted with tools ready for use. The back of the lower portion of the chest forms a tool rack, which may be raised and lowered. On the right hand side of the cabinet is a cupboard for containing the extension piece and leg, large planes, &c., while on the left are three drawers for extra tools, &c. These drawers are indicated in Fig. 2 of the illustrations, which shows the appearance of the tool chest when closed. In the front is a long narrow drawer with compartments for nails, screws and the like. The tool rack, which may be lowered and raised as above described and which forms the back of the bench, is fitted with tools, while the bench is fitted with a parallel vise and bench stop. The extension piece is so made as to fit in the front of the bench, forming a compact carver's table, so that when the operator is at work all the tools are within convenient reach. The cabinet, as shown in the illustrations, is made of walnut and ash with a solid beech top. The construction is so clearly indicated that we have no doubt there are many among the readers of *Carpentry and Building* who will be able to obtain valuable suggestions for a tool chest of their own.

A Vital Principle Vindicated.

"Shall the employer conduct his own business?" is a question that has been answered in the affirmative during the past month, with an emphasis that will be felt in every trade and through all channels of industry. The authorities of the New York Central Railroad corporation asserted their right to employ and discharge men at their discretion, without dictation from any source whatever—in short, to manage their own business as they saw fit. The representative of an important labor organization disputed the exercise of this right, insisting that some 50 odd men who had been discharged "for cause" should be reinstated in their positions. The officers of the company claimed to have acted with deliberation in what they had done, contending that no retrograde step was possible without breaking down the discipline by which some 22,000 employees were held as an effective working force. The consequence was that for at least two full days the traffic of the New York Central trunk line railroad was suspended and the whole Vanderbilt system threatened with serious consequences. The officers of the company at once determined to grapple with the difficulties by which they were environed, and success speedily rewarded their endeavors.

It now becomes the duty of ordinary sagacity and justice alike to acknowledge that in the course of events herein described there has been vindicated a vital principle, recognized through the whole range of industrial pursuits. Doubtless Vice-President Webb and associates distinctly saw the issue involved and comprehended its deep significance. The Knights of Labor, to whom the malcontents belonged, had already been discomfited in at least three memorable encounters, notably on Gould's Southwestern systems, and to surrender now was to abandon the field, leaving the way open through all coming time for strikes on the most trivial pretext.

In two respects the strikers were radically at fault. First, in failing to take a position that was morally impregnable, there being no real grievance. Second, they were not securely intrenched within their own organization. Lacking in either of these particulars their cause was lost. It must be observed, in estimating the chances of success, that there were internal dissentions in the order. Either the chiefs of the locomotive engineers and locomotive firemen respectively were not in accord with the general movement, and therefore deliberately refused to co-operate, or they timorously held aloof to await developments, indicating a lack of generalship fatal to the scheme.

Whatever the cause, it may be assumed with entire confidence that the Knights have been routed "horse, foot and dragoons," and that henceforth the principle is established more firmly than ever that the owners of a property, whether vast or small, shall be allowed to manage their own business in their own way and without dictation by men or organizations who have no connection, directly or indirectly, with the interests which are at stake. On the other hand, employees who have a grievance, real or imaginary, are entitled to be treated with due consideration.

A GENUINE relic of Napoleon I has been submitted to the competition of two or three furniture brokers at Dover, England, in pursuance of a county court execution. The article is a walnut console table, elaborately carved in the style of the First Empire, and bearing the Imperial "N" encircled with armory tracery, beneath a slab of marble, brown with age. This memorial of past greatness was knocked down to a broker for £4108. It is said to have been part of the fittings of Napoleon's cabin either on his voyage to St. Helena or while he was awaiting at Plymouth the decision of the Powers.



Fig. 2.—Chest Closed.

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The Builders' Exchange

CONDUCTED BY WM. H. SAYWARD, SECRETARY OF THE NATIONAL ASSOCIATION.

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Philadelphia Trade Schools.

The Master Builders' Association is rapidly pushing to completion the preparations for the opening of the trade schools and an early date for this is expected. The selection of Mr. William A. H. Allen as superintendent is in perfect harmony with the thorough and careful manner in which the trade school committee have conducted all the arrangements of the proposed school. Mr. Allen is a man in every way fully competent to undertake the supervision of an institution of this kind His life has been spent largely in the United States Navy, in various branches of the engineering department. He has had considerable experience in teaching mechanics and engineering at the Annapolis Naval Academy and is amply qualified for the undertaking.

Allusion has been made many times in the columns of *The Builders' Exchange*, to the projected trade schools to be maintained by and under the direction of the Master Builders' Exchange of Philadelphia, and the various affiliated bodies are more or less aware of the details of the plan upon which the schools are founded. The experimental stage of the trade school is past, and, following in the line which has been proved so thoroughly successful by Col. R. T. Auchmuty, of New York, the Philadelphia institution is assured a brilliant future. The builders and all practical men, whether members of the Exchange or not, are keen in the expression of interest in the undertaking and all seem anxious to assist so laudable an enterprise in every way.

Notwithstanding all that has been said on the subject, it would be impossible to attach too much importance to the establishment of this school. The time has come when the errand boy period in the life of the American youth who is bent upon becoming a mechanic should be abolished, and when he should be not only allowed but assisted to obtain a practical and thorough education in the line of his chosen trade. Heretofore young America has been compelled to go through a long and irksome apprenticeship, composed largely of a kind of drudgery that was, in a measure, useless to him. By the time his apprenticeship was ended, while he might possibly have become a good hand worker, in many cases the lack of careful grounding in the rudiments of his trade has been a serious detriment to his complete knowledge of his work, and oftentimes to his success as well. It naturally follows that a boy who has taken a course of study, such as is prescribed by the Philadelphia Trade School, and is then set at work, as an apprentice, upon a building, will, at the end of his term of apprenticeship, be a much superior mechanic to the boy whose term is spent in learning from observation alone or from occasional suggestions from his employer.

It is not intended to turn out finished mechanics from the school, but to prepare young men for the practice which makes perfect in any branch of the building trade. When the pupil is graduated from the Philadelphia institution he has passed a thorough and rigid examination, which demonstrates that his study has been of sufficient purpose to establish firmly and correctly in his mind the principles of his trade, and has taught his hands the best methods of accomplishing his work. He is then turned over to a master artisan or contractor who engages his services at a reduced rate of pay until the constant practice of actual work has developed a degree of skill sufficient to qualify him as a competent machanic, capable of earning a full day's wages.

The new feature of the school in question is that it will be under the supervision of a committee of actual and practical trade masters — men who have been selected from among the members of the different branches of building as being the most competent to advise in the methods of instruction and to assist in the

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formulation of plans for most desirable and beneficial results. This, as a new feature, together with the tireless and progressive energy of the members of the Master Builders' Exchange, and the example and advice of Colonel Auchmuty, will confer upon the building trades an inestimable and lasting benefit, the magnitude of which it is impossible to anticipate.

The National Association has advocated the establishment of schools of this character in the strongest terms, ever since its foundation, and Philadelphia has set the mark high.

The effect of the institution of these schools is bound to be felt by every community of builders in the country, and the influence of this example must not be underestimated.

The National Association urges upon every affiliated exchange the importance of this work. Every association of master mechanics in the United States, whether affiliated with the National Association of Builders or not, should take up the matter of proper trade instruction for our youth and push it to such condition as shall insure every young man the best possible opportunity to perfect himself in the knowledge of the trade to which he intends to devote his life. The ultimate result is obvious. In place of ignorant and unreliable foreigners, who can be swayed by the agitator into making all sorts of unpleasant complications in the labor market, we will have a race of skilled American workmen, capable of thinking for themselves and worthy of the consideration of the employer and the establishment of such conditions between the two as shall continually lessen and finally prevent the present unsatisfactory state of the field of labor.

Every filial exchange should at once take steps to provide a trade school for the young men of its vicinity. The details need not be so elaborate in the smaller cities as in Philadelphia, but the same effect can be accomplished in proportion to the resources of the association upon a much smaller expenditure.

A portion of the prospectus of the Philadelphia Trade Schools has previously been given in these columns, and a slightly abridged reprint of the plan of conducting each class is appended herewith:

CARPENTRY.

There will be two evening classes in carpentry and joiners' work, limited to ten young men each. Manual instruction will be given to Class No. 1 on Monday and Thursday evenings, and to Class No. 2 on Tuesday and Friday evenings, from 7.30 to 9.30 o'clock, the course of instruction being the same in both classes. Scientific instruction will be given to both classes every Wednesday evening from 7.30 to 9.30 o'clock. Class No. 2 will not be commenced until Class No. 1 is full.

The young men in the carpentry class are shown the use of the various tools commonly used in the trade, great care being taken that each is held and used in a workmanlike manner. After this has been acquired and boards can be sawed to a line and neatly planed, mortising and tenoning are taught. Then panels are framed, mouldings are put on and, later, doors and shutters are made. Partitions are also set, floors and partitions are bridged, and flooring laid. A small frame house is also framed, sheathed, shingled, &c. This course of instruction gives each member of the class a varied amount of work.

The scientific instruction includes the meaning of the terms used in carpentry, laying out a building from a plan, the framing of partitions and roof trusses, strength of girders, &c.

BRICKLAYING.

There will be two evening classes in bricklaying, limited to 15 young men each. Manual instruction will be given to Class No. 1 on Monday and Thursday evenings, and to Class No. 2 on Tuesday and Friday evenings, from 7.30 to 9.30 o'clock, the course of instruction being the same in both classes. Scientific instruction will be given to both classes every Wednesday evening from 7.30 to 9.30 o'clock. Class No. 2 will not be commenced until Class No. 1 is full.

Practical bricklaying will be taught in a thorough manner, leaving the quickness to be acquired after leaving school. Instruction will be in building 9, 13 and 18 inch walls, turning corners and building intersecting walls, building piers, flues, fireplaces, corbelling and turning arches.

Scientific instruction will be given on the thrust and equilibrium of arches, mixing and properties of mortar and cements.

PLASTERING.

There will be two evening classes in plastering, limited to ten young men each. Manual instruction will be given to class No. 1 on Monday and Thursday evenings, and to class No. 2 on Tuesday and Friday evenings, from 7.30 to 9.30 o'clock, the course of instruction being the same in both classes. Scientific instruction will be given to both classes every Wednesday evening, from 7.30 to 9.30 o'clock. Class No. 2 will not be commenced until class No. 1 is full.

Instruction in regard to the component parts of the materials necessary for each branch will be fully imparted to the pupil while he is applying the same.

1. Instruction in lathing. Space between laths. Number of laths to a course before breaking of joints on plain surface; also breaking of joints over window and door heads to prevent cracking.

2. The use of hawk and trowel. The taking up of the mortar from the mortar board on the hawk will be practiced by the pupil over the mortar board until he is thoroughly proficient before he is allowed to put mortar on any surface; this is essential to guarantee cleanliness.

3. The applying of the mortar to wall, partition or ceiling surface, which is known as scratch coat, roughing on a first coat, practicing on wall or partition first. After the pupil acquires proficiency then he will be shown how to work on ceilings. The use of the scratcher, and the leaving the first coat in a proper condition to receive the second coat.

4. Second coating. Screeding, first, of angles. How to handle the straight edge. How the screeding should conform to where window and door casings intervene. The filling of the space between screeds to make a perfect surface. The use of the darby, the proper face to be left, the rubbing up and cutting out of angles, to leave the work in a condition to receive the finishing coat of the white or hard finish.

5. Applying the white coat, the manner of running on white coat before skimming upis commenced, the necessity of running on the white stuff evenly to guarantee a uniform surface and lessen labor in skimming up, troweling off the work, how to edge the trowel, use of and the proper application of water with the brush; particular attention to this is essential on the part of the instructor; also the proportions of plaster of paris and sand required.

6. Hard finishing. How applied and the difference as to application and finish, both as to workmanship and material, as compared with white coat.

7. The cutting of Quirks on corner or angle beads. How a Quirk stick or tool is made and how applied.

8. Chamfered or beveled corners. How run, &c.

9. Sand finishing, or work left from under the float.

10. Cornicing, preparation of the ceiling and walls to receive the cornice. Traversing, striking of line on ceiling, setting of strips. Mitering, &c. Tools necessary and the proper appliance.

STONE CUTTING.

There will be two evening classes in stone cutting, limited to 15 young men each. Manual instruction will be given to Class No. 1 on Monday and Thursday evenings, and to Class No. 2 on Tuesday and Friday evenings, from 7.30 to 9.30 o'clock, the course of instruction being the same in both classes. Scientific instruction will be given to both classes every Wednesday evening, from 7.30 to 9.30 o'clock. Class No. 2 will not be commenced until Class No. 1 is full.

Instruction in plain and ornamental stone cutting in freestone and marble will be given

The course of instruction commences with squaring an irregular block of stone. The pupil is then shown how to finish the surface in various ways, such as rubbed, tooled, bush-hammered, random pointed, tooth chiseled, &c. He is then taught to cut chamfers, simple moldings, return moldings, raised and sunken panels, &c.

BLACKSMITH'S WORK.

There will be two evening classes in blacksmith's work, limited to eight young men each. Manual instruction will be given to Class No. 1 on Monday and Thursday evenings, and to Class No. 2 on Tuesday and Friday evenings, from 7.30 to 9.30 o'clock, the course of instruction being the same in both classes. Scientific instruction will be given to both classes every Wednesday evening, from 7.30 to 9.30 o'clock. Class No. 2 will not be commenced until Class No. 1 is full.

Instruction will be given in forging, filing and chipping.

The instruction in forging will be in the management of the fires, in drawing down, bending, shortening, welding, splitting, punching, chamfering, riveting, &c. In vise work, the instruction will be in filing to line, fitting tongues and grooves, chipping bevels, scraping, ring work, &c.

HOUSE PAINTING.

There will be two evening classes in house painting, limited to ten young men each. Manual instruction will be given to class No. 1 on Monday and Thursday evenings, and to class No. 2 on Tuesday and Friday evenings, from 7.30 to 9.30 o'clock, the course of instruction being the same in both classes. Scientific instruction will be given to both classes every Wednesday evening, from 7.30 to 9.30 o'clock. Class No. 2 will not be commenced until class No. 1 is full. Instruction will be given in painting, graining, lining, gilding, flatting, polish white, &c. Each member of this class will be advanced as rapidly as his proficiency will allow, it being required that each exercise shall be well done before proceeding to the next. Instruction will also be given in the harmony of colors, mixing of colors, properties of oils and driers.

PLUMBING.

There will be two evening classes in plumbing, limited to 25 young men in each. Manual instruction will be given to Class No. 1 on Monday and Thursday evenings, and to Class No. 2 on Tuesday and Friday evenings, from 7.30 until 9.30 o'clock, the course of instruction being the same in both classes. Scientific instruction will be given to both classes every Wednesday evening from 7:30 to 9.30 o'clock.

The manual instruction will consist of lead seams, overcast joints, cup joints, horizontal and upright branch and wipe joints, and joints on pipe at various angles, wiping on a stopcock, wiping on a ferrule, wiping a flange on a 2-inch pipe, putting an overflow pipe in a safe waste, caulking, &c. At the conclusion of this course miscellaneous and fancy work, sand bends, traps, &c.

The scientific instruction will be upon the proper arrangement of service and waste pipes and upon drainage and ventilation, as follows: Soil and drain pipes, trapping and ventilation of soil and drain pipes, supply pipes, boilers, tanks, fixtures, trapping and ventilation of fixtures, mistakes in plumbing, pumps, &c.

Each young man is furnished with a set of tools and has his allotted place at the work bench. The instructors, who are skilled mechanics, follow a regular course. Each member of this class is shown how his work should be done, and it is the duty of the instructor to see that it is done neatly and in a workmanlike manner. The solder is melted by means of Bunsen burners supplied with gas. This avoids the heat and unwholesome gases of charcoal, or the danger which might arise from a great number of gasoline furnaces.

Mid-Year Meeting.

Following out the recommendations made at the last annual convention, the president has decided to call a meeting of the officers, directors and committees for consultation on work in hand, for preparation of matters to be considered at the next convention, and to prepare recommendations as to the policy which should guide all builders in their relations toward their workmen through labor organizations. The date of the meeting is fixed for Monday, September 22, and the place of meeting will be at the rooms of the Building Trades' Club, 20 East Twenty-first street, New York City. All officers, directors, members of committees are hereby notified of said meeting, and ear-

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nestly requested to be present. A full attendance is important.

By order of the president,

W. H. SAYWARD, secretary.

Annual Missionary Tour.

Pursuant with the plan by which it has been the custom of the secretary of the National Association to make an annual visit to the filial bodies, and such other associations as are desirous of an address from him, Mr. W. H. Sayward is to make the trip for the current year some time in the latter part of September.

Due notice will be given the affiliated exchanges by letter. Other associations that desire a "talk" from the secretary on the benefits and purposes of the National Association, will facilitate the arrangement of the route by addressing Mr. Sayward as early as possible at No. 164 Devonshire street, Boston, Mass.

New Exchanges.

Secretary J. B. Cook, Esq., of the Master Builders' Association, of Dallas, Texas, has made application in the name of his association for membership in the National Association of Builders.

Hitherto the National Association has had no affiliation with Texas builders, and the establishing of a filial exchange in Dallas will greatly increase the field of the national body.

The wider the representation is in the annual conventions the more thoroughly can the needs of the builder, all over the country, be determined and more advantageously acted upon. The carrying of the principles and practices advocated by the National Association into so great and progressive a state as Texas, must result in an immense benefit to the conditions which surround the builder.

The leven of uniform methods and practices, such as have been proved the best in the greatest number of localities, will make itself felt in many ways. There are a number of other cities in Texas that should follow the example of Dallas, and should have well organized exchanges in which their builders might reap the benefits of association and harmonious relationship.

A letter has been received from Mr. A. Kendall, of Oakland, Cal., asking for information concerning proper lines upon which to establish an exchange, saying that it is the intention of the Oakland builders to organize themselves into an association.

The Builders' Exchange, of San Francisco, held its first regular meeting August 6, 1890, at which time the by-laws previously adopted were approved. The officers of this Exchange are: C. C. Terrill, president; W. N. Millar, vice-president; M. J. Donovan, secretary; A. W. Starbird, treasurer, and C. C. Morehouse, sergeant-at-arms.

This exchange has been organized on what is practically the same general plan that governs the conduct of the associations which compose the National Association of Builders, and begins its career with an excellent membership and every promise of speedily becoming an important factor in the building world of the Gate City.

An Interesting Letter.

The following interesting letter from the secretary of the New York Chapter of the American Institute of Architects, Mr. A. J. Bloor, is indicative of such friendly and intelligent appreciation of the work of the National Association of Builders that it is herewith given to the individual members of affiliated exchanges.

It is such expressions as these that foster a feeling of brotherhood between the two departments of building and help cement the bond of relationship between the conception and the execution—the architect and the builder:

NEW YORK, August 8, 1890.

DEAR SIR:—I am to-day in receipt of the Fourth Proceedings of your association, and will take much pleasure in presenting the pamphlet to this chapter and moving its thanks therefor, at its first regular meeting; which, however, will not take place till the fall.

For myself, I may say that I have already examined the pamphlet sufficiently to make me hope that it will have a good general circulation, for it ought to be interesting alike to capitalist, builder, contractor, material-vender, hand worker and (his brother and brain worker) architect. It has a direct tendency, through the classification resulting from associative discussion, and in the sunlight of succeeding publication, to separate the wolves from the flock, (and there is no large association in which at least a few black sheep do not grow up) and to make more easy and pleasant the daily walks of co-workers; while, outside of those connected in any way with the building art, it does its share in emphasizing and reinforcing the universal movement of these latter days toward the substitution of the reign of peace and industry for that of the one-sided conditions established of old by the sword and the predatory habits of those in power.

In their reports and arguments Messrs. Deeves, Sullivan, Prussing, Campbell and others show themselves well-skilled in observation, statement and dialectics. Debate among the élite of the building trades on such ever-present questions as the eight-hour system, lien laws, builders' sureties, sub-contracting, industrial education and manual training can hardly fail to bear good fruit sooner or later; while the passage (as I understand) of a resolution looking to the union of employers and employees in a society for promoting the mutual understanding of each others' necessities and rights, I regard as very important; and information of such a movement must have been specially grateful to the distinguished prelate whose benevolent inculcations were all in the same direction.

I am glad the praiseworthy efforts toward sound mechanical training of my old acquaintance, Mr. R. T. Auchmuty, receive due acknowledgment at the hands of your association.

With best wishes for its continued usefulness and success, I am,

Yours, very truly,

A. J. BLOOR.

WM. H. SAYWARD, Esq., Secretary National Association of Builders, Boston.

Builders' Exchange News.

Boston, Mass.

The alterations in the Master Builders' Association building are progressing favorably, with every indication of being sucsessfully completed at the specified time.

The encampment of the G. A. R. brought into Boston a number of members of other builders' associations from various localities, and the secretary had the pleasure of a call from several, including Mr. F. W. Boyle, a prominent member of the Builders' Association of Columbus, Ohio.

The striking carpenters have practically all returned to work, and are working nine hours per day on the majority of contracts in the city. The men who were forced to seek work elsewhere, as the result of the strike, are working nine and some cases ten hours in the surrounding towns.

The old Freestone Cutters' Union, which was locked out last February, have been using every possible means to secure an amalgamation of the Progressive Association of Journeymen Stone Cutters, which was organized under a set of joint rules with the Contractors' Association.

When the Progressive Association was formed the old union was very loud in its condemnation, and did not hesitate to pronounce the severest judgment upon the new organization. About August 1 the old union became aware of the fact that the Progressive Association had not only proved a success as an organization, but had established a harmonious relationship between themselves and the contractors, and were securing all the work they could do, under the most favorable circumstances. Realizing the significance of this condition of affairs to themselves, the old union began to take steps to insure the perpetuation of their own organization, and have resorted to all sorts of schemes for the accomplishment of their end.

President Lowrie, of the Progressive Association, has recently been approached by the officers of the old union, who, with plausible stories and statements to the effect that the Philadelphia Progressive Association was anxious to join a national movement, requested a special meeting to consider the project of amalgamating the Progressive Association with the old union. The action of the union was so suspicious that President Lowrie at once wired the Philadelphia association and received in reply a telegram saying that the statements of the union were entirely without foundation, and that the most pleasing relationship existed between the Philadelphia association and the contractors. In the light of this information Mr. Lowrie refused to meet with the old union under any consideration, and at once sent word to Springfield, Longmeadow and Worcester, warning the members of the new association to place no faith in the statements of the old union and their walking delegates. One of the next moves of the union was to insert the following advertisement in the Boston *Globe*:

FREESTONE CUTTERS.

All union men are requested to keep away from Boston until this lockout is settled, place no confidence in plausible and misleading advertisements. Per order. J. F. S. C. A. of Boston.

and on August 16 the following announcement appeared in the same paper:

ALL STONECUTTERS INVITED.

Those Applying for Card Before August 15 Admitted Free.

The Journeymen Freestone Cutters' Union met at Bay State Hall last evening. The following resolutions were adopted:

Resolved, That a general invitation be extended to all practical stonecutters in this city and vicinity, who are not already members of this union, to join this body.

Resolved, That all such who make application for card privilege within 14 days from August 15, shall receive a clear card without paying any initiation fee whatever.

The Executive Committee reported having interviewed prominent members of the Progressive Union, and that they had expressed a desire to affiliate with the union. Strong hopes are entertained that the two bodies will harmonize on the question of wages and hours of labor per day.

The action of the convention in Philadelphia was ratified by the union.

The statement regarding the desire of the members of the Progressive Association to affiliate with the union is entirely false, and is simply a part of the plan to absorb or crush the new organization. In view of the fact that the old union, previous to the action of the Freestone Contractors' Association which resulted in the lock out, had closed its books and refused to admit any more members, at any price, endeavoring thus to create an artificial scarcity of labor in the market, the foregoing offer to accept any and all stonecutters as members, free of any fee, is particularly significant, and fully demonstrates the weakness of their present position.

In the latter part of July the Freestone Contractors' Association expelled one of its members for breach of the rules, and this, together with the general condition of the freestone cutting trade, resulted in the calling of a special meeting of the Master Builders' Association, at which the following action was taken:

BOSTON, July 26, 1890.

At a special meeting of the Master Builders' Association, held this day, to consider existing labor complications in the freestone cutters' trade, and action taken in relation thereto by the Freestone Contractors' Association, of New England, the following resolutions were adopted:

Whereas, The Freestone Contractors' Association, of New England, has addressed the Master Builders' Association, of Boston, in reference to a recent expulsion of one of its members on account of acts detrimental to the interests of the body, and asks this association to co-operate with it, as far as possible, in

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maintaining the principles and policy they are seeking to establish. And,

Whereas, The said association has also called the attention of this body to a manifesto issued to the old Journeymen Freestone Cutters' Union, on July 14th inst., to the effect that the said Union had forfeited its claim to recognition by repeated refusals to settle all differences by arbitration, which refusal had compelled the contractors to aid in the establishment of a new union of journeymen, which new union only they were bound to recognize as a body of authority:

Therefore be it Resolved, That the Master Builders' Association of Boston, having been put in possession of the facts which led to the expulsion of Messrs. Walsh & Hughes from the Freestone Contractors' Association, believes that such expulsion was justifiable, and that all members of this body should govern themselves in accordance therewith

Resolved, That the Master Builders' Association heartily approves the recent manifesto of the Freestone Contractors' Association in relation to the status of the old union of journeymen, and believes it essential to the interest of the whole building fraternity that the Freestone Contractors be sustained in their efforts to create a new union of journeymen upon principles just and equitable to all concerned.

Resolved, That the Master Builders' Association, in furtherance of this approval of the acts of the Freestone Contractors' Association in existing labor complications, will use its influence with its members, with special trade organizations and with other builders' associations throughout the country to sustain the said acts and prevent any combination which shall tend to injure or destroy the life of the new union referred to.

Resolved, That this association is convinced that, while it is most desirable to have organizations of workmen as an aid to secure the establishment of uniform and just methods, it is undeniably true that almost all such organizations at present existing have assumed, by virtue of their strength, certain rights and powers altogether beyond their proper functions, and have overriden and outraged the rights of others.

Therefore, Until these improper methods and practices are abandoned and their organizations readjusted upon principles of justice and equity to all, the unions cannot be recognized and utilized by employers for the goods results otherwise possible.

Resolved, That this assocition will not only sustain the Freestone Contractors' Association in this endeavor, but will persistently urge all others special trade associations to secure the establishment of similar principles in workmen's unions, to the end that there may be safe and proper ground upon which employers and workmen may meet for the settlement of all matters of mutual concern.

A true copy. Attest:
WM. H. SAYWARD, Secretary.

Washington, D. C.

The work on the new building being erected by the Builders' Exchange is being forced ahead as fast as possible under the direction and supervision of secretary King. Work on the foundations and vaults has already been completed, and the other portions of the structure will be completed as soon as possible.

The active and thorough manner in which the Washington Exchange has taken up and disposed of the desirable and beneficial possibilities of a builders' exchange reflects the greatest credit upon secretary King and the other energetic members of his association.

Nothing is reported from the Exchange as of importance to brother builders in other localities.

Cincinnati, Ohio.

The result of the unsettled condition in the labor market during the past season has been manifested in a reluctance on the part of capital to engage in anything more than absolutely necessary improvements. Many contracts have not been undertaken, and the average of building has fallen considerably below that of preceding years.

Affairs in the Builders' Exchange are moving along about the same as usual, with nothing new worthy of particular mention.

Portland, Maine.

Mr. T. J. Feeney, secretary of the Builders' Exchange, writes that everything in the building line is in a very favorable condition.

Members of his association are all busy, and there is no apparent prospect of a falling off in business as long as the season lasts.

Pittsburgh, Pa.

Mr. J. M. McAfee, of the Builders' Exchange, writes under the date of August 12, that steps are being taken to secure a building of its own, and that affairs relating to the association are moving along about as usual.

The plasterers are having trouble with their workmen, who are out on strike. August 1 the men made a demand for an advance from $3 per day to $3.50, with lathing done. The contractors agreed to concede the extra wages but not other demands that were made at the same time. The strike is still on and no immediate prospect of its settlement.

The following resolutions were adopted by the Master Plasterers' Association, July 18, and nothing has been done since the first week in August:

RESOLUTIONS ADOPTED BY THE MASTER PLASTERERS' ASSOCIATION OF PITTSBURGH, ALLEGHENY AND VICINITY, AT A STATED MEETING, HELD JULY 18, 1890.

They will employ no member of the Journeymen's Union, No. 31, after August 2, 1890, until the union has agreed to work for no person who is not a member of the Master Plasterers' Association of Pittsburgh, Allegheny and vicinity.

That they will employ no member of the Journeymen's Union, No. 31, unless they take all restrictions off all apprentices. Respectfull yours. A. DIEM, President.
R. M. MORRIS, Secretary.

St. Paul, Minn.

The St. Paul Association has recently changed its name from the Contractors' and Builders' Board of Trade to the Builders' Exchange. The change is one that has been contemplated for some time, and is one that seems to bring the Exchange into closer touch with other organizations of the same name.

Building is at present more active than usual at this time of the year, and so far no trouble has occurred between employers and workmen, either for less working hours or for more pay. Considerable bluster was indulged in early in the season by some of the unions, but no action was taken that in any way obstructed the progress of work.

Baltimore, Md.

The Builders' Exchange has been for some time considering the advisability of erecting a building of their own for exchange purposes, and the result of their deliberation is the establishment of a corporate association known as the Builders' Exchange Building Company. The capital stock is $250,000, consisting of 2500 shares at $100 per share, and is to be owned in the Exchange, all the members being given an opportunity to subscribe. A large amount has already been placed. It is the purpose of this company, which is composed of certain members of the Exchange, to keep the stock within the membership, one of the by-laws being that in the event of the stock being offered for sale, owing to the holder withdrawing from the Exchange or for any other reason, members of the Exchange must be first given an opportunity to purchase the same. The projected building is to be in every way suitable to the needs of the Exchange, and will be finished in the finest style. The upper portion of the building will be used for offices for builders and contractors, and on the main floor will be located an exhibit of building material similar to that of Philadelphia. Every association should follow the example set by these exchanges who have built themselves a home. Nothing tends to bind the members together more, or to amalgamate their common interests as much as the centralization of all those interests into one locality under one roof, and in which all have a mutual pride.

The following is a copy of a letter in reference to the Building Company, which has been issued under the date of August 9, by Secretary Miller:

The Builder's Exchange Building Company, of Baltimore City, has been incorporated with the following officers and board of directors:

President.—James A. Smyser.
Vice-President.—Noble H. Creager.
Manager.—Benj. F. Bennett.
Secretary.—E. D. Miller.

Directors.—E. L. Bartlett, P. M. Womble, Jr., S. C. Sexton, Jr., Joseph M. Cone, N. H. Creager, Hugh Sisson, B. F. Bennett. J. F. Adams, James A. Smyser.

This company is composed entirely of members of the Builders' Exchange. The object is to erect a building, to be known as the Builders' Exchange Building, in which the Exchange will have its home. This will advance the interests of the Exchange by making it the center of all contractors, builders, manufacturers, material men and others. The building will contain an exhibition room where manufacturers can exhibit their products. The building will also contain offices, supplied with all modern convenience and appliances, suitable for architects, counting rooms, &c. The erection of this building will prove to be a good paying investment, besides being of great importance to the building trade and manufacturers, as well as to the city. Our committee is now looking for a suitable site in the center of the city, and to enable them to make a suitable selection it is necessary to know how much money they will have for the purpose. You are therefore most earnestly requested to give this matter your prompt attention, and to notify the secretary the amount of stock you will take. We now have over $50,000 subscribed, and wish at least $125,000. Very respectfully,

E. D. MILLER, secretary.
JAS. A. SMYSER, president.

Indianapolis, Ind.

The new officers of the Builders' Exchange, whose term began June 1, 1890, are John C. Pierson, president; Chas. F. Laycock, first vice-president; William Kattan, second vice-president; August M. Kuhn, treasurer; Geo. W. Stanley, Secretary.

Recent enlargement and improvement of the Exchange rooms have added very materially to their attractiveness and given members increased facilities for transacting business under more favorable conditions.

The situation in building circles is reported as being very favorable, with all the members of the Exchange busy with many contracts which will probably extend late into the fall.

Indianapolis has escaped any serious trouble with unions such as have disturbed operations in other cities, and the active and healthy condition of the business is a strong comment on the fallacy of strikes and like disturbances.

Kansas City.

Secretary McDonald writes that their new building will be ready for a formal opening early in September.

The builders and contractors of Kansas City have thoroughly comprehended the value of organization and of concentrating their com mon interests as much as possible into one locality. The new building will be the headquarters of almost every association of a nature allied to building in the city.

The importance of bringing the masters of the various branches of what is practically one business into constant contact with each other is prolific of the very best results. Their separate interests become more identified with each other and greater harmony is engendered by the men in the different departments of the calling being continually thrown together socially and in a business way.

The building business generally is in a very favorable condition, and but little trouble is being experienced with labor difficulties.

Omaha, Neb.

A letter from the secretary of the Builders' and Traders' Exchange, Mr. D. J. Collins, says that building is progressing favorably and that everything points to a profitable season's business. The exchange gives promise of ultimately attaining a firm hold upon the appreciation of the best builders, and members are looking forward to a visit from the national secretary.

St. Louis, Mo.

Secretary Walsh writes that the Mechanics' Exchange is in a prosperous condition both numerically and financially, and that the

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present season has been a favorable one for building and the prospects are very favorable for the rest of the year.

A number of contracts were somewhat delayed by the brick famine, but at present the members of the exchange seem to have all they can attend to and are looking forward with pleasant anticipations to the visit of the secretary of the National Association.

Philadelphia, Pa.

It is reported that the District Council of Carpenters, of Philadelphia, has decided to request all contractors and employers to adopt a uniform schedule of wages September 1. They ask that the pay of competent carpenters be $3 per day from date mentioned. It is the intention of the carpenters to select committees which will present the request to their respective employers, and in any event no strike is contemplated.

The freestone cutters have formed an association embracing local organizations in all the Eastern States, and the object in this move is said to be the establishment of more uniform rules and practices for the government of their trade.

A school of architecture is to be established in connection with the University of Pennsylvania, and will be opened with the commencement of the regular fall session. Such a branch has been maintained by the Towne Scientific School since 1874, but the new institution is to cover more technical and higher instruction. The faculty of the new school will have its classes instructed by well known builders and contractors, besides the regular professors, on such topics as will give students the best knowledge of the practical side of their studies. A school of practice is to be a feature, and will be thoroughly equipped with tools and materials to facilitate the study of the various branches of building, designing, drafting, molding, &c. This school, together with the trade schools alluded to elsewhere in this issue, will provide unequaled opportunity for young men who desire to embrace any of the trades or professions taught, to secure a thorough education.

Matters pertaining to the Master Builders' Exchange are running along about as usual, with nothing of particular interest to builders worthy of mention.

Notes.

Ex-President of the National Association, John S. Stevens, and wife expect to sail for home from Liverpool September 24, on the steamer City of Chicago. Mr. Stevens has recovered from the temporary illness which interrupted their journey for a time, and has fully regained his usual health.

Mr. H. F. Kiel, of the Mechanics' Exchange, of St. Louis, with a friend, made a pleasant call on the secretary of the National Association during the recent encampment of the G. A. R. in Boston. Mr. Kiel expressed himself as much pleased with the Boston local association, and spoke hopefully of the prospect of his exchange soon having a home of its own.

During the past month a couple of Philadelphia gentlemen walked into the Master Builders' Exchange, of Boston, and asked to see some samples of asphalt for paving purposes. When it was explained to them that at present there was no building exhibit in connection with the Boston Exchange, they were amazed to learn that builders could exist without such an institution. One of the gentlemen remarked that it would be impossible to compute the benefit to the contractor and dealer both that was derived from that department of the Philadelphia Exchange.

Mr. D. W. C. Belleville, first vice-president of the Builders' Exchange, of Cincinnati, Ohio, has been making the G. A. R. rally in Boston the occasion of a visit to New England. The secretary of the National Association was the recipient of a pleasant call from Mr. Belleville, who is an active member of the Cincinnati Exchange, and much interested in the work of the national body.

The Master Builders' Exchange, of Philadelphia, loses in the recent death of William S. McGinley, one of its most highly esteemed and most useful members. Mr. McGinley's death was particularly sad, he having been ill only five days, and a week previous to his decease was attending to business in his usual health One of the directors of the Exchange, and at all times one of the most active and earnest of its members, Mr. McGinley was a man whose absence will be felt and whose death is the occasion of great loss to his friends and associates, as well as to the National Association, in which he took the greatest interest.

At a special meeting of the Builders' and Contractors' Association, of Victoria, Australia, held for the purpose of considering the Lien bill, June 17, in Melbourne, Mr. Edmund Hunt, editor of the *Building and Engineering Journal*, gave a short history of the lien law movement in the colonies, and produced copies of the various bills which have been introduced into the various legislatures from time to time. He claimed that Victoria was the first to move in the matter, a Lien bill being introduced into the Legislative Assembly by Mr. A. Michie as far back as 1856. The scope and fate of the various measures were also dealt with. He urged that a Lien bill to be any service should not go further than the principal contractors, and that if the lien was to be of any practical value it must have precedence of any unregistered lien of a bank, and in support of these contentions cited the experience of the American builders, who had found that a bill on the lines he had indicated was worked satisfactory to all parties, but that a very comprehensive measure, which attempted to protect everybody, succeeded amirably in protecting nobody. In conclusion, Mr. Hunt mentioned that it had been his intention to deal very fully with the American aspect of the question, holding, as he did, that an ounce of practice was worth a ton of theory, but that upon taking up the last annual report of the National Association of Builders of the United States of America, the previous evening, he found that two excellent papers had already been prepared for him, and prepared moreover by recognized authorities upon the question. The first paper to which he would call their attention was that read before the National Convention by Mr. Geo. C. Prussing, of Chicago, Ill., which was about as complete and thorough a condemnation of the law in any shape or form as could possibly be conceived. The arguments of both Mr. Prussing and Mr. Deeves were given in full.

Mr. Hunt very kindly furnishes the National Association regulary with a copy of the *Journal*, and it is from its columns that the foregoing information was obtained.

NEW SCHOOL OF ARCHITECTURE.

THE FOLLOWING details of the course of the School of Architecture of the University of Pennsylvania, which have just been given out, will be found of interest to a large class among our readers: The preliminary details of the organization of the New School of Architecture, to be opened at the University of Pennsylvania in the fall, have now been largely completed, and the authorities of the university are enabled to announce a programme that will challenge comparison with any school of its class in the country. Representatives of the faculty have inspected some of the more important architectural schools in this country with a view of obtaining the latest and best views on methods in vogue elsewhere, and an examination will also be made of the larger schools of Europe, it being the intention of those having the affairs of the school in hand to leave no step untaken that will add to the strength of and value of the work they have undertaken. The course of study provides full theoretical, practical and artistic instruction as a foundation for professional work. While it is essentially a technical school, it has not been forgotten that a successful architect must be a man of broad culture, and therefore a limited number of general studies have been retained which will serve as a basis for such training. Special attention will be given to practical work, it being the intention to give the student a knowledge of practical matters, important and necessary to architects, but which is frequently difficult to acquire in an office. In fact, the plans already outlined include a greater proportion of practical work than is to be found in other architectural schools, and it is this which will give the new school an individuality of its own.

With the exception of those who are members of the faculty by virtue of their office in the university, the school is entirely under the charge of men who have had long and thorough training in practical questions of architecture. The faculty is composed of Dr. William Pepper, provost of the university, and ex-officio president; Dr. Horace Jayne, Dean of the college; Mr. Theophilus P. Chandler, Jr., director of the school; Mr. Thomas W. Richards, professor of architecture, and Mr. Charles E. Dana, professor of art. Mr. Chandler is one of the foremost architects of Philadelphia, and has erected many of the more important buildings built here in recent years. His reputation is more than local, and the excellence of his work is sufficient guarantee of the thoroughness with which the school will be conducted. Prof. Richards, who is also a trained architect, has occupied the chair of architecture in the university for some years, and brings to the school the knowledge of a practical architect and the ripe experience of a successful teacher. Mr. Dana is an accomplished water colorist, and will have charge of that branch of instruction. In addition to these gentlemen, who make the regular faculty, the school will have the advice and assistance of a number of well-known architects in Philadelphia who will lecture on special architectural subjects, and also in a measure supervise a portion of the practical work of the students. The university will thus be able to offer not only a technical course provided by its own instructors, but give almost as much office training or its equivalent, as would be obtained by one working in an office exclusively.

The lecturers already secured include Mr. Frank Furness, Mr. Wilson Eyre, Jr., Mr. Frank Miles Day, Mr. Joseph M. Wilson, Mr. Addison Hutton, Mr. John Stewardson and Mr. Barr Ferree. In addition to the lectures to be given by these gentlemen, arrangements have been made to supplement them by lectures by contractors, builders, plumbers, &c. The school will therefore be in every sense, a practical school of practical men for practical work.

The technical and practical studies are distributed throughout the whole four years of the course. In the first year greater time is allotted to general studies than in the last three years, but the architectural work is continued from the beginning Candidates for admission are required to pass an examination in English, including grammar, composition and the reading of certain standard books, in the history of the United States and a portion of ancient history and mathematics, arithmetic, algebra and plane geometry. In addition they must show ability to sketch some ordinary object in a satisfactory manner, and produce drawings indicating

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familiarity with the use of mathematical drawing instruments. In the first year instruction is provided in English, mathematics, chemistry and French. The work on drawing is begun with a thorough course in geometrical, isometrical and free hand drawing and exercises in simple architural design. In the second year the studies in English, French and mathematics are concluded, additional time given to drawing and the technical studies increased by lectures and recitations in physics and applied chemistry, the latter being a course especially adapted to architectural work and dealing with the chemical and physical properties of materials, stones, bricks, mortars, cements, &c., while in physics special attention is given to electricity, light and acoustics In the third year the volume of technical studies is much increased. The work in physics is concluded with practical work in the physical laboratory and an extended course in engineering begun, including exercises in surveying. Like the chemistry of the second year this course has been especially devised to meet the requirements of the architectural students. Further progress is made in drawing and water color and lectures on the history of architecture begun. The students have previously familiarized themselves with this portion of the subject by reading Fergusson's History of Architecture during the first two years. In the fourth year's courses in social science and geology are offered engineering, including sanitary engineering, completed; specifications, contracts, estimates, &c., considered and the history of architecture and ornament concluded.

Throughout each year ample facilities are afforded for practical work in the workshop, including demonstrations and exercises in carpentering, construction, bricklaying, plastering, tin work, &c , the object being to make students familiar with the physical properties of materials and tools. Weekly exercises in modeling are also provided and visits made to technical establishments and buildings in progress of construction, at stated intervals. Work is not interrupted during vacation, but students are required to pass a certain amount of time in an architect's office or to produce a certain quantity of work. Arrangements have also been made for lectures on allied subjects, as landscape gardening and archæology.

Large and commodious rooms have been secured for the use of the school and they will be fitted up with all the improvements that long experience and careful study can suggest. The beginnings of a collection of photographs and casts have already been formed and provision made for securing a proper collection of books and drawing models. Arrangements will also be made for practical work, under the supervision of the university's own instructors. The plan of the work of the school, as here outlined, is a broad one, but it is impossible to undertake it on a less generous basis. Though the preliminary announcement has but just been made, the future prospects of the school point to a successful future.

Hours of Labor for Carpenters.

From a recent issue of *The Carpenter* we clip the following:

EIGHT-HOUR CITIES.

Below is a list of the cities and towns where carpenters make it a rule to work only eight hours a day:

Alameda, Cal.	Louisville, Ky.
Austin, Ill.	Milwaukee, Wis.
Albina, Ore.	Manitou Springs, Col.
Berkeley, Cal.	New York, N. Y.
Brighton Park, Ill.	Oakland, Cal.
Brooklyn, N. Y.	Pensacola, Fla.
Carondelet, Mo.	Portland, Ore.
Chicago, Ill.	St. Louis, Mo.
Colorado Springs, Col.	San Antonio, Tex.
Denver, Co'o.	San Francisco, Cal.
Duluth, Minn.	San José, Cal.
East. St. Louis, Ill.	San Rafael, Cal.
Grand Crossing, Ill.	South Chicago, Ill.
Hyde Park, Ill.	South Denver, Col.
Indianapolis, Ind.	Town of Lake, Ill.
Jeanette, Pa.	Whatcom, Wash.
Kensington, Ill.	West Troy, N. Y.
Los Angeles, Cal.	Winona, Minn.

Total.... .....36 cities.

NINE-HOUR CITIES.

Below is a list of the cities and towns where carpenters make it a rule to work only nine hours a day:

Allston, Mass.	Stoneham, Mass.
Atlantic City, N, J.	Somerville, Mass.
Arlington, Mass.	San Rafael, Cal.
Asheville, N. C.	St. Catharines, Ont.
Astoria, Ore.	San Bernardino, Cal.
Auburn, N. Y.	St. Paul, Minn.
Auburn, Me.	Santa Cruz, Cal.
Ann Arbor, Mich.	Santa Barbara, Cal.
Allegheny City, Pa.	Saginaw City, Mich.
Albany, N. Y.	Stockton, Cal.
Atchison, Kan.	Sacramento, Cal.
Austin, Tex.	Sheepshead Bay, N. Y.
Bakersfield, Cal.	Springfield, Ohio.
Bath Beach, N. Y.	Taunton, Mass.
Buffalo, N. Y.	Toronto, Ohio.
Bryn Mawr, Pa.	Toledo, Ohio.
Butler, Pa.	Toronto, Ont.
Bayonne, N. J.	Trenton, N. J.
Blaine, Wash.	Trinidad, Col.
Braddock, Pa.	Troy, N. Y.
Bradford, Pa.	Tacoma, Wash.
Bridgeport, Ohio.	Tarentum, Pa.
Bradford, Mass.	Turtle Creek, Pa.
Bellaire, Ohio.	Union Hill, N. J.
Belleville, Canada.	Uniontown, Pa.
Baltimore, Md.	Utica, N. Y.
Boston, Mass.	Vancouver, B. C.
Bridgeport, Conn.	Verona, Pa.
Brockton, Mass.	Vicksburg, Miss.
Beaver Falls, Pa.	Victoria, B. C.
Brookline, Mass.	Visalia, Cal.
Bellevue, Pa.	Wellsburg, W. Va.
Chelsea, Mass.	Winthrop, Mass.
Chester, Pa.	Windsor, Can. (Ont.)
Columbus, Ga.	Weymouth, Mass.
Cincinnati, Ohio.	Waltham, Mass.
Camden, N. J.	Waco, Texas.
Concordia, Kan.	Worcester, Mass.
Columbia, S. C.	Washington, Pa.
Cohoes, N. Y.	Wilmington, Del.
Columbus, Ohio.	Whitman, Mass.
Cambridge, Mass.	Woburn, Mass.
Charlestown, Mass.	Winchester, Mass.
Coraopolis, Pa.	Wheeling, W. Va.
Cleveland, Ohio.	Washington, D. C.
Des Moines, Iowa.	Wilkinsburg, Pa.
Dover, N. H.	Winnipeg, Man.
Detroit, Mich.	Yonkers, N. Y.
Denison, Texas.	Youngstown, Ohio.
Dedham, Mass.	Marlboro, Mass.
Dorchester, Mass.	Manayunk, Pa.
Duquesne, Pa.	Malden, Mass.
Dallas, Texas.	Millville, N. J.
East Boston, Mass.	Media, Pa.
East Liverpool, Ohio.	Marblehead, Mass.
East Saginaw, Mich.	Manor Station, Pa.
East Orange, N. J.	Monongahela, Pa.
East Portland, Ore.	Memphis, Tenn.
Elizabeth, N J.	Mt. Vernon, N. Y.
Findlay, Ohio.	Martin's Ferry, Ohio.
Fishkill, N. Y.	Meriden, Conn.
Fresno, Cal.	Mobile, Ala.
Frankford, Pa.	Muskegon, Mich.
Fort Worth, Texas.	McKeesport, Pa.
Fort Wayne, Ind.	New Britain, Conn.
Fitchburg, Mass.	Norfolk, Va.
Franklin, Mass.	Newport, R. I.
Greensburg, Pa.	Nyack, N. Y.
Gloucester, Mass.	Norwood, Mass.
Greenville, Pa.	Natchez, Miss.
Germantown, Pa.	N'wCumberland, W. Va
Homestead, Pa.	New Castle, Pa.
Hartford, Conn.	New Haven, Pa.
Hot Springs, Ark.	Norristown, Pa.
Halifax, N. S.	New Rochelle, N. Y.
Haverhill, Mass.	NewWestminster, B.C.
Hoosick Falls, N. Y.	Newark, N. J.
Hyde Park, Mass.	Natick, Mass.
Hoboken, N. J.	Newton, Mass.
Holyoke, Mass.	Newburg, N. Y.
Hingham, Mass.	New Bedford, Mass.
Highland Park, Ill.	New Albany, Ind.
Jacksonville, Ill.	Oswego, N. Y.
Jersey City, N. J.	Ogden, Utah.
Kansas City, Mo.	Olean, N. Y.
Kearney, Neb.	Ottawa, Can.
Knoxville, Tenn.	Oneonta, N. Y.
Kingston, N. Y.	Ontario, Cal.
Lawrence, Mass.	Omaha, Neb.
Little Rock, Ark.	Orange, N. J.
Lowell, Mass.	Peterborough, Can.
Lynn, Mass.	Pueblo, Col
Leominster, Mass.	Port Townsend, Wash.
Lafayette, Ind.	Passaic, N. J.
Lancaster, Pa.	Plymouth, Mass.
Lewiston, Me.	Portland, Me.
Long Island City, N.Y.	Port Angeles, Wash.
Lincoln, Neb.	Poughkeepsie, N. Y.
Springfield, Mass.	Paterson, N. J.
Seattle, Wash.	Philadelphia, Pa.
St. Augustine, Fla.	Plainfield, N. J.
South Omaha, Neb.	Pittsburgh, Pa.
Salem, Mass.	Pierre, S. Dak.
San Leandro, Cal.	Pasadena, Cal.
Santa Ana, Cal.	Porterville, Cal.
Santa Rosa, Cal.	Peoria, Ill.
St. John's, N. B.	Quincy, Mass.
St. Joseph, Mo.	Rochester, Pa.
Salt Lake City, Utah.	Richmond, Va.
Schenectady, N. Y.	Rock Island, Ill.
Syracuse, N. Y.	Rondout, N. Y.
Scottdale, Pa.	Roxbury, Mass.
Spokane Falls, Wash.	Rochester, N. Y.
Sharon, Pa.	Revere, Mass.
Staten Island, N. Y.	Riverside, Cal.
Stoughton, Mass.	S. Framingham, Mass.

Total.... ..... 284 cities.

MISCELLANEOUS.

	Hours.		Hours.
Biloxi, Miss.....	57	Lebanon, Pa.	59
Bloomingdale, Ill..	59	Lake Linden, Mich.	58
Bradford, Pa.....	59	Marquette, Mich....	58
Davenport, Iowa..	59	Quincy, Ill.....	59
Hamilton, Ont....	55	Steubenville, Ohio...	58
Haverstraw, N. Y.	59	Salamanca, N. Y..	59
Jackson, Tenn....	59	Somerville, N. J.....	59

Total..... 14 cities.

How to Test a Wall's Dryness.

Gelatine, according to an exchange, is a capital means for ascertaining whether a wall is thoroughly dry or not. The sheet gelatine of commerce is the best for the purpose. The thinnest pieces are selected; they are soaked in water for about a quarter of an hour, until they are quite soft, spread out flat on a greased sheet of glass and stretched with the finers until any folds and creases that may exist are smoothed out and the whole is made as thin and as uniform as possible. The sheets are then dried in the air, rough or uneven edges are trimmed off and the whole cut into strips about 4 inches long and 2 inches wide, for use in testing. If kept flat in a dry place, these gelatine strips are very sensitive to moisture. If a wall is suspected of being damp, without showing it outwardly, a slip of gelatine is moved slowly over it, near the surface, but without touching it. If any damp spots exist, they are immediately indicated by the curling of the gelatine as it passes near them.

NEW PUBLICATIONS.

PRACTICAL SANITARY AND ECONOMIC COOKING. Adapted to Persons of Moderate and Small Means. By Mrs. Mary Hinman Abel. 190 pages. Bound in stiff board covers. Published by the American Public Health Association. Price, 40 cents.

In the year 1888 Mr. Henry Lomb, of Rochester, N. Y., offered, through the American Public Health Association, two prizes on the subject indicated by the above title. This offer brought out something like 70 essays, which were carefully considered by a committee of award. The decision of the judges was announced at the sixteenth annual meeting of the American Public Health Association and was in favor of Mrs. Abel, to whom was awarded the first prize of $500. This little work is the first prize essay and is, in effect, a cook book adapted to the needs of persons in moderate circumstances. The author presents what she has to say in a simple and lucid manner, and has succeeded in the difficult task of making clear to the unscientific mind some of the fundamental principles upon which the preparation of food depends.

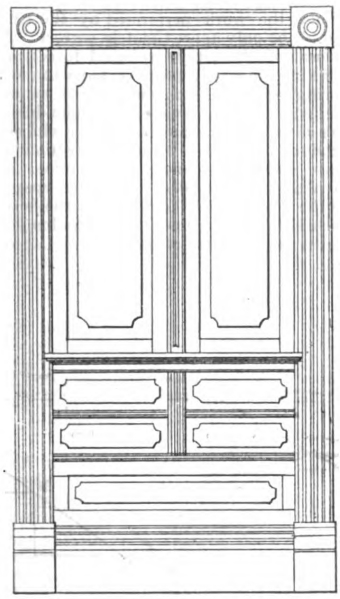
WILLIAM ORR, Trenton, N. J., is the patentee of a metallic lathing, which consists of a series of rods extending from one to another of adjacent beams and secured at their opposite ends to the flanges of the beams. The tension of the rods is adjusted by means of nuts secured upon their ends. These rods hook around the flange of the beams and to the rods is secured the metallic lathing.

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CORRESPONDENCE.

Designs in Woodwork.

From A. D. F., *Auburn, Cal.*—I take the liberty of sending the editor of *Carpentry and Building* some designs which may be of possible interest to readers of the paper. The one shown in Fig. 1 of the sketches represents a design for a cupboard intended for the wall between



Designs in Woodwork.—Design for Cupboard.

the dining room and the kitchen. It is provided with doors opening into both rooms. The design shown in the sketch represents the dining room side. It is cased up in the same style as the doors of the room with pilaster finish. The upper part has shelves, while the lower portion contains five drawers. The large drawer

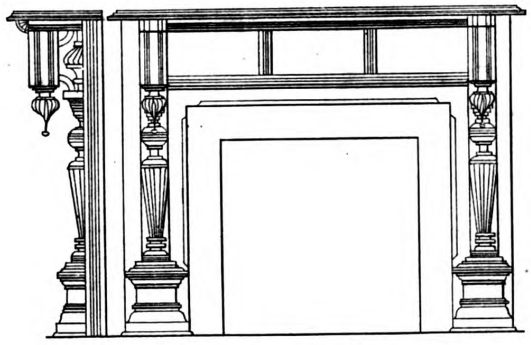
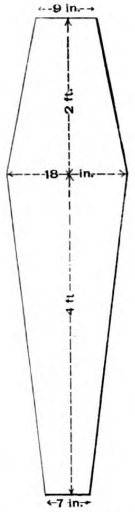


Fig. 2.—Design for Mantel.

is designed for table cloths, while the four small ones are for other table linen. The kitchen side may be finished to correspond with the woodwork of that room. In Fig. 2 of the sketches is shown a design for a mantel which may be made of either hard or soft wood according to the preference or taste of the one making it.

Making Coffins.

From H. L. S., *Colorado Springs, Col.*—In answer to "T. B.," of Headingly, Mass., who inquired in a recent issue of *Carpentry and Building* with regard to the proper proportions of coffins, I take the liberty of submitting a rule which I have used and which was given me by an old carpenter. The swell of the coffin

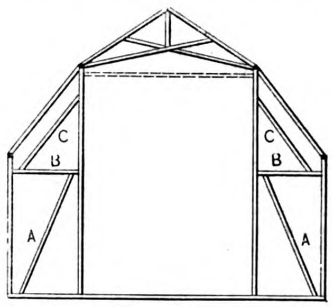


Sketch Submitted by "H. L. S."

should be at one-third of its length and its width one-fourth of the length. The width at the head of a coffin 6 feet long should be 8 inches and at the foot 7 inches, with other sizes in proportion. The accompanying sketch may be of service in making my meaning clear. The dimensions given are for persons of ordinary size. The depth of a 6-foot coffin should be 12 inches, and it should flare 1½ inches. Smaller ones should be made in the same proportion.

Framing a Barn.

From E. S. L., *Columbus, Ohio.*—I see so much said in *Carpentry and Building* with reference to framing barns that I am constrained to contribute my mite to the general fund. I would say to "E. A. R.," West Alden, N. Y., that as he invites criticism I hope he will not feel offended at what I am about to say. His frame would do if it had anything to keep it from spreading, but as it is I am afraid by the time it is filled to the plates once or twice with hay or grain he will find it beginning to spread, if it does not go to everlasting smash altogether. The long brace C C, which he has run from the beam to the purlin posts, would in the center bents offer no resistance whatever. As the strain is all from the inside outward, the side and end walls are the parts of the frame which should be the best protected against pressure from within. This brace would simply pull out of the mortise instead of offering any resistance. In the sketch which I inclose I have endeavored to illustrate the manner in which I

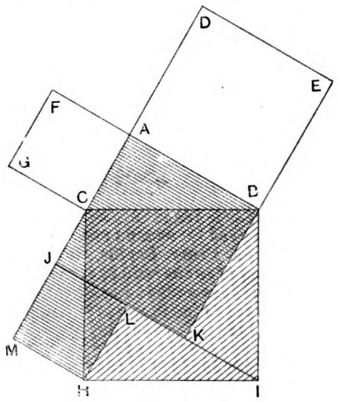


Method of Framing a Barn, Suggested by "E. S. L."

think the evil may be remedied. The spur posts A A are framed into the beam B B. This beam should not be less than 6 x 8, and framed into the posts with 6 x 2 inch tenons, running clear through the posts, with at least three 1-inch draw bores. This is done so that when the pressure comes on the sides, and the posts begin pulling on the beam, the tenon will be strong enough to bear the strain. The manner in which the spur posts hold the beam renders it utterly impossible for the beam to give in the slightest degree, unless the purlin post gives way at the same time. This it is not likely to do, as the spur post relieves it of nearly all except the upward strain. A collar beam framed in at the point indicated by the dotted lines would make the frame much stiffer without intertering in the slightest degree with the hay fork tracks.

Graphic Demonstration of Euclid First 47.

From D. J., *Calgary, N. W. T.*—I inclose a sketch of what I consider a Chinese demonstration of Euclid First 47, which I drew in order to fix it in my mind. Be-



Sketch Accompanying Letter from "D. J."

fore I had completed the sketch, I thought it might be of possible interest to some of the readers of *Carpentry and Building*, as more than half the carpenters have never studied Euclid and do not know this im-

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portant proposition. I think, however, that they can readily understand it from the demonstration which I give. Referring to the sketch, let A B C be a right angled triangle. Upon A B describe the square A D E B; upon C A describe the square C B I H; then C B I H will be equal to the two squares A B D E and C G F A. Make A B J K equal to the square of A B. Make J L H M equal to the square of C A and C B I H equal to the square on C B. The part C A B, of the square A B K J, is equal to B I K, and the remaining parts outside the square C H M is equal to H L I, and if these parts were turned around on the points which join them, they would fit in and fill up all the space of the square C B I H. Therefore, in any right angled triangle the square of the hypotenuse is equal to the square of the other two sides.

Problem in Handrailing.

From M. L. B., *Danbury, Conn.*—I have been an interested reader of *Carpentry and Building* ever since its first publication, and I take especial interest in the hight equal to A L of Fig. 2. Draw a line from D through F to G. In Fig. 3 make D E F G equal to the same letters in Fig. 1. Square up lines and make D A, E B and F C equal to D A, O B and N C of Fig. 1. Draw a line from B through A and C; these lines to be correct. B A and B C must equal A C M of Fig. 2. The square sections show the application of bevels, one bevel answering for both ends.

Shingling Brackets.

From J. M. B., *Burlington, Pa.*—I notice in the July number of *Carpentry and Building* that "F. K.," of Keiler, Wis., asks for information about roofing brackets, and states that Stanley's are not what he wants. I notice what he says about a man knowing something about shingling before he manufactures roofing brackets. I also think a man should know something about siding before he made side gauges. I recently bought a set of Stanley's clapboard gauges and find them quite handy for siding set 4½ inches or under. I cannot, however, use them on siding wider than that. Now, in this part of the country we use 6-inch siding laid 5 inches to the weather, so my gauges are not of the greatest value to me. It is possible that "F. K." might like the roofing bracket made by the Wilder Mfg. Company, of Gardner, Mass.

From C. J. G., *Canon Springs, N. Y.*—Allow me to say in response to "F. K.," in the July issue, who thinks Stanley's patent shingling brackets very defective, that I have used them and like them very much. A few days since I had occasion to use several, when the man for whom the work was being done, and who had used them himself, remarked that they were a "great thing; worth $5 each." I can use the 8 inch Stanley for shingles laid 4½ inches or more. I will state right here that I deem it a waste of lumber to expose good 18 inch shingles less than 5 or 5½ inches. Perhaps "F. K." would like the Richardson adjustable bracket better than the one to which he refers. It will take a grasp on shingles if laid only 2 inches to the weather.

Saw Kerfs for an Elliptical Head.

From D. J. A., *Dayton, Ohio.*—About a year ago I noticed in *Carpentry and Building* an article on kerfing an elliptical head, in which the principle involved was that of making the ellipse from quadrants of different circles. As this principle is a fallacy, the work performed by the rule would be only approximately correct. A perusal of the article referred to set me thinking, and as a result I have the following rule: Take as many kerfs as are needed to bend a circle of the same diameter as the minor diameter of the ellipse. Produce the ellipse by an intersection of lines, making as many intersections as there are kerfs needed. Copy the spaces on the board which is to form the head with dividers, beginning with the longest spaces at the center of the board. Lay off spaces in the same order as they are found in the drawn ellipse; kerf and bend, and the result is a perfect ellipse. If desired, the well hole in stair strings may be kerfed and bent, provided a piece of veneer is glued to the concave surface and kerfs are made parallel with the risers. This plan may be followed with good effect, while resulting in a saving of labor.

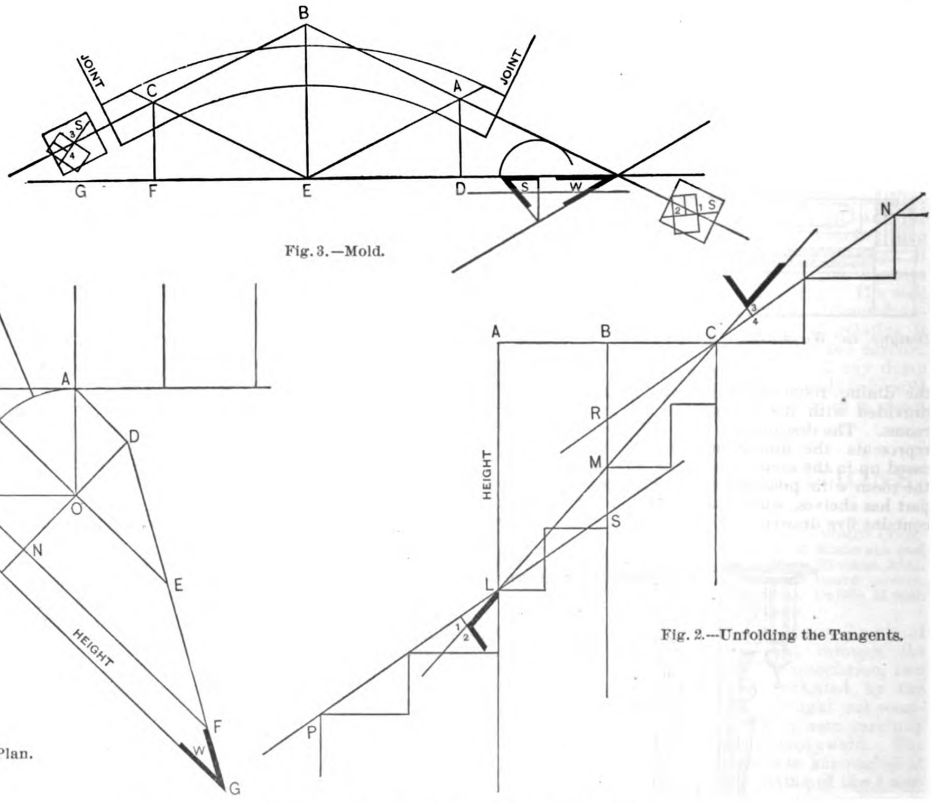


Fig. 3.—Mold.

Fig. 2.—Unfolding the Tangents.

Fig. 1.—Plan.

Problem in Handrailing.—Diagrams Submitted by "M. L. B."

Bevel for Valley Rafter.

From F. H. W., *Williamsport, Pa.*—I would like to have some of the practical readers of *Carpentry and Building* explain, by means of a diagram or otherwise, how to obtain a bevel for the lower end of a valley rafter so that a piece of molding running along the ends of the common rafters will meet and properly miter on the

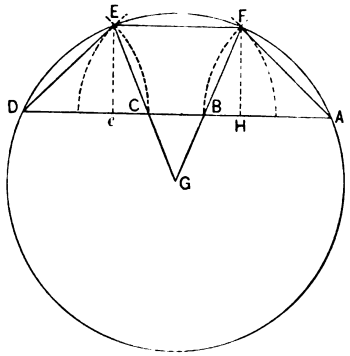
Correspondence Department. In a recent issue I noticed a communication from "J. C.," of Cedar Rapids, Iowa, who gives a plan of stairs which, according to his idea, is the very best way of constructing a wreath from the quarter circle. I take the liberty of forwarding drawings in answer to this correspondence, and beg to differ with him in the matter. To answer his first question, however, I will refer to Fig. 1, which represents the plan. The tangents A B C are unfolded in Fig. 2. Draw the lines through the corners of the square steps, cutting the perpendicular from B at R and S. Now draw the line through C and L. Let the joints be made at 1 and 4 square with P S and R N. Referring to Fig. 1, draw the line from B to E; make A D and C F parallel with it and the seat square with it. Make the

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end of the valley rafter. A square cut on the end of the valley stands at a different angle from a square cut on the common rafters when they are in position on a roof.

Laying Off an Octagon Bay Window.

From J. H. D., *Knoxville, Tenn.*—I have been a reader of *Carpentry and Building* only a short time, but have been very much interested in a communication from "W. S. W.," in which he tells how to lay



Laying Off an Octagon Bay Window.—Fig. 1.—Laying Off Three Sides of an Octagon in a Straight Line.

off an octagon bay window, which appeared in the August number of the paper for 1888. He seems to have been criticised by "L. W. T.," in the April number for 1889. I do not know what these criticisms are, as I am not in possession of the April number, but in the February issue, for 1890, "W. S. W." asks any reader of the paper to prove his method correct or false. In complying with his request I will take the same Fig. 1 that he used in his explanations in the August number for 1888. He divides the line D A into 29 parts; then he takes 12 parts for a radius, and with A and C as centers, throws up arcs, cutting each other at F. With B and D as centers he throws up arcs, cutting each other at E. Now, if we

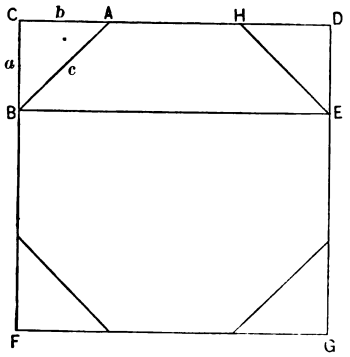


Fig. 2.—Showing Relation Between E F and A D of Fig. 1.

let perpendiculars fall from E and F they will bisect the two lines A C and B D in H and I. Now, A B = $\frac{12}{29}$ and B C = $\frac{5}{29}$; then A C = $\frac{17}{29}$. A H is $\frac{1}{2}$ of A C. Then A H = $\frac{8\frac{1}{2}}{29}$. A H = D I; then A H + D I = $\frac{17}{29}$ and H I must be equal to $\frac{12}{29}$. It follows, therefore, that H I = E F, so the three line A F, F C and E D are each equal to $\frac{12}{29}$ of A D.

What we want to determine then is the true relation between the lines E F and A D. The line B E of Fig. 2 is equal to the line A D of Fig. 1, and is equal to any one side of the circumscribed square C D F G. Suppose the line C D of Fig. 2 equals unity, the three sides of the triangle A B C are equal to the line C D, because B A equals A H, and B C equals H D, while C A is common to both. The sum of the three sides of the triangle, A B C, therefore equals 1. It is right angled at C, and C B equals C A, so the problem is "A given isosceles right triangle, the sum of the three sides of which equal 1. What is the hypotenuse on the line A B?"

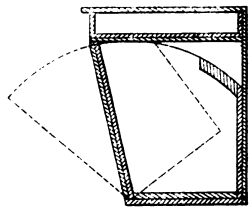
Let a b c represent the three sides. Now according to the rule of a right angled triangle $a^2 + b^2 = c^2$; b is equal to a; then $2a^2 = c^2$ so $a^2 = \frac{1}{2} c^2$. This gives $\frac{c^2}{a^2} = \frac{2}{1}$, and $\frac{\sqrt{c^2}}{\sqrt{a^2}} = \frac{\sqrt{2}}{\sqrt{1}}$. Of course $\frac{\sqrt{c^2}}{\sqrt{a^2}} = \frac{c}{a}$ then $\frac{c}{a} = \frac{\sqrt{2}}{\sqrt{1}}$. Without going through all the calculations the different results are:

$$\frac{\sqrt{c}}{\sqrt{a}} = \frac{c}{a} = \frac{\sqrt{2}}{1} = \frac{1.4142}{1} = 0.4142.$$

So $c = 0.4142$, which is one side of the octagon. When the side of a given square equal unity the side of the inscribed octagon equals 0.4142. Now, "W. S. W." makes one side of the octagon equal to $\frac{12}{29}$ of one side of the square. If we reduce $\frac{12}{29}$ to a decimal, it gives 0.4137—an error of only 0.0005. According to my figures "W. S. W." must, therefore, be practically correct.

Combination Flour Bin.

From J. P. B., *Guy Mills, Pa.*—In reply to "R. G. M.," Atchison, Kan., who inquired in a recent number of *Carpentry and Building* for a plan for a combination flour box and dough board, I inclose a



Combination Flour Bin.—Fig. 1.—Sectional view, Showing Bin Open.

sketch which may be of service to him. The sketch illustrates a device having three small drawers and two flour bins, the top of which may be used as a dough board. The dotted lines in Fig. 1 of the sketches shows the bin open. The panels in the front, as shown in Fig. 2, can be made with a $\frac{1}{2}$-inch piece nailed around, over the face of the bins. I think the correspondent referred to will be able to understand the construction from this description and an inspection of the sketches.

Pitch of Roofs.

From W. S., *Paterson, N. J.*—I frequently notice in the columns of *Carpentry and Building* the use of the term "one-half" and "one-quarter pitch," as applied to roofs. I am only a beginner at the carpenter's trade and do not know much about some of the terms employed. Here in Paterson I hear the expression among carpenters of so many inches pitch to the foot, as, for example, 6 inches or 8 inches to the foot. Now, if it is not too much trouble and the reply will not occupy too much valuable space, I would like some one to tell me what one-half pitch means.

Note.—The term "pitch," as applied to roofs, is the slope or slant of the rafters, and is dependent upon both the span and the rise. The pitch of a roof may be expressed in a number of ways. Sometimes it is given in the degrees of angle which the rafters make with the horizontal. The most general plan of expressing pitch is by the hight in parts of the span. If, for example, the span, by which is meant the distance between supports, is 30 feet and the hight is 10 feet, the pitch of the roof by this method is called third pitch. If the span is 20 feet and the hight 10 feet, the

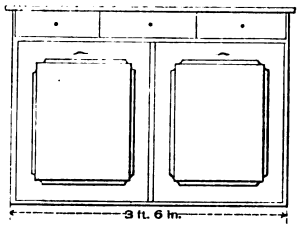
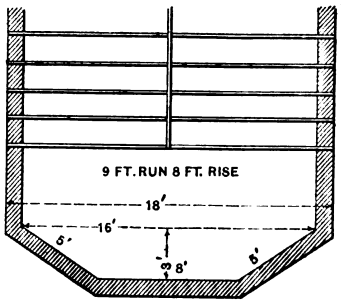


Fig. 2.—Front view.

pitch is called half pitch. Another plan, but one which is not in such general use, is by the length of the rafters in parts of the span. Thus if the span is 30 feet and length of the rafter 20 feet, the pitch would be called two-third pitch. A fourth method of describing the pitch of a roof, but one which is not in very general use, is by a name which indicates to the expert uniformity with some received model or standard. Of these terms may be mentioned Grecian pitch, which is inclined from 12° to 16°, or which has a hight equal to $\frac{1}{4}$ to $\frac{1}{3}$ of the span; Roman pitch, which is inclined from 23° to 24°, or whose hight is equal to $\frac{1}{3}$ to $\frac{2}{5}$ of the span; Gothic pitch, in which the rafters are equal to the span, and Elizabethan pitch, in which the rafters are larger than the span. Gothic pitch is also called equilateral pitch, and Elizabethan pitch is also called knife edge pitch.

Framing Jack Rafters.

From O. A. B., *Vreka, Cal.*—Inclosed I send a sketch of one end of a house I am now building. I desire to ask some of the readers of *Carpentry and Building* for suggestions as to the proper way of framing



Sketch of End of House Sent by "O. A. B."

the hip and jack rafters of the different angles and of obtaining the side bevels and backings of the same. Will it be an entire hip roof? In order to make true work of it the seats of the hip rafters should bisect the angles of the corners. I trust that some of my brother chips will help me in this matter.

Lime in Mortar.

From J. P., *Newark, N. J.*—Not long since I noticed in a building paper published in New York the statement that 3½ barrels of lime would do 100 square yards of plastering, using two coats; that 2 barrels of lime would do the

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same amount of plastering with one coat; and 1½ bushels of hair and 1¼ barrels of good sand would be the proper quantity for 3½ barrels of lime. I am a constant reader of *Carpentry and Building*, and think that many of its readers in the building trades could get some useful information upon this subject if it was discussed. I think 3½ barrels of lime too much for 1¼ barrels of sand. I think there is oftener 3½ barrels of sand to 1¼ barrels of lime, though I am satisfied that there is too much sand. What I would like to hear is the opinion on this point of some of the practical men who read *Carpentry and Building*.

Mitering a Plank at the Valley.

From H. L. S., *Colorado Springs, Col.*—I will endeavor to answer the inquiry of "S. J. W.," of Centerville, S. Dak., with regard to mitering a plank at the valley. I send a sketch, together with a rule, that may be of use to this correspondent and other readers of *Carpentry and Building*. Dak., whose communication appeared in the May number of *Carpentry and Building*, I take the liberty of submitting the inclosed sketches. Take any pitch or corner and cut the material 1 inch longer than the length required. Cross the material at the joint and mark with a knife at the edge, as shown in the various sketches by 1, 2. I then cut on this line which gives me the correct joint every time.

Shingle Clapboards.

From C. K. T., *Madison, Ohio.*—With regard to the communication of "C. J. B.," Lebanon Springs, N. Y., which appeared in the July number of *Carpentry and Building*, I would like to say that I have made shingle clapboards for ornamental work in gables, &c., by simply notching the clapboalds at regular intervals. I think they are much superior to shingles, as they are smoother, thereby taking less paint. They can also be applied quicker when one takes into consideration the he would have a convenient house instead of a tool chest.

Note.—It frequently happens that an error of the types makes curious reading, and the above is one of the many examples of this kind. A tool box 25 feet wide and but 24 inches high would certainly be a curiosity. It is obvious that the dimensions of the box should have read 24 inches high, 25 inches wide and 39 inches long. We think if the readers of *Carpentry and Building* will follow these figures instead of those published in the June number they will find no trouble in producing a well proportioned tool box.

White Beech Versus Red Beech.

From APPRENTICE, *Vineland, N. J.*—Can any of the readers of *Carpentry and Building* explain the difference between white beech and the sap or white portion

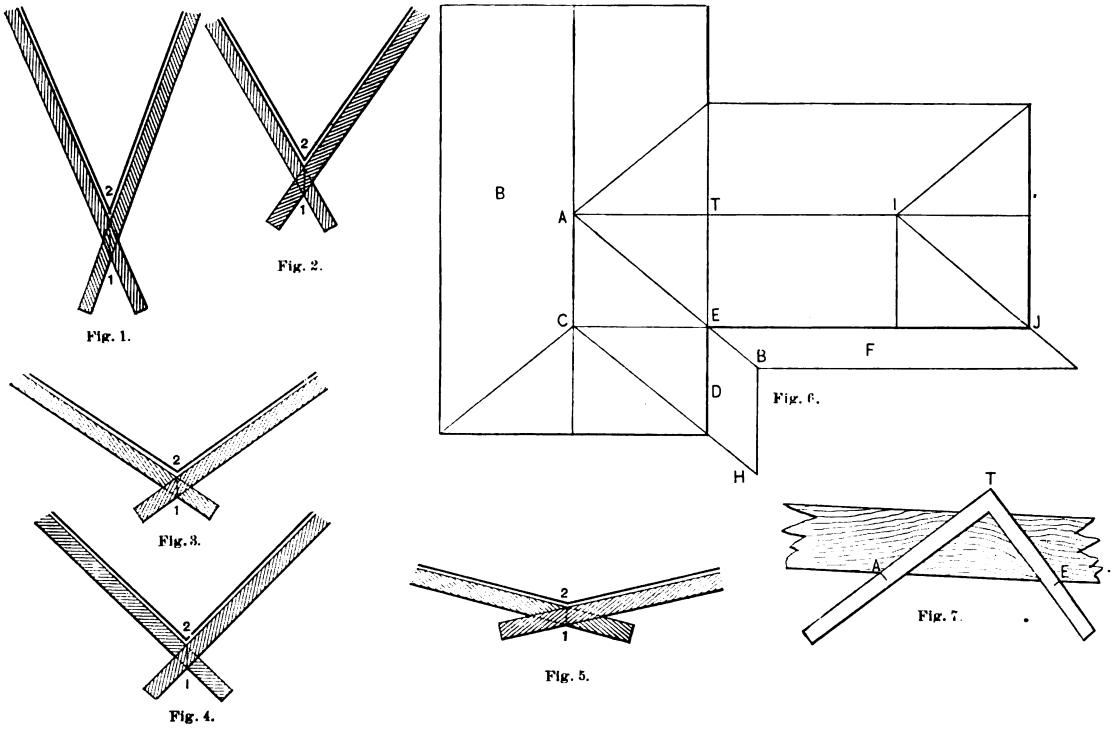


Fig. 1. Fig. 2. Fig. 3. Fig. 4. Fig. 5. Fig. 6. Fig. 7.

Figs. 1 to 5.—Sketches Accompanying Letter From "S. L. B." Figs. 6 and 7.—Diagrams Submitted by "H. L. S."

Mitering a Plank at the Valley.

Referring to the sketch, let B represent a plan of a roof of unequal pitches; A B the valley, I J the hip and H B J the plank. Now, with a steel square, take A C on the tongue and C E on the blade and the tongue gives the cut for D at E. B. Take A T on the blade and E T on the tongue and the tongue gives the cut for F, at E B and J. To obtain the plumb cut take the length of valley or hip on the blade and the rise on the tongue and the tongue gives the cut. This rule will apply to all roofs, for cutting sheathing or cornice. No twisting is required. The planceers will be of different widths. The one of the sharpest pitch will be the narrowest, for the side of all roofs is a plane, and a hip or valley is the hypotenuse of a right angle triangle. This rule will also apply to hoppers. The small sketch which I send shows the manner of applying the square to the plank.

From S. L. B., *Washington, D. C.*—In answer to "S. W. J.," of Centerville, S. time necessary to sort out the shingles of proper width. With regard to the matter of nailing, I fail to see how one nail in a shingle will prevent splitting. The succeeding course will secure the other edge of the shingle, it is true, but it will split just the same. I have heard this question discussed a great deal by carpenters, especially in New York State, where I worked one summer. I would like to know with "C. J. B." what other readers of the paper think about these questions.

Convenient Tool Chest.

From O. H. S., *Mellenville, N. Y.*—I notice in the communication of "F. B. C.," Jersey City, N. J., which appeared in the June number of *Carpentry and Building*, on page 125, that he gives a sketch of a convenient tool chest, and states that the size is "24 inches high, 25 feet wide and 39 inches long." Permit me to suggest that if the correspondent would add a little to the hight and more to the length of red beech when used for plain stocks? I notice that it is often stated by manufacturers of planes that white beech only is employed. If any practical reader of the paper can throw any light upon this point I shall be glad to have him present his views to the editor for the benefit of the trade at large.

Stretching Drawing Paper.

From C. E. W., *Duluth, Minn.*—For the benefit of the readers of *Carpentry and Building* I send a description of a good method of straining drawing paper, which, although not new, may prove interesting. The first step is to well dampen, with a sponge and water, the reverse side of the paper to within ¾ of an inch of the margins; then turn the paper over and affix it to the drawing board by means of strips of tracing cloth, 2 inches wide. Old pieces of tracing cloth are just as good for this purpose as new. The paper is fastened with strong mucilage, and when the

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drawing is completed the strips of tracing cloth will come off very easily and may be used again. The drawing board remains clean and ready for use without further trouble.

Protecting the Interests of Architects.

From E. S. I., *Owasso, Mich.*—I desire to ask if there is any method adopted by architects generally to prevent persons from building from designs made for the clients of the architect, and thus robbing him of his daily bread. I have designed a store building for people here who intend to build soon. There are others intending to build adjoining the structure for which I have prepared the designs, but who will not order any designs made, it being their evident intention to wait until my building has been put up, then to copy it, and thus save the price of the plans and architect's fees. I desire to know if there is any way to prevent them by copyright or otherwise and what the probable expense would be. Who should I apply to?

Note.—The case of our correspondent aboveis one of many which are continually arising in the trade, and one for which we fear there is no remedy. It does not appear that copyright or design patent will cover the requirements of the case, and we very much fear that our correspondent is without redress. We should think, however, that architect's services should mean something more than mere design, and that some value should be attached to the knowledge of building construction, ability to judge of the proper materials to be employed, and also for his services as superintendent of construction. The mere fact that the architect's plans are practically duplicated by others in the erection of buildings should not detract from the reputation of the architect, or cause him to feel that his rights are being encroached upon. He should rather regard it in the light of a compliment. There is, of course, a moral obligation in the case referred to by our correspondent, but in business transactions this obligation is not always recognized.

THE INTERDEPENDENCE OF MEN.*

BY EDWARD ATKINSON.

WITHOUT ENTERING into a discussion of the eight-hour, the nine-hour or ten-hour question, I only venture to call your attention to the fact that the branches of industry upon which it is proposed to put legal restrictions as to time are those in which labor saving has been the prime motive, consequently, if it is expedient to stop the wheel of the factory and to limit the product of that machinery in order to make more work for the unemployed, then by the same rule it might be expedient either to forbid the erection of the factory itself or to forbid its use more than four hours a day. Morever, if that which constitutes a day's work is limited by law to a short number of hours in any given art, it by no means follows that there will be any more occupation provided for the unemployed unless the restriction of the law is applied to the individual operative; and unless the law says to each man or woman: After you have worked your eight or nine hours in the factory, in the workshop or as a carpenter, blacksmith or mason in the building trades you shall not devote yourself to any other kind of work in that day or week of which the product may be sold. If hand work, household work or small shop work be not forbidden to the eight-hour man, it may happen that a greater disparity even in the condition of weavers, spinners, carpenters, masons and others may grow out of that very restriction than ever before existed. The prudent, industrious man or woman values time as an opportunity for doing something for gain, or the carpenter or mechanic who may be forbidden either by the law of the State or the law of the trades union to work more than a given number of hours in a particular shop or upon a particular building may very soon find out that he has gumption and aptitude for something else. He may then find in that very restriction upon himself and his fellows, whose work in the factory has been stopped by law, his own individual opportunity to lift himself away up above the plane of those who stop productive work according to the rule. He may choose to set up his own little workshop. He may take advantage of the tendency of all the new forces which are being placed at his disposal by science and invention to establish a household art of which he may sell the product; thus, after having gained his wages as an eight-hour man, he may add two hours more, or three, or four, to his productive work, as he chooses, and put by his savings which others who do not avail themselves of the same opportunity, or cannot do so, fail to gain in corresponding measure. You cannot suppress gumption if you try. You cannot prevent the man or woman who chooses to make a free and intelligent use of time and opportunity from getting the advantage which is due to industry, foresight and intelligence. The more you restrict the many, the greater the advantage do you give to the few whom you cannot reach by statute or by law.

* Continued from page 186.

THE APPRENTICE QUESTION.

I think that many of the rules of the trades union will soon be abolished by themselves on account of the very prejudice which they may create and the very privileges which they may establish among the workingmen themselves. Many of these rules have been adopted for the purpose of limiting the number of persons who shall be permitted to comprehend the mystery of special trades. These rules are derived by perversion from the old guilds. The ostensible and in fact the real object of the control of the mediæval guilds was that each apprentice might become a master of the art to which he was bound, and might become more capable than any other man of doing his work, and thereby holding the control of his trade. The object of the restriction of the present trades union is that too many may not learn the mystery of each trade; therefore those who do learn it may become a privileged class, and may be able to secure a larger share of the annual product by doing a smaller share of the work than their neighbors. All of such privileges must fail in the face of science and invention. If a capable youth cannot get a chance to learn a trade that he wants to learn in the ordinary way; if he then finds that it would be profitable for him to learn it, he will find plenty of ways to become a better master of that specific art than any who are thus restricted; or else he will be the very man who will invent a better method of doing that work, and in that way he may excel his restricted competitors.

THE POSITION OF MAN.

I now come to the objective point of this address. In dealing with physical forces, scientists and inventors soon discovered that the direction of natural forces could be changed, but could not be resisted, and that necessary abundance of natural products on which the life of man depends could be promoted and increased by directing and not by resisting these forces. It is over the direction of these forces that man has, to a certain extent, been given dominion—to what extent who can yet tell? These are physical laws, so called. I have reached the conclusion which seems to be very foreign to the minds of many philanthropists and of many earnest workers on social questions, that there is a correlation of metaphysical forces corresponding to the physical, and that the mind of man may give a direction to these metaphysical conditions, but cannot resist them without disaster or distruction. The direction which man may give to these metaphysical forces which govern society and which control the relations of men will become beneficent in its effect upon society in the exact measure in which students ascertain what the nature and direction of these great laws or forces really may be, by which society is governed, whether it will or no. Man has a right to be governed, controlled or directed in harmony with, or in the direction in which these great forces work, and the science which deals with his rights is the science of jurisprudence, the highest within the range of all studies. Is it not the highest that science which deals with the rights of mankind? The word which I have used in giving the title to this address, interdependence, conveys to my own mind, as its correlative term, the conception of the most potent and beneficent force by which the relations of men are subjected to a higher law. This relation of men, each to the other, finds its material expression in the exchange of service for service, of product for product, to the mutual gain and mutual benefit of all who engage in the transactions of life. How is this interdependence mainly brought into action? Mainly, if not wholly, by competition.

Do not misunderstand me. Organizations for mutual benefit and co-operation within certain lines and in certain directions are wholly consistent with competition, and are not in the slightest measure antagonistic thereto. The trades union, the benefit society, the organization of laborers, constitute one class of co-operative organizations. The distinctly co-operative societies for the distribution of products constitute another. Corporations such as railway, manufacturing and the like, constitute a third. And, finally, the State, in its function of corporation, constitutes a fourth. All these organizations may work in perfect harmony with each other, and may promote human welfare; but, as I am convinced, only so far as their representatives recognize the beneficent force of the competitive idea, and work on each one of their own lines in that direction, and not in resistance thereto.

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TRADE NOTES.

T. B. RYAL & Co., Detroit, Mich., present an interesting inquiry elsewhere in this issue which cannot fail to attract the attention of carpenters generally. The firm request those in want of such a publication to send for a copy of their catalogue.

J. B. SCOTT & Co., Pittsburgh, Pa., present in their advertising space this month a letter from the engineer of the Central Union Depot and Railway Company, who have used a large amount of Scott's Extra Coated Roofing Plate. According to this communication the Plate has given entire satisfaction, and the writer states that it is the intention to specify its use on other buildings that the company may erect.

THE SYKES IRON AND STEEL ROOFING COMPANY, Niles, Ohio, are offering the trade an improved form of Roofing which is claimed to be suitable for all classes of buildings. The statement is made that all the company's iron and steel is re-rolled and box annealed, as well as painted on both sides with the best of paint and pure linseed oil.

ELSEWHERE IN THIS ISSUE the Chieftain Hay Rake Company, Canton, Ohio, set forth some of the advantages claimed for the Superior Saw Set which they manufacture. Attention is directed to the hood, bed plate or anvil, and die bar, which are so arranged as to give the operator full view of the saw teeth while setting. The company request those interested to send for circulars and price-lists.

J. H. HOAGUE, Chicopee, Mass., is offering hardware dealers and carpenters a Draw Knife Chamferer Gauge, provided with a graduted scale, for which many claims are made. Attention is called to the fact that there is no danger of injuring the cutting edge by the use of this device, and that it is furnished the trade nicely nickel plated. We understand that a sample Gauge will be sent to any address on receipt of 60 cents.

G. & H. BARNETT, 21 Richmond street, Philadelphia, Pa., present an announcement elsewhere in this issue which cannot fail to interest the trade. This firm are proprietors of the Black Diamond File Works, and state that their goods are sold by the principal hardware dealers throughout the country.

THE GAGE TOOL COMPANY, Vineland, N. J., send us with their compliments a photograph of a mowing and reaping machine drawn by a pair of horses, the object being to show the application of their attachment to wagon tongues. The device is such as to permit the use of a large umbrella, which is held just over the horses' heads. Upon the umbrella is the inscription "A merciful man is merciful to his beast."

JOSEPH DIXON CRUCIBLE COMPANY, Jersey City, N. J., are distributing a circular relative to the merits of leather belting. Directions are given for cleaning a belt, and attention is called to the fact that the use of a good belt dressing is superior in economy to any other method for correcting the slipping of slightly loose belting. The circular also states that "it is estimated that every inch in width of good double leather belting traveling at the rate of 500 feet per minute will transmit 1 horse power, and that every inch in width of good single leather belting traveling at the rate of 800 feet per minute will also transmit 1 horse power." Other information relative to belting is presented which will be found of interest and value to all who make use of power.

WE HAVE RECEIVED from the Central Expanded Metal Company, with office at 116 Water street, Pittsburgh, Pa., a copy of a little pamphlet which they have just issued relating to an improved method of house construction and plastering. This consists of a discussion of the question of fire protection and the presentation of the merits of a new method of construction in imitation of stone work. Attention is given to portland cement and to the results of a test of the fire resisting qualities of Expanded Metal Lath when applied to wood. Illustrations are given showing some of the ways in which Expanded Metal Lath may be employed, and a number of testimonials which indicate in what light this material is regarded by those who have practically demonstrated its merits.

THE HERENDEEN MFG. COMPANY, Geneva, N. Y., are distributing copies of the tenth edition of a catalogue illustrating and describing the Furman Vertical Water Tube Steam and Hot Water Heaters. Attention is given to the proper method of estimating a house for herting either by steam or hot water. A chapter on the general subject of heating is presented, together with general directions for running the Furman Steam Boiler. The work is illustrated with engravings of the boiler mentioned, and with sectional cuts showing the system of piping for steam heating and also for combined steam and hot water heating. A number of tables of interest to the steam fitter are also given, as well as a long list of testimonials from those who have used the company's goods. Accompanying the pamphlet is a large poster showing a sectional view of the Furman Hot Water Boiler. It is surrounded with suitable advertising matter, and is printed in colors in such a way as to attract attention wherever displayed.

THE EGAN COMPANY, of Cincinnati, Ohio, report that their Woodworking Machinery of all descriptions is meeting with a heavy demand, both from the trade in this country and abroad. They claim to study the wants of their customers in such a way that they hear no complaints relative to the machines they turn out, and are continually pushing their efforts in the direction of reducing the cost of manufacture to the lowest point consistent with good workmanship and satisfactory operation.

E. B. STOCKING, of 611 F street, N.W., Washington, D. C., has issued a little work of something over 60 pages of letterpress entitled "Plain Words about Patents." Within its covers is presented a great deal of information of interest to inventors, patentees and manufacturers, relating as it does to patents, caveats, trade-marks, labels, designs, copyrights, re-issues, and foreign patents and trade-marks, as well as giving extracts from recent important decisions of United States Supreme and Circuit Courts and of the Commissioner of Patents touching the rights of inventors and patentees. Mr. Stocking is a patent lawyer of large experience, and elsewhere in this issue presents a card which may be of interest to our readers.

ELSEWHERE IN THIS ISSUE the Cortright Metal Roofing Company, Philadelphia, Pa., call attention to the specialties with which they are in a position to furnish the trade. They have prepared a circular in which the advantages of their Patent Roofing, adapted for churches, factories, railway stations and other classes of buildings, are set forth and fully explained. Those among the roofing trade who are interested will be furnished copies of this circular upon application to the company.

THE VAN WAGONER & WILLIAMS COMPANY, 82 Beekman street, New York, are distributing a little pamphlet of a size convenient to carry in the pocket, which will be found of special interest to carpenters and contractors. It consists of a condensed price-list of goods manufactured by the company mentioned, including such as Blind Adjusters, Door Pulls, Door Springs, Ceiling, Coat and Hat Hooks, Sash Lifts and Spring Hinges in great variety.

WE HAVE RECEIVED from the Norfolk and Western Railroad, with offices at Roanoke, Va., and Philadelphia, Pa., an interesting little volume of nearly 100 pages, outlining the present condition of progress in mining, manufactures and agriculture, and the undeveloped resources of those portions of the State of Virginia traversed by its lines of railway. The little pamphlet is profusely illustrated with engravings showing some of the more important industrial establishments along the line of the Norfolk and Western Railroad, as well as views of a number of points of interest.

AULD & CONGER, 100 Euclid avenue, Cleveland, Ohio, report the demand for slate the present season as being remarkably good, with steady prices for staple articles. In the Pennsylvania regions, and in vermont, there has been a shortage of many sizes, and no surplus of any sizes. Mr. Auld is at present visiting the quarries in Maine and reports a large stock on hand, considering the yearly production. As near as could be estimated the stock on hand is about 30,000 squares. Messrs. Auld and Conger report that they have just closed a contract for a large tract of slate land adjoining the village of Poultney, Vt., which is very promising, and on which they propose to erect the best machinery in the market and proceed to develop the quarries.

THE ANNOUNCEMENT PRESENTED ELSEWHERE in this issue by the Pratt Institute, Brooklyn, N. Y., is to the effect that the day classes will begin work September 17 and evening classes September 25 in the departments of art, domestic science, commerce and music. Entrance examinations for the Technical High School Department will be held September 17 and 18.

THE ENERGY MFG. COMPANY, Philadelphia, Pa., present in their advertising space this month a general view of their Patent Dumb Waiter Gearing, which they claim to be very strong and cheap. They make special reference to the fact that it holds the load securely at any point, both in ascending and descending, and that it is provided with a simple self acting brake, which prevents the waiter from lowering except when the brake cord is pulled.

LE BOSQUET BROS., Haverhill, Mass., and 82 Union street, Boston, direct attention elsewhere in this issue to Le Bosquet's Hot Water Heater. Some of the points of superiority claimed for this device are pointed out, and a broken view of the heater presented in connection with the descriptive text.

S. E. SMITH & BRO., 199 West Seventh street, St. Paul, Minn., are distributing a little pamphlet of nearly 50 pages, containing some of the many new designs for stair finish which they are prepared to offer the trade. The statement is made that in order to meet the increased demand for their goods they have recently erected a new brick factory and fitted it up in the most convenient manner with the very best machinery and tools, especially adapted for stair building. Within the covers of the catalogue attention is given to Newels of various kinds, Angle Posts, Stair Rails, Fancy Turned and Carved Balusters, Hand Rails, &c. Several pages at the close of the pamphlet are devoted to Hints on Stair Building. Accompanying the pamphlet is a revised price-list and a sheet of testimonials.

J. E. BOLLES & Co., 336 and 342 River street, Detroit, Mich., favor us with a copy of an illustrated catalogue known as No. 8, which they are distributing among the trade. It is an interesting work of nearly 50 pages, and within its colored paper covers attention is given to Wrought Iron Fences, Entrance Gates, Wrought Iron Grills, Elevator Inclosures, Wire Fencing, Vault Gates, Vases, Settees, Iron Wire and Brass Work. The pamphlet is profusely illustrated with designs of the various kinds of work which the firm are prepared to turn out, and directions are contained for ordering iron fences. The fourth page of the cover is embellished with a view of a corner of a house provided with balconies, the work being executed in cast and wrought iron.

STAMPED METAL CEILINGS is the subject of an announcement presented elsewhere in this issue, by Henry S. Northrop, of 18 Rose street, New York City. Attention is called to the fact that Metal Ceilings, in many designs suitable for all buildings, can be furnished the trade, as well as corrugated and twilled paneled ceilings. Those interested in the subject of metal ceilings are requested by Mr. Northrop to send for a copy of his catalogue.

THE ASPHALTIC SLAG PAVING AND ROOFING COMPANY, with works located on Polk street, Newark, N. J., and main office at 45 Broadway, New York City, report an active demand for the special Roofing which they manufacture, and state that the present capacity of their works is fully engaged upon orders. The form of roofing turned out is the invention of George S. Lee, a well known mining engineer, chemical and metallurgical expert, and is claimed to be readily applied, of light weight as compared with slate or metal roofing and as very durable in character. Reference is made to the fact that the slag employed is thoroughly embedded in the surface asphaltum and rolled into and upon the cloth surface, making it one indestructible body. The manufacturers state that the weight is 117 pounds to the square of roofing. The officers of the company are Gen. Fitz-John Porter, president; William Bouldin, Jr., vice-president; Nelson S. Easton, treasurer; Robert S. Masterton, secretary, and George S. Lee, general manager.

THE GUM ELASTIC ROOFING COMPANY, 39 to 41 West Broadway, New York City, elsewhere in this issue direct the attention of the trade to the Gum Elastic Roofing Felt, which they are offering at a price per 100 square feet which cannot fail to invite consideration. The company claim that the material which they have to offer makes a good and durable roof, and that any one can put it on. Those interested are requested to send a stamp for a sample and full particulars.

WE HAVE RECEIVED from the Thomas, Roberts, Stevenson Company, of Philadelphia, Pa., photographs of some of the leading specialties which they are prepared to furnish the trade. Among them is a brickset double oven range, provided with wire gauze doors. It is known as No. 808, and is fitted with all the latest features of convenience and utility. A large canopy directly above the high shelf carries all odors arising from cooking to the chimney. Another novelty is the Regal Fortune, a six hole range of substantial appearance, and known as No. 618. This is a single oven range with the fire box at the left, and is arranged for connection with a hot water circulating boiler. Still other new patterns for the season of 1890 is the Active Fortune range, Nos. 27 and 28. This is a pleasing construction, so arranged as to make a close finish to the side or back wall without loose finishing pieces. It is provided with sliding doors in the base, large warming closet over the circulating boiler, hot air plates for heating upper rooms, smoke and hot air openings at the top or back as may be desired, large feeder and ash pit door, dust flue and water back on the side or front, as the exigencies of the case may demand. The range is fitted with Hayes' patent horizontal circulating boiler, which is supported in brackets directly beneath the elevated warming closet. Another photograph shows the company's No. 218, a six hole range, provided with gauze oven door.

TOWER & LYON, 95 Chambers and 77 Reade streets, New York City, have just issued an illustrated catalogue and price-list, which they designate as No. 7. It is an interesting volume of over 125 pages, profusely illustrated with specialties made by the firm, and containing sufficient descriptive text to enable the dealer to obtain a clear idea of the various merits of the goods presented. The volume is bound in colored paper covers with gilt side title. In the majority of cases prices are given as well as the various sizes in which the different tools are made. The company manufacture all kinds of specialties in Hardware, Mechanics' Tools of high quality, Stephen's Patent Vises, Police Equipments, Brass and Malleable Iron and Scandinavian Padlocks, &c. At the addresses given are the New York offices of the Union Hardware Company, makers of Gun Implements, Skates, Dog Collars, Tackle Blocks, &c., and also of the Le Page Company, manufacturers of Improved Process Liquid Fish Glues.

THE BRIDGEPORT STEEL CUTTING COMPANY, Bridgeport, Conn, are distributing a little circular illustrating and describing the Fox Adjustable Try and Bevel Square which they manufacture. This device is claimed to do all the work of the Try, Bevel and Miter Square, and that it can be set instantly to any pitch or rise from 5 to 16 inches without the aid of other tools. Full directions for this device are presented in the circular referred to.

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CARPENTRY AND BUILDING.

A MONTHLY JOURNAL FOR THE BUILDING TRADES.
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DAVID WILLIAMS, - - PUBLISHER AND PROPRIETOR.
A. O. KITTREDGE, - - - - EDITOR.
JOHN S KING, - - - BUSINESS MANAGER.
66 & 68 DUANE STREET, NEW YORK.

OCTOBER, 1890.

Supplemental Plate.

Our colored supplement plate this month is another novelty to which the attention of our readers is directed. Each of our supplements for several months past has been made by a different process, and all radically different from those employed by others. By their use we have secured certain effects with relief plates which heretofore have been considered impossible by any other plan than that of lithography. What we lay before our readers this month is a gem of a picture, and is something that will be treasured by many a subscriber long after the number of *Carpentry and Building* to which it is a supplement has been forgotten. The copper work of the roof, the stone of the foundation, the brick work of the body of the house, all appear in pleasing contrast, while the background of trees and shrubbery and the foreground of lawn make a most attractive setting. We do not make promises for the future, but the reader need not be overcome with surprise if we give him still another novelty with the next issue.

Repairing Old Buildings.

In the last issue of *Carpentry and Building* we referred to the demolishment of two prominent buildings in the metropolis and the lessons it was possible to derive from them. Now we want to call attention to another feature of building process in and about New York, which likewise has its own particular value to the student in the building trades. We refer to the habit that New York builders have of taking out the lower portion of a building and replacing it with new, without in the least disturbing the upper part. Occasionally this thing is carried to an extreme. The amount of the old building that is left is so small that it would seem that tearing down the entire structure and rebuilding from the bottom would have been cheaper than the method employed. That this is not so is evidenced by the fact that the other plan is preferred, and builders seldom follow the most expensive method.

An Illustration.

A case in point is a building we have passed frequently during the past few weeks. At the start it was an old style three story building. The usual posts, shores and beams were inserted, by which the upper portion of the building was carried, and by which the second floor was also carried independent of the walls. The walls, to the extent of the first and second stories, were then removed and an iron front was inserted, a feature of the design being huge arches sprung from columns so as to give a large amount of glass surface both to first and second floors. Intermediate walls, which had formerly divided the building into separate store rooms, were removed and replaced by wooden columns. Nothing remained of the second floor at this stage except the joists and their bridging. The plastering was stripped from the under side, and the flooring was removed from the top. After the iron front and the arches had been put in place, what little brickwork was necessary to make the connection from the iron work to the old brick of the upper story was put in place. The posts, props, beams and shores were removed and the inside columns were put in place in the upper stories, and the building then appeared as a very different structure from what it was before the changes commenced. Finally, the roof was taken off and a new roof laid. What we have referred to is, perhaps, an extreme case, but nevertheless it shows what methods city builders prefer to employ.

The Grant Monument.

The readers of *Carpentry and Building* have, no doubt, learned from the daily papers that a design has been accepted for the monument to be erected over the grave of General Grant, in the upper part of New York. A brief description of the proposed work, which has been designed by John A. Duncan, of New York, who also was the successful competitor for the design for the Soldiers' and Sailors Memorial Arch, in Prospect Park, Brooklyn, will be of interest. The main part of the monumcnt is a cube, one hundred feet each way in dimension. Above this is a turret-shaped structure, the principal architectural features, of which are a colonnade and a massive cornice. Above, on top of this, stands a pyramid some seventy feet in hight, crowned by an appropriate piece of statuary. The architecture of the lower part, which we have likened to a cube, is of the doric order. The four sides face the points of the compass and the main entrance is on the south side. In front of this entrance will be a colossal equestrian statue of General Grant. Two other entrances are provided, one each side of the main entrance. Over it all extends a gateless portico, on the top of which a cornice runs and in which are worked the coats of arms of several States of the Union. Further up on the exterior is another cornice in which are worked designs of weapons and battle flags. In other particulars the outside of the monument is plain. A place for a tablet is provided above the main cornice surrounding the lower portion or cube. This is in front of a plain pediment and immediately above it is space for a group of statuary. At the right and the left of the tablet also are emblematic figures. Urns emphasize the four corners of the cube. The pyramid at the top ascends to the apex by terraces. The extreme top, as already mentioned, provides a place for a group of statuary, the exact details of which, we believe, are at present undetermined. Thirty feet below the top there is a row of windows through which visitors may look from the inside.

The Interior.

The interior of the monument is in one single open space, constituting a large hall 75 x 85 feet, and capable of containing a thousand people. At one side is a staircase leading to the gallery, 122 feet above the floor, from which the visitor, through the windows already mentioned, may obtain views up and down the Hudson, east over the Sound and west to the wooded hights of New Jersey. The interior of the dome is supported by columns. On the side of the main hall, opposite the entrance, is the crypt, the floor of which is lower than that of the hall, with marble steps leading down to it. The cost of the whole structure, including the great equestrian statue at the entrance, but exclusive of all other statuary, is estimated at $500,000. As much as $100,000 additional will be necessary for the statuary and other ornamentation contemplated. One feature which led the committee to accept this design is that it provides a large memorial hall suitable for a display for all sorts of mementoes and emblems. The monument will be grand in its proportions, which will exhibit solid strength. The ornamentation is in accord with the purpose of the structure. The leading idea is massive simplicity, which, it will be conceded, is well in keeping with the character of the man in whose honor it is erected. The ground on which this monument is to stand is well known to New Yorkers. It is at the upper end of Riverside Park and is very high. The monument will tower above all its surroundings, and will be visible far up the Hudson and also far down the bay.

The Eight Hour Day.

The eight hour question is of paramount importance at the present time to thousands of men employed in the building trades. The vast majority of these people think that the eight hour day is the ideal day, and that if labor of all kinds could be reduced to eight hours the dawn of the millenium would be at hand. We are not disposed to assert that the eight hour day is not desirable, but it does seem only right to call attention to the fact that the eight hour day is not universally accepted by mechanics as being the best thing for them. This is fully established by the action of various bodies of workingmen quite recently, to one of which we particularly refer.

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Getting On in the World.

Before mentioning the incident we have in mind, let us call attention to the fact that those who "get on" in this world have to work, if not struggle, for their own advancement. Those who are willing to always remain privates in the ranks and always keep step in the march have far less to do, have far less anxiety of mind, have far less need of exertion of any kind than those who have higher ambitions and who aspire to manage a contract, or those who in any way hope to deserve and to receive promotion. Now, we take it that the average American mechanic wants to "get on" in the world, in the best sense of the term. But how can he get on if he does no more than his fellows? If he only keeps step he advances only when others advance, and that stirring thought so happily expressed by the poet about "climbing upward in the night while others sleep," is lost sight of entirely. Of course, if every one struggled for advancement, advancements would be harder to secure than at the present time; but all do not so struggle, and therefore our words appeal to those who are ambitious. For such the very idea of a union by which men are bound to move when the crowd moves, and only then and with the crowd, is obnoxious. They clearly see that it is opposed to their best interest. A man to get on in the world must be free to work when he has the opportunity and free to do two days work for one day's pay if some object justifying the effort is to be attained thereby. A man who can barely live with the wages that eight hours or nine hours labor brings him, ought, for the sake of the greater comfort of his family, and for the sake of his own social and material advancement, to have the privilege of working two hours or three hours extra whenever it pleases him so to do, but all the unions prohibit this. It is against the rules to work more than the established day except at advanced wages.

Action of French Workmen.

What we set out to mention, however, was the action of the mechanics of France as recorded by their votes a short time since. It has surprised many people to learn from the daily press that the eight-hour movement in France has encountered a decisive rebuff. It is often thought that the French are given up to amusement and frivolity, and, accordingly, that no opportunity would be lost to shorten the hours of labor so as to lengthen the hours of pleasure. But among the hard working people of France such, it seems, is not the case. A commissioner was appointed some time since to secure votes from various workmen on the eight-hour issue. The result was that out of 7454 who voted only 1767 were in favor of the eight-hour day. The rest either deprecated any legislation on this question or else asked for a day of 10, 11, or even 12 hours The latter is the legal day in France at present. In France, as well as in England, professional labor agitators favor the eight-hour movement. The average working man, on the other hand, is well aware that what he most needs is not less work but more pay; and with the hard, common sense of his race he realizes that more pay in the long run can only come from more work. In England a similar rebuff to the eight-hour movement was recorded some time since, although later action in certain directions, as reported in the daily papers, seems to be the reverse of this. The English trade societies at that time voted 18 to 17 against the agitation of the eight-hour law. A large number of workmen, it was shown at that time, felt that such a law would be a good thing as a basis for pleas in behalf of extra pay for overtime, but they did not believe they could live satisfactorily from the results of eight hours labor as the world is at present constituted. Such are the views of some of the mechanics in France and England on the eight-hour question. Their conclusions, however, do not necessarily show what is best to be done in free America, and yet these facts, as they have come to us, have given us the opportunity for this little talk about what is to the best interest of the individual man who is ambitious for advancement in his trade and who desires to make a little better living for his family than his fellows secure.

Architectural Papers.

Questions are frequently addressed to us concerning other architectural and building papers. Certain readers, who are well pleased with the efforts of *Carpentry and Building* to serve the trades addressed, and who subscribe for it year after year because of the satisfaction derived from its various features, yet require to know occasionally where they may send for some other paper which gives particular prominence to something outside of our field. We are in the habit of carefully answering such letters whenever received, giving all the information we possess, for we are disposed to encourage the habits of reading and investigation whenever we have the opportunity to do so. Just at present, by way of answer, we are referring those of our readers who raise questions of this kind to the August number of *The Office*, a periodical edited and published under the same auspices as *Carpentry and Building*, and which contains an article entitled the "Architectural and Building Papers." In this article some 26 papers belonging to this general class are listed, and various particulars concerning each of them are presented which cannot fail to be of interest to those who wish to know the extent of the field and the number of the papers that occupy it, and also their distinctive features. The article, which is one of a series now running in *The Office*, has been prepared with a view to serve advertisers and subscribers alike, and has been widely read and extensively quoted from by the trade press.

The New Croton Aqueduct.

July, 1890, will be memorable in the history of New York City as marking the completion of the new Croton Aqueduct and the turning on of the water supply through the new conduit. Although this work is a wonderful engineering feat, and has occupied years in construction, besides involving the expenditure of many millions of dollars, its completion was celebrated in a most informal manner, there being none of the exercises that usually attend the ending of such a great enterprise. It had been determined that the water should be let into the reservoir in Central Park on Tuesday afternoon at 2 o'clock, and shortly after that hour the Aqueduct Commissioners and the engineer of the aqueduct, Mr. Fteley, were present and formally raised the gate. The water, however, had been running through the two big mains all the morning, so the work of the Commissioner was the most formal sort of labor. Now that the main part of the construction is completed, it will be interesting to review, very briefly, the history of this work.

History of the Aqueduct.

The law under which the new aqueduct was built was passed June 1, 1883, and a permanent organization of the Commission was effected on August 8 the same year. On August 15 Benjamin S. Church was elected chief engineer, and on January 21, 1884, A. Fteley was made principal assistant and executive engineer. The preliminary plans were approved on February, 27, 1884, and after several minor changes had been made, contracts for its construction were awarded December 13, 1884. On the 30th of that month the first ground was broken and three shafts begun, and during the first week of March, 1885, the work of blasting out the tunnel was commenced, 64 feet of the aqueduct being excavated during the first week. The tunnel proceeded rapidly from that time onward. In 1886 the politicians manœuvered with the Commission and passed a bill putting the work in charge of a new board. This Commission stayed in office a little over two years, and in the summer of 1888, a special session of the Legislature passed a third bill creating a third Commission, which has continued up to the present time, and consists of the Mayor, Commissioner of Public Works, the Comptroller, Gen. J. C. Duane, Walter Howe, Francis M. Scott and John C. Tucker. On November 21, 1888, Mr. Church resigned his position and Mr. Fteley was appointed in his place, and under him the aqueduct was completed.

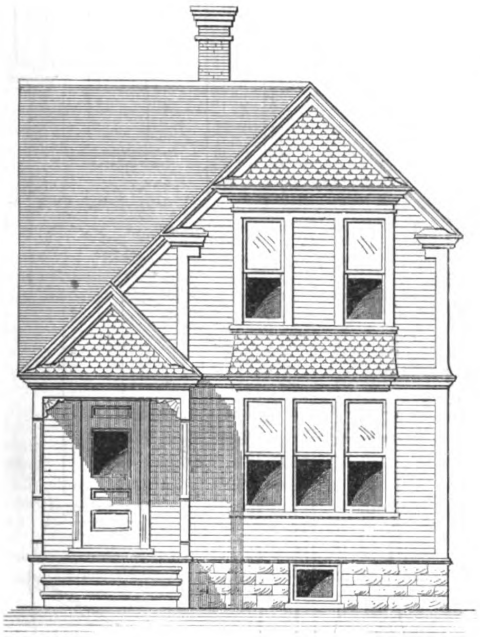
Size and Capacity of the Aqueduct.

The Aqueduct from Croton Lake to Jerome Park is of a horseshoe section, with a capacity of 318,000,000 gallons per day. From that point its capacity is reduced, to allow for a branch to supply a reservoir that will be built later at Jerome Park. Down to the gate house at 135th street the conduit is circular and will have a capacity of 250,000,000 gallons daily. From the gate house the water passes through eight 4-foot pipes of total capacity equal to the single conduit supplying them. Four of these will bring water to the west side of the city and the remainder will discharge into the reservoir in Central Park. The storage capacity at present in the Croton Valley is about 9,000,000,000 gallons, the water being confined in several reservoirs. The new storage reservoirs at Sodom will, however, be completed by the beginning of next year, and then the storage capacity will be double what it is now. Until that time the conduit will only flow to half its full capacity. The total length of the aqueduct tunnel is 30¼ miles, while the pipe line mentioned above is 2⅜ miles long. The deepest shaft that was sunk in running the tunnel was 350 feet, and its average distance below the surface of the ground is 170 feet.

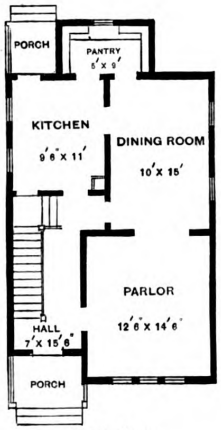
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DESIGN FOR A CHEAP HOUSE.

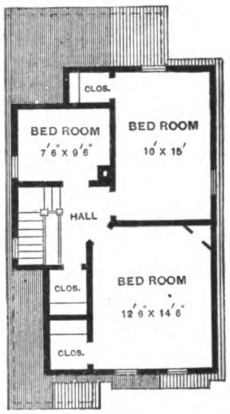
WE PRESENT upon this and the following page the elevations, floor plans and details of a house designed by S. A. Bishop, of 488 Main street, Buffalo, N. Y. The house is of neat construction, providing three rooms on each floor. The arrangement upon the ground floor is such that the front door may be reached directly from the kitchen, thus avoiding the necessity of passing through either of the principal rooms. Communiction is had between the kitchen and the dining room by means of a pantry 5 x 9 feet in size, as well as by a door opening directly from one room to the other. The three sleeping rooms upon the second floor are all easily accessible from the upper hall. The cellar extends under only a portion of the house. As will be seen from an inspection of the elevations, the gables are shingled as well as the roof. The floors of the house are of $\frac{7}{8}$-inch matched pine, while the walls of the kitchen are wainscoted 3 feet high. The stairs have cherry rails, newels and balusters. The parlor and dining room have a reeded finish. The front door of the house is fitted with stained glass, producing a neat and cheerful effect. All painting, both exterior and interior, is in two-coat work in tints of lead and linseed oil.



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

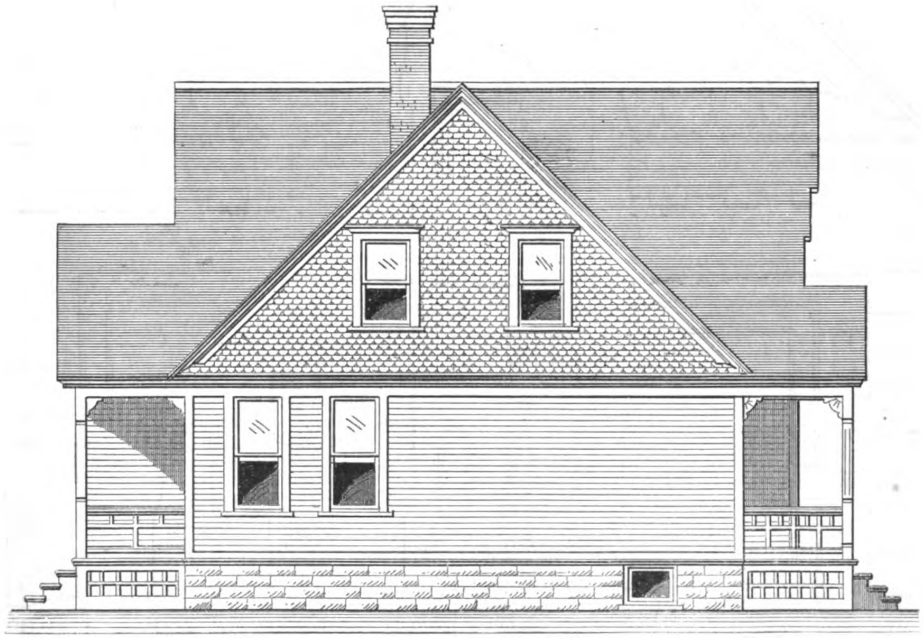


First Floor.



Second Floor.

Scale, 1-16 Inch to the Foot.



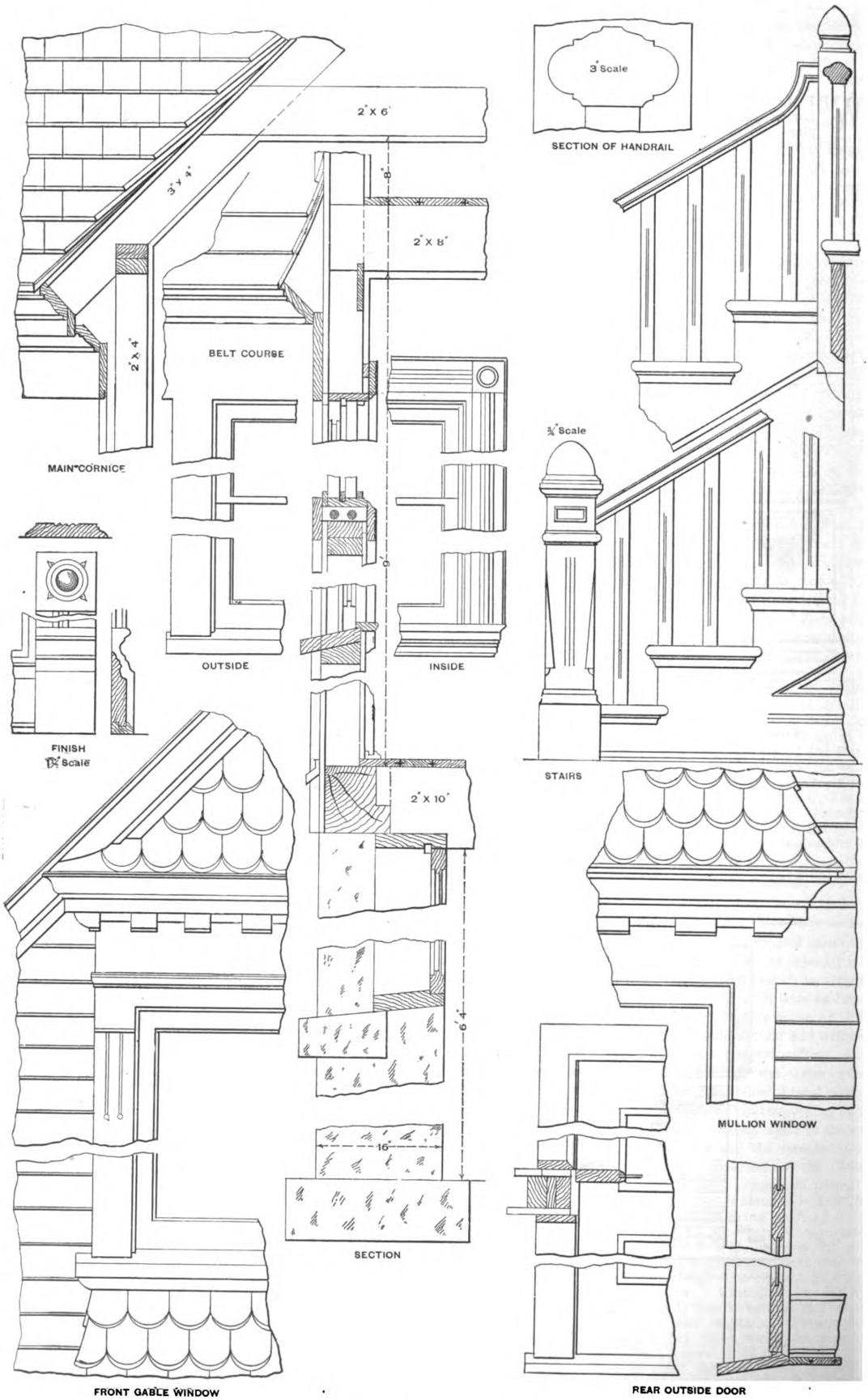
Side (Left) Elevation.—Scale, ⅛ Inch to the Foot.

Design for A Cheap House.—S. A. Bishop, Architect, Buffalo, N. Y.

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Design for A Cheap House.—Details.

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PROBLEMS IN ROOF FRAMING.

By I. P. HICKS.

THERE IS NOTHING in the art of carpentry which so thoroughly taxes the skill and ingenuity of the builder as roof framing. Particularly is this the case when it comprises roofs of many hips and valleys and of different pitches. The subject has been brought up and discussed many times in *Carpentry and Building*, and in a most thorough manner. Almost every conceivable way of obtaining hip and valley rafter lengths and bevels has been illustrated and desribed, but the readers of the paper are a studious, energetic class, always striving for the simplest, quickest and easiest way of producing certain results. Judging from the letters of inquiry of late asking for still further information on this subject, it is natural to conclude that the readers of *Carpentry and Building* are not yet satisfied, and that a system is wanted whereby a mechanic with a steel square and a 10-foot pole can lay off the lengths of hips, valleys and jack rafters with their proper levels on roofs of any pitch without ever making a diagram, and in less time than it takes to describe the operation.

Well, here we come with a system which will enable any one to find the lengths and bevels of hips, valleys and jacks, on roofs of any pitch. It does not matter whether the mechanic can make or understand a drawing or whether he every heard of square root. The system which we shall use in the article, consists of a table from which the lengths and bevels of rafters, hips, valleys and jacks may be readily obtained.

Rafter Table.

1 Pitch of roofs.	2 Common rafter, 1 foot run.	3 Corresponding hips or valleys.	4 Common rafter cuts.	5 Hip and valley rafter cuts.	6 Jack rafter cuts.
Inches.	Feet.	Feet.	Inches.	Inches.	Inches.
6	1.12	1.50	12 & 6	17 & 6	13½ & 12
7	1.16	1.53	12 & 7	17 & 7	13⅝ & 12
8	1.20	1.56	12 & 8	17 & 8	14⅛ & 12
9	1.25	1.60	12 & 9	17 & 9	15 & 12
10	1.30	1.64	12 & 10	17 & 10	15⅝ & 12
12	1.42	1.73	12 & 12	17 & 12	17 & 12
15	1.60	1.88	12 & 15	17 & 15	19¼ & 12
18	1.80	2.07	12 & 18	17 & 18	21⅝ & 12

In explanation of the table it may be remarked that column 1 shows the pitch of roofs in the number of inches rise to the foot run. Column 2 shows the length of common rafter to a foot run. Column 3 shows the length of a hip or valley corresponding to a foot run of the common rafter. Column 4 shows what figures to take on the square for the cut of the common rafters, which are always 12 on the blade and the pitch of roof on the tongue. The blade gives the bottom cut and the tongue the top cut. Column 5 shows the figures to take on the square for the cut of a corresponding hip or valley, which are always 17 on the blade and the pitch of the roof on the tongue. The blade gives the bottom cut and the tongue the top cut. Column 6 shows the figures to take on the square to make the top bevel of jack rafters, which are always 12 on the tongue and the length of the common rafter for a foot run on the blade, the blade giving the cut. The plumb cut or down bevel of a jack rafter is always the same as that of the common rafter.

To avoid a complication of fractions the figures in columns 2 and 3 are given in feet and decimals. To find the lengths of common rafters, hips, valleys and jacks, it is only necessary to multiply the run by the figures given, corresponding to the pitch wanted. The following practical example shows how to find the lengths of rafters by the table:

What will be the lengths of rafters on a building 16 feet wide, roof of 7 inch pitch, hipped to the center, and rafters placed 16 inches from centers?

The run of the common rafter is one-half the width of the building, which is 8 feet. Multiplying the length of rafter for 1 foot run, 7 inch pitch—column 2 of the table—and pointing off the product as in multiplication of decimals, we have the length of rafter in feet and decimals of a foot. The decimal part must be multiplied by 12 to reduce it to inches, thus:

$$1.16 \times 8 = 9.28 \text{ feet.}$$
$$0.28 \times 12 = 3.36 \text{ inches.}$$

Thus the length of the common rafter is 9 feet and 3 inches. The 0.36 being a decimal of 1 inch and very small may be discarded. The corresponding hip or valley will be found as follows:

$$1.53 \times 8 = 12.24 \text{ feet.}$$
$$0.24 \times 12 = 2.88 \text{ inches.}$$

The decimal 0.88 being almost equal to 1 inch, it is best to retain it and call it ⅞ inch. Thus the length of the hip rafter would be 12 feet 2⅞ inches.

If the rafters are placed 16 inches from centers, the run of the first jack placed 16 inches from the corner will be 16 inches. Taking the same figures in the table as we took to find the common rafter, and multiplying by 16 inches, we have the following:

$$1.16 \times 16 = 18.56 \text{ inches.}$$

The decimal 0.56 being equal to ½ inch, the length of the first jack will be 18½ inches, the second will be twice that, the third three times, and so on till the required number is found.

The table covers almost every pitch of roof commonly used, but if some pitch is wanted not represented in the table, the figures are very easily found. They may be ascertained in two ways. The first process is by square root, but, as many of the readers are unacquainted with square root, we will take a simplier method, and one that all can understand. To find figures to work any pitch desired, take 12 inches on the blade of a square and as many inches on the tongue as the rafter rises in 12 inches. Now, measure across and divide the inches by 12, carrying out the quotient to two decimal figures. This will give the figures for finding the lengths of common and jack rafters. For hips or valleys on roofs of equal pitch take 17 inches on the blade of a square and as many inches on the tongue as the roof rises in 12 inches; measure across and divide the inches by 12, carrying out the quotient to two decimal figures, and we have the figures for finding hips and valleys.

Here are a few simple facts which, if remembered, will enable any one to tell the cuts in a hip and valley roof as quickly as they know the pitch. The cut of a common rafter is always 12 inches on the blade and as many inches on the tongue as the roof rises in 12 inches' run. The blade gives the bottom cut and the tongue the top cut. The cut of a hip or valley on a roof of equal pitch is always 17 inches on the blade and as many inches on the tongue as the common rafter rises in a 12 inch run. The blade gives the bottom cut and the tongue the top cut. The top level of a jack rafter is always 12 inches on the tongue of a square and as many inches on the blade as the length of the common rafter would be for a 12 inch run of the same pitch. The blade gives the cut. The plumb cut or down bevel will be the same as that of the common rafter.

The lengths and cuts on hip and valley roofs of unequal pitch may be found much in the same manner, and by taking figures on the square which will represent the different pitches. Thus, if a roof hips 6 feet one way, 8 feet another at right angles, and has a rise of 6 feet, the operation will be as follows: To find the hip rafter, take 8 inches on the blade of a square and 6 inches on the tongue and measure across. The result will be 10 inches. Now take 10 inches on the blade and the rise of the roof, 6 inches, on the tongue and measure across, which will give the length of the hip. The blade gives the bottom cut and the tongue the top cut. To find the length of common rafters for the short run, take the run, 6 inches, on the blade and the rise, 6 inches, on the tongue and measure across, which will give the length, nearly 8½ inches. The blade and tongue give the cuts top and bottom. To find the top bevel of the jacks corresponding to this pitch, take the run of the common rafter, 6 inches, on the tongue and the length of the common rafter, 8½ inches, on the blade and the blade gives the cut. The down bevel will be the same as the common rafter. To find the length of common rafters for the long run, take the run, 8 inches, on the blade and the rise, 6 inches, on the tongue and measure across, which will give the length, 10 inches, the blade giving the bottom cut and the tongue the top cut. To find the top bevel of the jacks corresponding to this pitch, take the run of the common rafter, 8 inches, on the tongue and the length of the common rafter 10 inches on the blade, and the blade will give the cut, the down bevel being the same as the common rafter. We have now clearly shown that the lengths and cuts of almost any rafter may be easily obtained with a square and 2 foot rule, and without diagrams; yet we do not advocate or advise anyone to discontinue the use of diagrams for finding lengths and bevels in roof framing. Diagrams serve to make ideas plainer and more easily understood.

A DANIELSONVILLE correspondent of the New York *Sun* writes as follows about the shingle removed a few days ago from the steeple of the Unitarian Church, Brooklyn: One of the first pastors of the church nailed them with big-headed wrought iron nails to the steeple in 1771, and under them General Israel Putnam often has sat and listened to the dicsourses—rare in these days—giving liberal interpretations of the Scriptures. It is stated, also, that the shingles were "rived" by men who afterward fought with Old Put at Bunker Hill. The shingles were remarkably well preserved. Four of them are displayed in the street windows of the *News* office, in this village, and above them is a placard with this reading: "These shingles were in use on the Unitarian Church in Brooklyn, 115 years. Just look at the nails." The nails are fine specimens of the old-fashioned, painstaking workmanship. They are smooth, straight and round, with large, thin, perfect heads, and are as clean and bright as at the time they were driven in the steeple. They would be considered to-day too valuable to use in any except the most elaborate and costly work. The shingles, of red cedar, are not at all decayed.

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MEASUREMENT OF ROOFS.*

BY TRIANGLE.

THE FRUSTUM of a pyramid or a cone is the part that remains after cutting off the top by a plane parallel to the base. Fig. 78 represents the frustum of a pyramid and Fig. 80 of a cone. The convex surface of the frustum of a pyramid or cone is found by multiplying the slant hight by half the sum of the perimeters of the two bases. In Fig. 79 let *a b c d* represent the elevation and *f e h* the plan of the frustum the slant hight, as derived from *c d* of elevation. Make *n' o'* equal to *n o* of plan, as shown, then *k' n' o' m'* will equal one of the faces of the pyramid. This figure is called a "trapezoid," which is a four sided figure having only two of its sides parallel, and the area is found by multiplying the altitude by half of the sum of its paralellel sides The area of one face can also be obtained, as shown, by the vertex of a cone. With *e* as center, and *e d* as radius, strike the arc *m n* indefinitely, then with *e b* as radius the arc *k l*. Draw *e k*, and from the point *k* space the circumference of plan *g f h*, as shown by *k s l*, then draw *l e*, which completes the envelope *m k s l n*.

A sphere or globe, Fig. 82, is a solid bounded by a convex surface, every point of which is equally distant from the center,

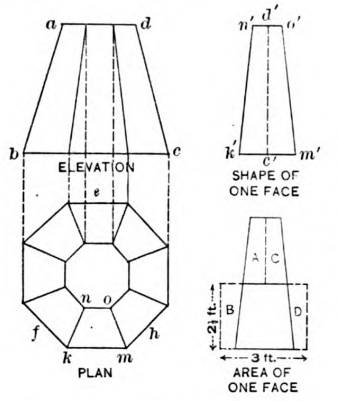


Fig. 79.—Area of Surface of Frustum of Pyramid.

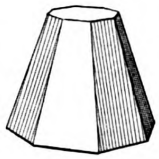


Fig. 78.—Frustum of Pyramid.

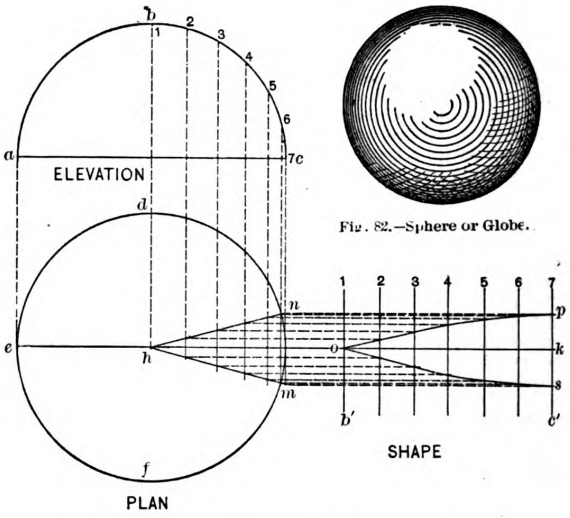


Fig. 82.—Sphere or Globe.

Fig. 83.—Elevation and Plan of Dome, Round in Plan.

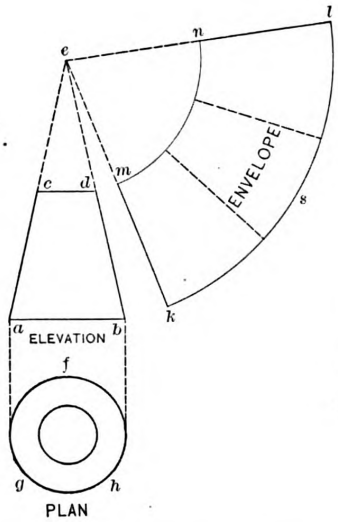


Fig. 81.—Area of Surface of Frustum of Cone.

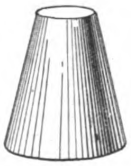


Fig. 80.—Frustum of Cone.

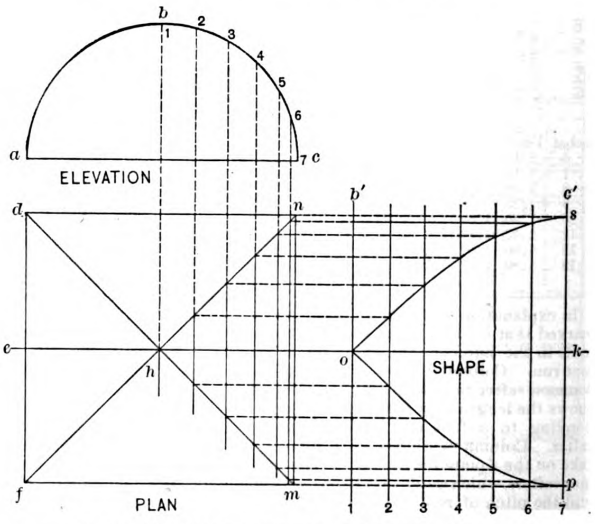


Fig. 84.—Elevation and Plan of Dome, Square in Plan.

Measurement of Roofs.

of an octagonal pyramid. If *k m* was 2 feet the perimeter of the large base would be 16 feet, and *n o* being 1 foot the perimeter of the small base would be 8 feet. We will suppose the slant hight, as *c d*, to be 5 feet. To find the surface of the sides of the frustum by the rule given above we would proceed as follows: $16 + 8 = 24 + 2 = 12 \times 5 = 60$ feet. To obtain the shape of one of the faces draw *k' m'* equal to *k m* and bisect by *c' d'*, *c' d'* being

* Continued from page 158.

drawing A at B and C at D, which, by the scale previously used, would give a figure $2\frac{1}{2} \times 3$ feet, and $3 \times 2\frac{1}{2} = 7\frac{1}{2}$ feet in one face, and as there are eight faces, $7\frac{1}{2} \times 8 = 60$ feet, which is the same answer as previously obtained.

In Fig. 81 let *a c d b* represent the elevation, and *g f h* the plan of the frustum of a right cone. The shape of the envelope can be obtained in the same general way as for a right cone. Extend *a c* and *b d* until they meet at *e*, which would be a point within the sphere. The diameter of a sphere is a line passing through its center and terminating in its surface. The radius is half of the diameter. The surface of a sphere is found by multiplying the circumference by the diameter. In Fig. 83 let *a b c* represent the elevation and *e d f* the plan of a dome, and as the plan is a circle, it can be considered as a half globe, and its surface obtained by the above rule by estimating the surface of a globe of the size indicated on the plan,

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and then taking one-half of the amount. In the engraving the plan is drawn directly under the elevation, and if it was necessary to determine the convex surface of the dome without the aid of figures, it could be done approximately as follows: Divide the half of elevation, as *b c*, into any convenient number of equal parts. Through the plan draw *e k* parallel to *a c*. The circumference of the plan is to be divided into any convenient number of parts, and one of these spaces marked so as to be bisected by *e k*, as shown by *m n*, and the miter lines *m h* and *h n* drawn, which represent the boundaries of the section, and points from the profile are dropped so as to cut these two lines. On any convenient place outside of the plan on *e k* space the stretch-out of *b c* as *o k*, which divide into the same number of parts, and draw the measuring lines 1, 2, 3, &c., at right angles to *e k*. By bringing the blade of the T-square against the several points in the miter lines *h n* and *h m*, and thus cutting measuring lines of corresponding numbers, points of intersection are thus obtained, through which lines can be traced forming the shape or pattern *s o p* for *m h n* of plan. As the plan was divided into 12 parts, one of which is shown by *m n*, after obtaining the area of shape *s o p*, twelve times this amount would be (nearly) the surface of the dome.

In Fig 84 is shown a dome having the same elevation as previously used, but square in plan. The shape of *m h n* of plan is obtained the same as in the previous figure, similar letters to designate similar parts being employed.

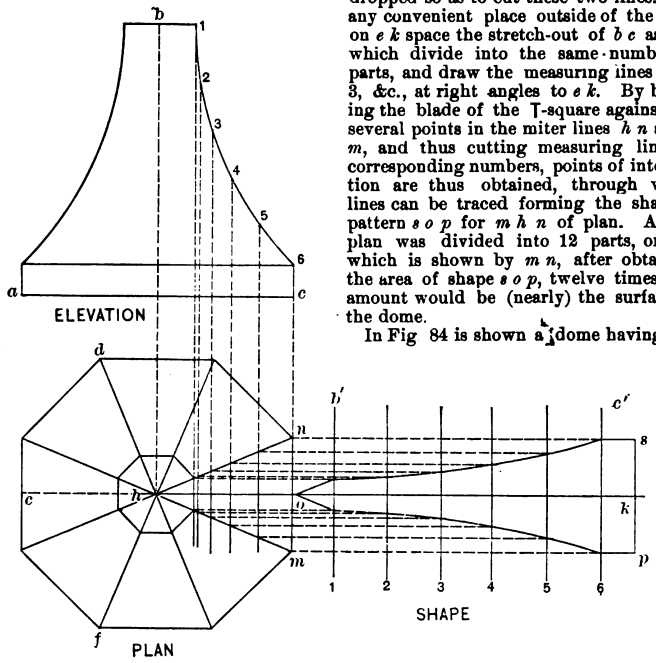


Fig. 85.—Octagonal Pinnacle.

In Fig. 85 we have a figure that migt be used as a pinnacle or tower, and while it is octagonal in plan, the same method is used for obtaining the shape of one of the the faces as in the previous figures, similar letters being used to designate similar parts.

In the three previous illustrations the shape of a certain portion of the roof or covering has been derived from the plan, after lines have been dropped from the elevation. In Fig. 86 the roof shape is derived from the elevations. Let *h a b c j* represent the front view of a dormer window and *d f e* the side. The part of roof *a b* is to be divided into any convenient number of parts, and by placing the blade of the T-square parallel with *f e*, the necessary measuring lines can be drawn as shown by the small figures. On *d e* extended as *e g* space a stretchout of *a b*, and from these points draw the measuring lines as shown by the figures between *e* and *g*. With the blade of the T-square parallel to *d e*, drop lines from the points in *d f*, as indicated by the dotted lines, to corresponding lines drawn at right angles to *e g*. A line traced through these points *s x* will give the shape of part of roof *a b* to join *d f*. The entire roof being obtained in a similar manner, or by transferring the distances to similar lines, as *x p*, and tracing a line through these points, then *s x p g e* will be the shape of cover for the roof *a b c* to join a mansard roof having straight sides, as shown by *d f*. If the roof was to join a mansard of any other shape, as *k m*, *b c* is to be divided in a similar manner, lines drawn through the side elevation, and the shape of roof *l n o t* obtained as in the previous illustration.

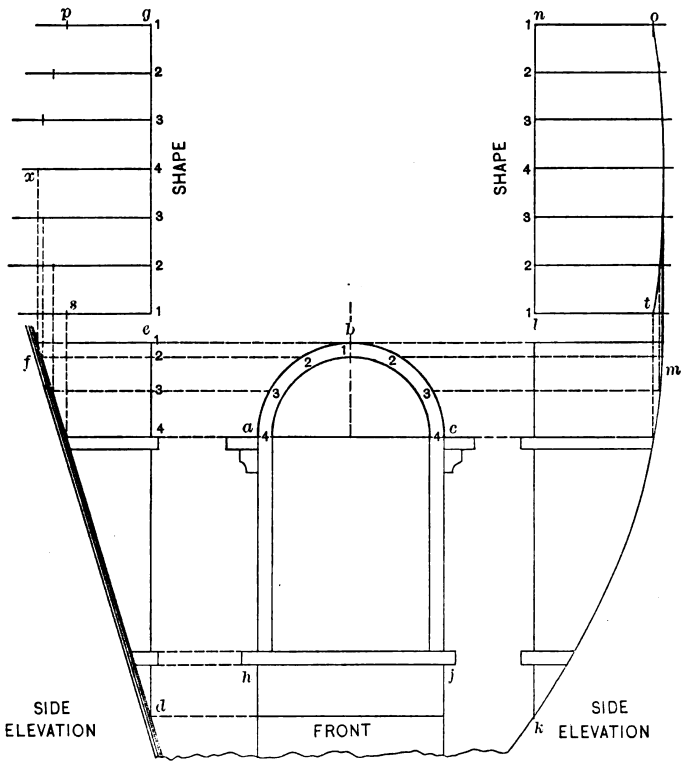


Fig. 86.—Dormer Window in Mansard Roof.

Measurement of Roofs.

Portland Cement for Anchoring Bolts.

A writer in the *Polytechnic*, of Troy, relates how, during a recent experience in constructing foundations for an elevated railway, solid rock was encountered so near the surface as to necessitate anchoring the foundation bolts in it. Some more durable and economic means of accomplishing this than by the use of sulphur or lead was desired, and Portland cement was suggested as being suitable.

A careful investigation failed to find any any record showing the adhesive strength of cement in pounds per square inch when used this way, hence it was decided to make such experimental tests as would give reasonably positive information on this point. For this purpose 14 holes were drilled in a ledge of solid limestone, seven of them being 1⅛ inches in diameter, and seven of them being 1⅛ inches in diameter, all being 3½ feet deep. Seven ¾-inch and seven 1-inch bolts were prepared with thread and nut on one end and plain at the other end, but ragged for a length of 3½ feet from the blank end.

Four were anchored with sulphur, four with lead, and six with cement mixed neat. Half of each were ¾ inch and half 1 inch bolts, and all of them were allowed to stand till the cement was two weeks old. At the expiration of this time a lever of sufficient power was rigged and all the bolts were pulled, with the following results:

Sulphur.—Three bolts out of four developed their full strength, 16,000 and 31,000 pounds. One 1-inch bolt failed by drawing out under 12,000 pounds.

Lead.—Three bolts out of four developed their full strength, as above; one 1-inch bolt pulled out under 13,000 pounds.

Cement.—Five of the bolts out of six broke without pulling out; one 1-inch bolt began to yield in the cement at 26,000 pounds, but sustained the load a few seconds before it broke.

While this experiment demonstrated the superiority of cement, both as to strength and ease of application, yet it did not give the strength per square inch of

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area. To determine this, four specimens of limestone were prepared, each 10 inches wide, 18 inches long and 12 inches thick, two of them having 1¼-inch holes and two of them 2¾-inch holes drilled in them. Into the small holes 1-inch bolts were cemented, one of them being perfectly plain round iron and the other having a thread cut on the portion which was embedded in the cement. Into the 2¾-inch holes were cemented 2-inch bolts similarly treated, and the four specimens were allowed to stand 13 days before completing the experiment. At the end of this time they were put into a standard testing machine and pulled. The plain 1-inch bolt began to yield at 20,000 pounds and the threaded one at 21,000 pounds. The 2-inch plain bolt began to yield at 34,000 pounds and the threaded one at 32,000 pounds, the strain in all cases being very slowly applied. The pump was then run at a greater speed, and the stones holding the 2-inch bolts split at 67 pounds in the case of the smooth one and at 50,000 pounds in the case of the threaded one.

It is thus seen that cement is more reliable, stronger and easier of application than either lead or sulphur, and that its resistance is from 400 to 500 pounds per square inch of surface exposed. It is also a well ascertained fact that it preserves iron rather than corrodes it. The cement used throughout the experiment was an English Portland cement.

THE BUILDING HANDICRAFTS.—II.*

CHANGE OF STYLE.

SUCH WAS THE CASE when Gothic succeeded Italian, and "Queen Anne" the Gothic. In the historic periods the change was gradually brought about, owing to the foreign artists who came over, as during the age of Elizabeth and the later days of Charles II. The Stuarts, indeed, encouraged foreign artists, and the workmen were instructed in new modes of working. But there was something stronger than foreign influence: there was the individual unfolding of ideas which the earlier guilds promoted in every locality; the apprentice was instructed in the "mystery" of his craft, and learned to become a proficient in it; he was not restricted as to time or material, and was permitted to exercise his own talents. In this manner invention was encouraged, a new stage was entered upon, and expressed itself outwardly. As we have said, the growth was from within outwards, not as now—a forcing process by which all, except the architect, become mere tools.

THE BRICKLAYER.

But to take each trade in the order we have named them, and first the bricklayer. We have said he has superseded in some districts the mason. During the last 10 or 15 years the bricklayer has recovered his somewhat fallen condition under the reign of "compo." We see examples of brickwork now which equal the brick architecture of the Tudors and the Dutch of the Seventeenth Century. Owing to the taste and labors of Mr. Norman Shaw, Messrs. Ernest George and Peto, Mr. John L. Pearson, R.A., and Mr. A. Waterhouse, R.A., among modern architects, ornamental brickwork in England has made great strides. The "Queen Anne" craze, to its credit, has restored the reputation once enjoyed by our brick cutters and setters, and we need not go far to point out in London some fine examples of modern workmanship that worthily compare with the Flemish. Italian Gothic led the way. Mr. John L. Pearson, R.A., in his fine church of St. Augustine's, Kilburn, and St. John's, Upper Norwood, has shown what can be done by modern hands in brick groin vaulting.

At the recent Architectural and Building Trades Exhibition, at Islington, we noticed some excellent rubbed and carved brickwork, executed by T. Lawrence, of Bracknell; we also see red brick houses at Kensington, designed by Mr. J. J. Stevenson and Messrs. George and Peto, which are masterpieces of the bricklayers' and the brickcuttters' arts. Yet not long ago, the English bricklayer was looked upon as occupying not a very important position in the building fraternity, and, in fact only a little above a hodsman. His attainments were then measured by the operation of laying bricks. But the skilled bricklayer is a great deal more than a layer of bricks. His knowledge of practical geometry should be not less extensive than the mason's if he understands the method of setting out such things as oblique arches, groined vaults, gauged arches, niches, &c. This setting out has been generally intrusted to foremen and clerks of works, though there is every reason why the operative should know the principles, especially if he desires to raise himself amongst his fellows. The drawing and cutting of arches, the taking off the bevels and moulds for an arch on a circle, require at least intelligence, and when to these things we add a knowledge of architectural features and ornament, it will be easily seen that the superior operative in this department should possess attainments as respectable as those of the mason.

He should particularly welcome the efforts made to raise the handicraft by the establishment of classes for apprentices, such as those of the City and Guilds of London Institute. The opportunity will be lost to him later in life. It is for the workman alone to raise himself to the position of an artist in the material he works with, and till he earnestly sets this ideal before him the contractor will continue to use him as a mere tool. An accomplished bricklayer or mason is intrusted with a great deal of the architectural design; he should be able to second the architect's efforts, and, if necessary, be competent to suggest modifications and improved details as the work advances. Very few do anything of the kind; they simply execute orders as expeditiously and thoughtlessly as they can—they have no interest to do more. But taking the trade all round, we may say there are indications of more intelligent interest and higher artistic culture in the craft. To be a successful worker in brickwork a man ought to have some knowledge of art; to have a correct eye; to understand technical drawings, and to know when a thing looks well and what to do to increase its effect. Without he knows this he is only a bungler.

THE CARPENTER AND JOINER.

The art of the modern carpenter and joiner holds, it must be confessed, an inferior place to that of his predecessors. Triumphs of the carpenters' art, such as we meet with in the noble roofs of Westminster Hall, the Great Hall of Hampton Court, Eltham Hall, in Kent, and in the beautiful examples of hammer beam roofs in the old churches of Norfolk and Suffolk, are no longer to be met with. Iron has seriously interfered with the greater constructive feats of the carpenter; while his artistic skill has very little scope left under the modern contracting system of dividing labor. The old carpenter, although his scientific construction was not always perfect, produced works of art; his eye and hand were cultivated and expressed themselves on the work he did. Machinery has lightened his labor, but without, alas! increasing the artistic cultivation of the worker. Though he has less drudgery to perform, he has not benefited; the hand and eye are no longer associated, and a marked separation of the artist and operative has taken place. We can explain it on no other assumption than that labor saving machinery has benefited only one class, and has taken away from the craftsman the means he had before of developing his skill and exhibiting his art. Things are done piecemeal—the capitalist only reaps the benefit. In this trade also, therefore, as in that of the mason, development from within has been impaired. The highest class of joinery to be found nowadays is in the hands of a very few men, who do the best church work, and are located in the principal towns. They contract for fittings. The skilled village or journeyman carpenter is now no longer met with. The consequence of these things is that the carpenter and joiner is no longer associated with building, except as an independent factor in its production, and contributes very little of his head and heart to the work. The recent statistics published on the depression of the building trades show two main causes of depression in this trade: The importation of manufactured material and joinery and speculative building. Reckless speculation is, we believe, the bottom of the trouble, as it draws into competition with skilled hands the inferior workman. But we still look to the carpenter and joiner. His labor constitutes a very considerable and important part of architecture, and the influence of the carpenter on architecture will always be felt. The Carpenters' Company, by providing technical instruction and free lectures and exhibitions of handicraft, is recovering lost ground, if only the London apprentices will take advantage of them. Again, let not the youth believe he can do without apprenticeship. In London the apprenticeship system is dying out and the market is being flooded with unskilled workmen. With unskilled joiners architectural detail must suffer, and when internal finish deteriorates the exterior architecture becomes neglected. To masonry and joinery belong the essential part of architecture, and for the credit of art we must preserve them from falling into merely mechanical operations.

* Continued from page 162, July issue.

A SHEET METAL PIPE, composed of longitudinal sections joined by continuous longitudinal seams, has been patented by Charles L. Hart, of Brooklyn, N. Y., and Thos. S. Crane, of East Orange, N. J. The pipe also has a series of sections at opposite ends of the longitudinal seams.

A SMOOTH FLOOR may be stained a rich dark brown by the use of 1 pound of asphaltum mixed with ½ pound of beeswax, or a greater quantity of each in the same proportion. If the composition is judged too light, additional asphaltum may be cautiously added. This is applied with a sponge or brush. A thin coat of shellac is then laid over the whole, and the surface smoothed with sandpaper. A coat of common varnish will give it a splendid finish.

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A ST. LOUIS RESIDENCE.

J. B. LEGG ARCHITECTURAL CO., ARCHITECTS, ST. LOUIS, MO.

FOR ELEVATIONS AND FLOOR PLANS SEE PAGES 227 AND 228.

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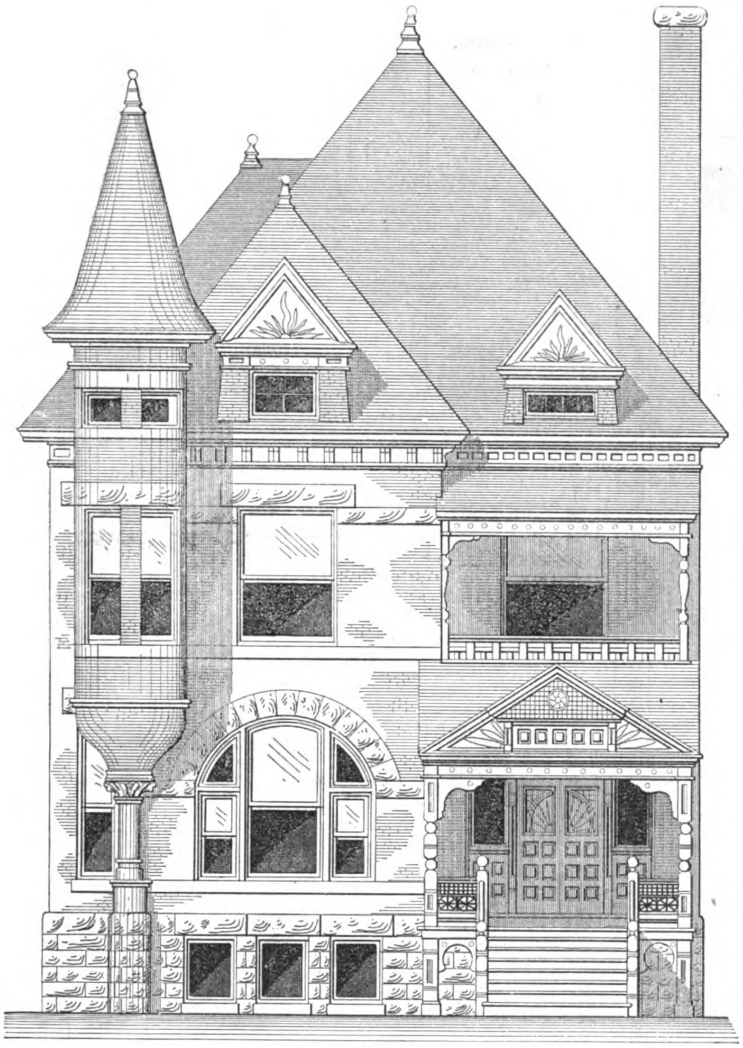
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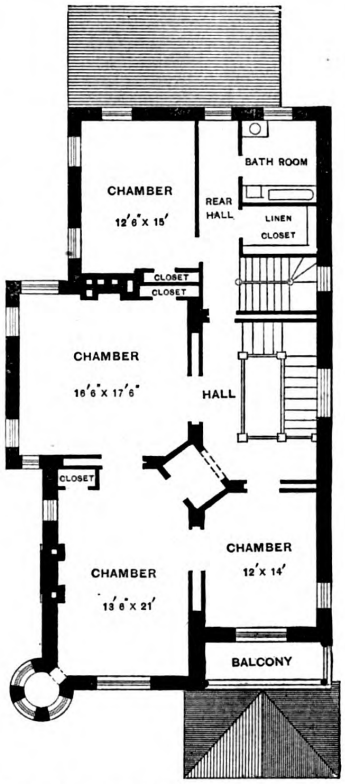
A ST. LOUIS RESIDENCE.

UPON THIS and the following pages we show the elevation, floor plans and details of a ten-room brick residence recently completed for L. L. Culver, and located upon the south side of Morgan street, between Ware and Grand avenues, St. Louis, Mo. A perspective view of the structure will be found upon the colored plate which forms our supplement this month. The basement of the structure is built of white limestone, with cut joists and stone, rough faced and pointed in black mortar. The superstructure of the building is of St. Louis pressed brick, laid in red mortar and trimmed with Lake Superior red stone. The roof is red slate, and the cornices, finials, dormers, crestings, porches, &c., are of cold rolled copper in its natural state. From an inspection of the engravings it will be seen that there are three large rooms upon the first floor, besides an ample reception hall, which is entered from the porch through a vestibule. The porch and vestibule are floored with mosaic tile, relieved with red Tennessee marble, polished borders and steps. The main stairway rises from a second hall immediately in the rear of the reception room. The arrangement of rooms is such that there is direct communication from the kitchen to the front door, thus avoiding the necessity of passing through any of the principal rooms. Upon the second floor are four sleeping rooms, all easily accessible from the hall. The bathroom and linen closet are in the rear just beyond the back stairway. In the basement story is finished a large billiard room, paneled in antique oak. The first, second and third stories are finished in quartered oak, cherry, black walnut and butternut, with heavy paneled dadoes and wainscoting throughout the reception hall, bathroom and stair halls. One of the chief attractions of the building is the main stairs, with its paneled curb strings, doubled molded railing and unique balusters, chimed in with newels of deep paneled work, having carved shafts and rosettes extending to the ceiling. These form an arcade across the width of the reception hall, producing a very handsome effect. The bathroom is fitted in the most modern style, the floor being covered

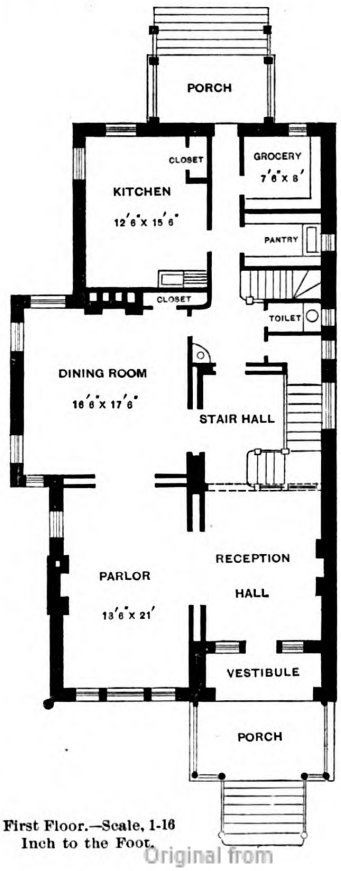


Front Elevation.—Scale, ⅛ Inch to the Foot.

A St. Louis Residence.—J. B. Legg Architectural Co., Architects, St. Louis, Mo.

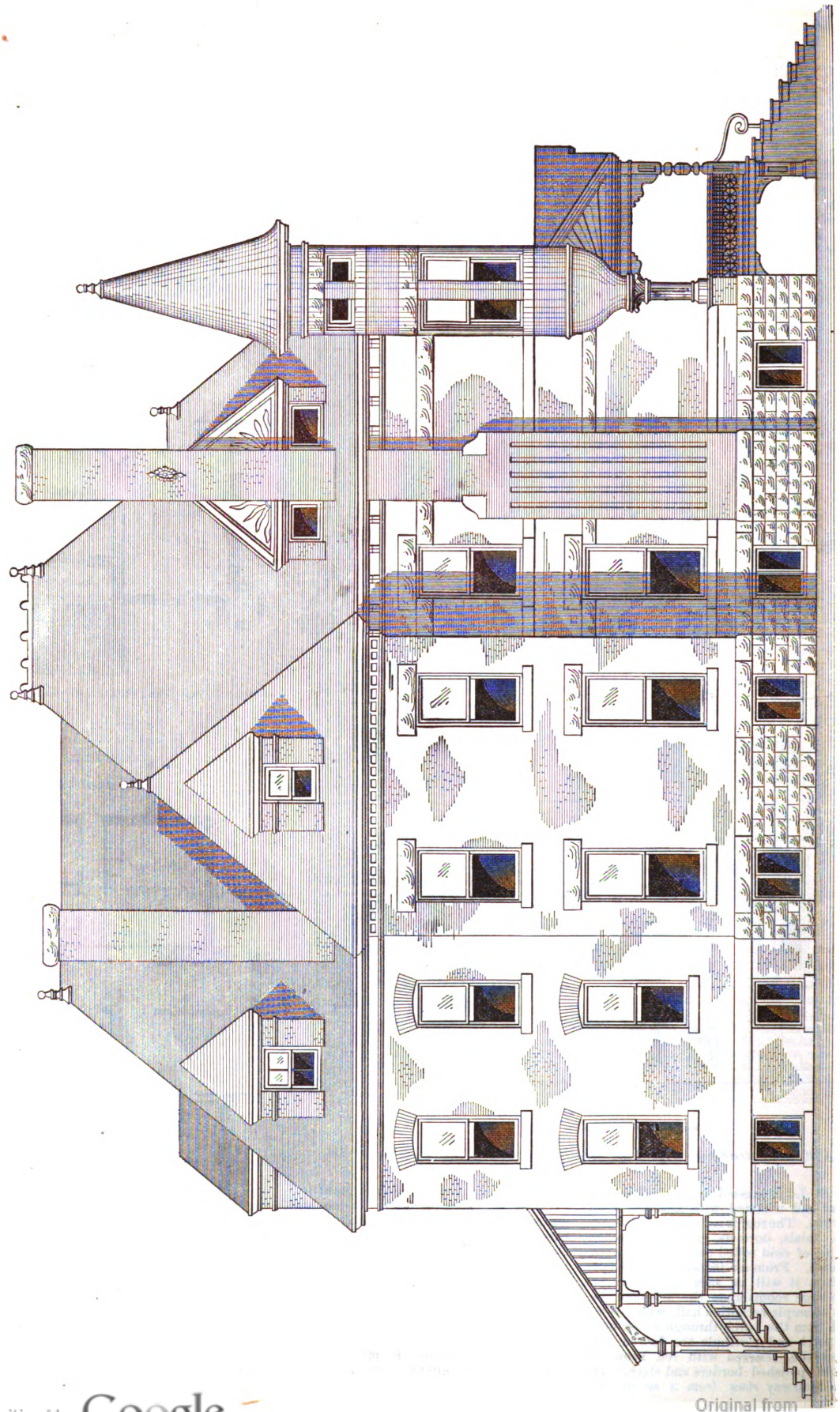


Second Floor.—Scale, 1-16 Inch to the Foot.



First Floor.—Scale, 1-16 Inch to the Foot.

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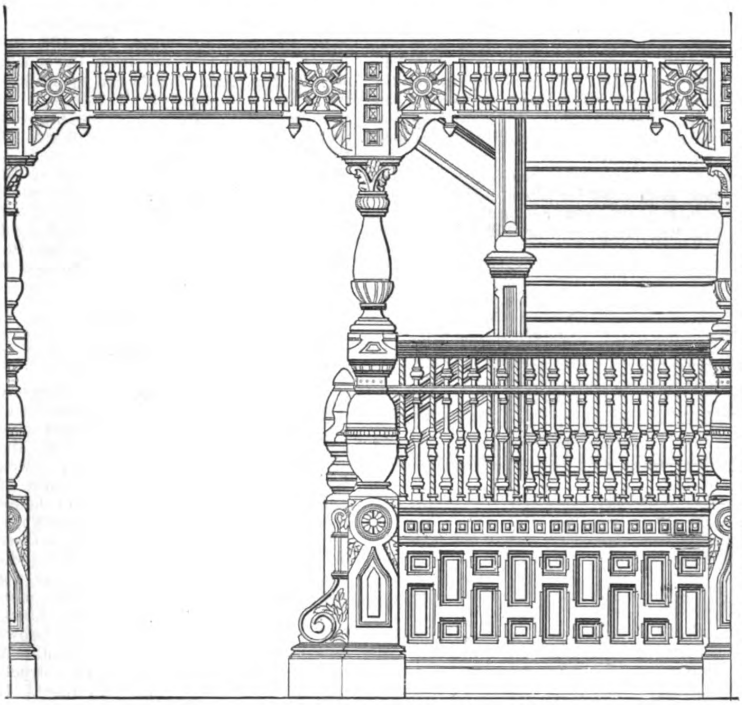


Side (left) Elevation.—Scale, ⅛ Inch to the Foot.

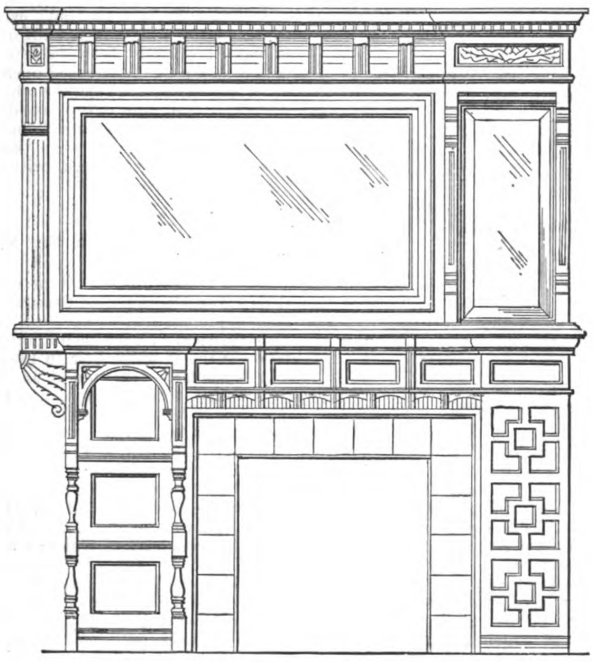
A St. Louis Residence. J. B. Legg Architectural Company, Architects.

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with mosaic tiles, while the wainscoting is polished Tennessee marble. The room is fitted with porcelain lined enameled tubs, fancy decorated pedestal closets and oval wash stands, all set on brass supports. The house has been erected and completed at a cost of $25,000. It was constructed from designs prepared by and erected under the supervision of the J. B. Legg Architectural Company, St. Louis, Mo., and Dallas, Texas.



Main Stairway.—Scale, ⅜ Inch to the Foot.



Elevation of Dining Room Mantel.—Scale, ½ Inch to the Foot

A St. Louis Residence.

THE FIRST consideration in planning the plumbing for any house, says an exchange, is to concentrate the fixtures as much as possible and to strive to have everything compact and accessible. Plumbing should not be scattered helter skelter all over the building with no system, and with the necessity of carrying pipes in places where they are liable to freeze or where they are inaccessible, so that in case of accident they cannot be got at without damage to walls and ceilings and much outlay of money.

Aboriginal Carpentry.

In speaking of ancient American tools, H. F. McLeod, of the Smithsonian Institute at Washington, recently said: "Aboriginal carpentry was the chief trade of our predecessors on this continent. The Indians and the mound builders had a very good idea of woodworking. You will see even now some very pretty joining done by Sioux Indians. Their tent poles make a fit which many a white carpenter would not like to try to better.

"The best carpenters, of course, were the Aztecs, who had arrived at quite a high stage of art, and whose tools, although they knew nothing of steel, are really excellent. We have a few of their tools at the Smithsonian, but the best collection is, of course, in the City of Mexico. The material used was almost wholly glass, especially for the finer parts of their wood cutting. To chop trees they used flint axes, and for rough hewing out of logs the same, but when it came to the accurate fitting in of the hewn timber, they handled glass knives, chisels and saws very deftly and with beautiful results. There is a ceaba wood post in Washington with hieroglyphics and faces cut upon it all with glass. You can see bits of the original chisel still sticking in a corner of the wood, where it broke off three centuries ago under the hand of the workman. The Aztecs knew how to make a very good and manageable glass, and their best cutting blades, swords, daggers and spears, saws, chisels and axes were made of it. When the edge dulled they broke it from the end, instead of sharpening it, and got a new cutting line.

"You can see a great deal of aboriginal carpentry still in use among the Moqui Indians of the United States. Of course they use our tools now, but they follow out their old patterns. They know how to make ladders and they swing their doors on hinges from the top, and they know how to mortise timbers—knew how long before Columbus landed in America. Of course they use our tools differently from our way. The chisel they push rather than hammer, work the board up and down on a fixed saw rather than the saw on the board, and withal they get creditable results. The framework in the Pueblos is quite as honest as anything we have in America."

THE FACT is mentioned in a German newspaper that under some conditions sheet zinc, when in direct contact with brickwork, suffers to an appreciable extent from rapid corrosion. It appears from this account that in building the Berlin city market halls a portion of the zincwork which rested upon brick walls was found to be deeply pitted at a number of places, this being particularly the case where the metal was close to the bricks. Chemical examination of these resulted in showing that they contained as high as 1.14 per cent. of soluble salts, capable of producing the destructive effect in question, and stimulated to more energetic action by moisture. The proportion of such salts, of course, varies with different kinds of bricks, while in some there may be nothing to induce any such corrosion. As a preventive, roofing felt or similar material may be placed between the zinc and brickwork.

THE COST of new buildings erected in New York during the first six month, of the year is $45,698,511, against $41,084,072 in the same period in 1889.

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MASONRY AND STONE CUTTING.*

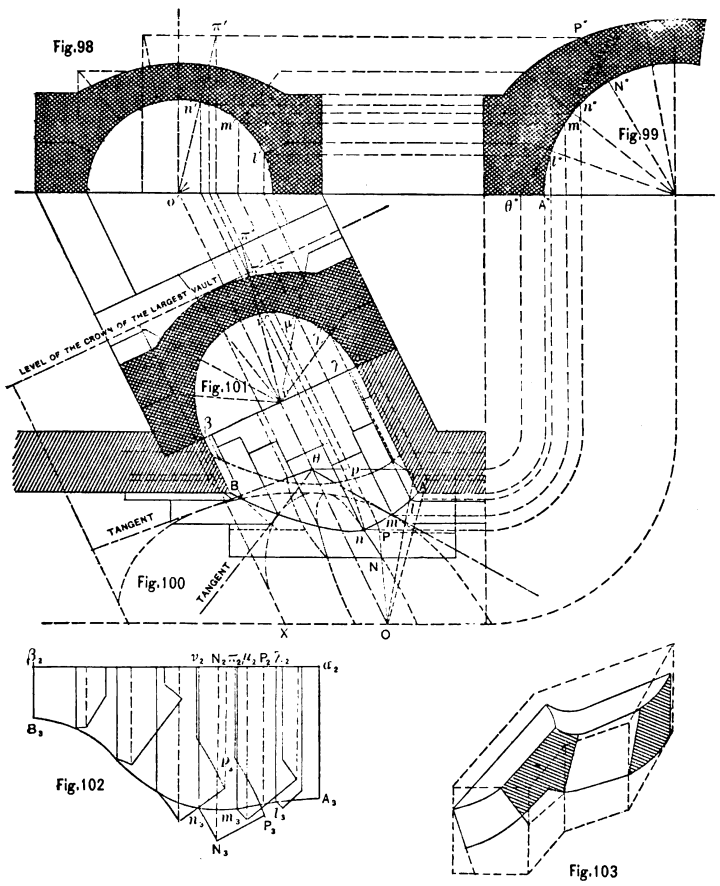
GROIN FORMED by the intersection of a skew lunette in a barrel vault.—In engineering works for covering watercourses, the tunnels bringing affluents into the main course must enter the main vault in a skew direction, and not square. Let o' O be the direction of such a vaulted subway constructed in stone, Fig. 100. If, as in our drawing, the face of the lunette, Fig. 98, be skew with its direction, and, for appearance sake, be made semi-circular, with joints radiating from the center, then the right section, Fig. 101, will be an ellipse, and the joints will not be normal to the surface of the vault. We may, on the contrary, assume that the right section is circular, and then the outside face of the arch will be elliptical. Whichever alternative be assumed, it must be remembered that the development of the surface of the vault can only be found by means of the right section.

The division of both vaults in arch stones will be done as in the case when the vaults met at right angles; the groin will again be found by cutting both vaults by a series of horizontal planes, such as l' l'', m' m'', n' n'', Figs. 98, 99, each of which will cut both vaults along straight lines, the intersection of which will give the points l, m, n of the groin. The tangents to the curve of the groin on plan are found by exactly the same methods as when the vaults meet at right angles, either by the method of the plane of the normals or by the method of the intersection of the planes tangent to each of the cylinders.

Development of the Soffit, Fig. 102.—Develop the right section, Fig. 101, then make a_2 $A_2 = \alpha$ A, $\lambda_2 l_2 = \lambda l$, μ_2 $m_2 = \mu$ m, ν_2 $n_2 = \nu$ n . . . . , β_2 $B_2 = \beta$ B. This series of points will give the line of the groin on the developed surface of the soffit. Each division of this development will give us the soffit mold of the respective arch stones.

In drawing the bed molds the depth of each joint must be taken on the right section, Fig. 101, and not on the face arch, Fig. 98. Thus, in Fig. 102, ν_2 $N_2 = \nu'$ ν'' of Fig. 101, and ν_2 $P_2 = \nu'$ $\pi'' = \nu'$ π'. The lengths, Fig. 102, N_2 N_3, P_2 P_3, π_2 p_3, are taken from the plan, Fig. 100, equal to the distances of the points N, P, p, from the line a β. The curves n_2 N_3, p_2 P_3 formed by the intersection of the bed with the soffit and extrados of the larger vault are found exactly as in the case of the ordinary Welsh groin described in the previous article; they are again portions of ellipses, but of which we have conjugate diameters such as O o and O X, not axes. It is observed that the ellipses formed by the intersections of the beds with the soffit of the vault have all got the one conjugate diameter O o in common, and that tangents, taken on points where lines parallel to the other conjugate diameter, cut the ellipses, will meet in one point, such as θ, on the diameter; for θ will be in every case given by the intersection of the horizontal trace of plane m'' θ'', Fig. 99, tangent to the larger cylinder with the center line of the smaller vault, which is the horizontal trace of all the planes of the bed joints.

In working the stones, Fig. 103, the face mold must be taken from the square section, Fig. 101. We begin by producing a prism, the base of which is equal to the plan of the stone, and the hight of which is equal to the difference of level of the highest and lowest points, such as μ' and π'', Fig. 101. The working of the stone is then completed by the same methods as in working the stone of the Welsh groin when the vaults met at right angles, the only difference being that the sides of the L-shaped prism are not at right angles.



Masonry and Stone Cutting.—Figs. 98 *to* 103 *Inclusive.*

* Continued from page 200.

Fireproof Houses.

The combustible nature of Japanese houses renders large fires a frequent and disastrous calamity, says the Detroit *Free Press.* Hence since a long time ago the more wealthy Japanese merchants, as well as farmers, have been in the habit of building a kura or fireproof mud house contiguous to their shops and dwellings, yet generally entirely isolated. Into these are hurried at the first alarm which indicates a fire approaching the premises, the portable property, household stuffs, merchandise, &c., and the kura is then closed, and if time permits the joints of windows and doors are sealed with fresh mud. A fire passing around and over such a structure will leave its contents unharmed. It is a very common thing to see in Yokohama, in the streets of the native town, many of these kura built with much attention to architectural effect. They resemble very closely gigantic fireproof safes which may be one, two and even three stories high. The kura is built of a light framework of wood, between the openings of which is securely fastened open wicker work of bamboo. Then the whole wall surface, inside and out, is solidly filled with stiff plastic mud taken from the bottom of the rivers, and when thoroughly dried is smoothly covered with stucco, often treated ornamentally.

A Big Tree and a Big Saw.

The Chicago papers state that Neal Girard Van Doornum, of Cramers, Cal., is making preparations to take out a section of a big redwood tree, for the purpose of exhibition at the World's Fair in 1893. This will be the largest section of any big tree ever taken from California. The tree measures 99 feet in circumference, making it almost 33 feet in diameter. The section to be taken out will be 9 feet in hight and 60 feet in circumference. It will be divided into three cuts. The World's Fair big tree is to be taken from Mammoth Forest, Tulare County, Cal., which is located 52 miles east of Tulare City, at an altitude of 6325 feet above the level of the sea. The work of felling the tree has already begun. Ten skilled workmen have been engaged and are busy at work. The saw to be used in getting out these sections is 22 feet in length, and was made to order by the Pacific Saw Company, of San Francisco. It is said to be the largest crosscut saw ever made of one piece of steel, and is supposed to require eight men to handle. It will take ten men at least two months to complete all the work to be done. Three flat cars will be necessary for transportation, as the total weight will not be less than 65,000 pounds.

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AN ENGLISH COUNTRY HOUSE.

WHILE ENGLISH country houses do not differ necessarily from those erected in this country, it is often interesting to note the arrangement of rooms and the conveniences afforded by a typical English summer residence. One of these dwellings, located in Surrey, has recently been materially improved and remodeled by Mr. Joshua Field, under the superintendence of Wilson & Long, architects, of London. The greater part of the old building was changed, and large additions made. The new work has been so arranged as to fit on to the old building in a manner to harmonize and render the actual junction between the two as little apparent as possible. The exterior is of Suffolk facing bricks, with stone dressing, while the interior joinery is of oak wainscot throughout, part stained and part fumigated in oil. In our illustrations upon this and the opposite pages we show the floor plans of this house, as well as an



An English Country House.—View of Main Stairway.

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interior view indicating the main stairway and a portion of the hall from which it rises.

Some Paradoxes.

At a recent meeting of the Iowa Surveyors' Association, held at Des Moines, Mr. Seth Dean, of Glenwood, Iowa, secretary of the organization, read the following very entertaining paper:

John Henry has built a house. Well, you say that is not a surprising fact, for the average American citizen has an ambition to some time during his life reside in a house planned and built according to his own ideas of comfort and usefulness, and John Henry is no exception.

As John is of an economical disposition he concluded to dispense with the services of an architect, and to build after the plan of a house which appeared in a paper that he takes. This house he said could be built for —— dollars, and John thought that was about what he wanted to pay. The editor also published in connection with the plan, a series of rules to be observed in the construction under the formidable title of General Specifications, which read somewhat as follows:

1. All material furnished shall be of the best quality to be obtained in the market.

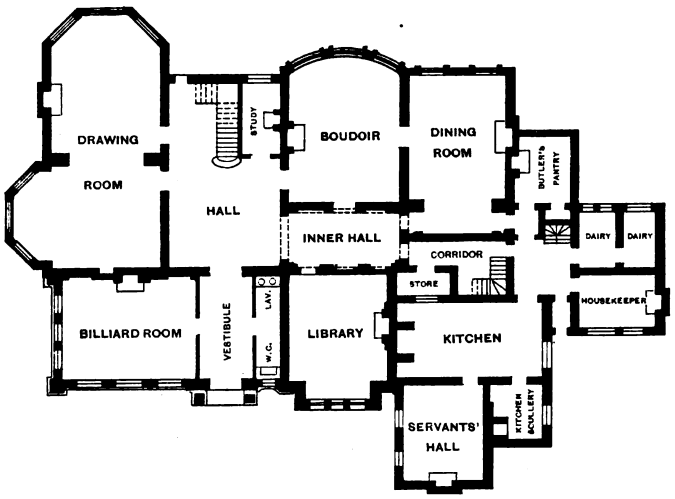
2. The workmanship in every part shall be of the very best, and all parts shall be pushed to completion as expeditiously as possible.

3. All excavating or grading for the foundation will be measured and paid for by the cubic yard.

4. All stonework in the foundation walls will be paid for by the perch, and dimension stone by the cubic foot.

5. All brickwork will be estimated and paid for by the 1000 feet in the wall.

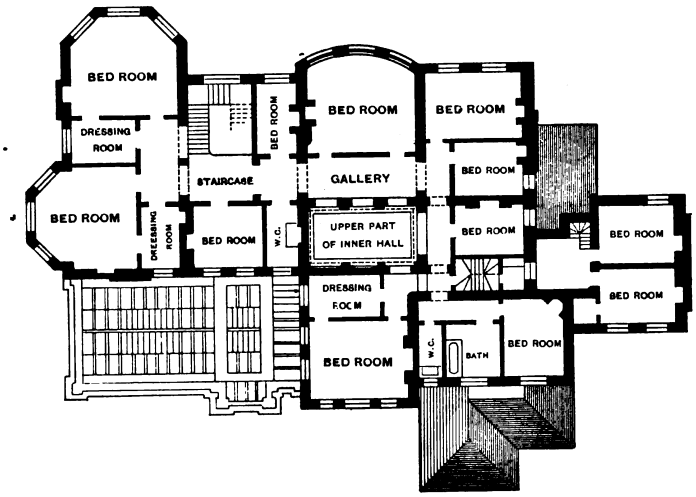
6. Plastering and painting by the square yard.



First Floor.

7. Carpenter work will be paid for by the piece or by the 1000 feet of finished work, according to circumstances.

Now these specifications looked very plain and simple to John and he could see no reason why they would not answer his purpose, and as his boy Peter was pretty good in figures and felt sure he could keep track of the work, John decided to furnish all the material himself and to hire the workmen according to the plan described, and in the end he had no difficulty in making contracts with his workmen, based on the printed specifications. With this explanation we will commence the building.



Second Floor.

An English Country House.

"Well, Peter, how many yards of earth excavation is there in the foundation?"

"There will be 127½ cubic yards in the cellar and trenches; and the way the stakes are set there will be just 125 cubic yards needed to make the filling around the walls when the house is built."

"Good," says John, "I will let Patrick put his men at work to-morrow. Patrick says it is worth 25 cents a yard to make the excavation, and as your figures show there will be earth enough from the cellar and trenches to grade up the grounds in good shape, we will let them spread the loose earth at the ends and back of the house first, and after the front steps are built and the curb for the walk set, they can dress up the front."

So Patrick and his men make the excavation and spread the excavated earth as planned by John and Peter, but find they have used it all as they go along, and there is none left for the front yard. Peter wonders at this and looks over his figures but can find no mistake, so he asks Patrick what he has done with the 14 yards of earth that is missing. "Oh," says Pat, "is that what bothers you? Well, the earth shrinks when it is moved in the manner we have moved this, the earth being packed closer in the new grade than in the hole; it will lose from 10 to 12 per cent. in this way, so if you figure on a fill you want to remember that it takes 10 yards of earth in the bank to make 9 in the dump."

"Well," says Peter, "father's specifications don't say anything about that, where are you going to get the rest of the earth to make the front fill?"

"Your specifications, Peter, don't say anything about my borrowing earth to surface your yard with, my part of the contract is completed as soon as we finish the trench for the footing of that cross wall yonder. I expect you will have to haul the dirt for the rest of your work from the Bever cut, over west; it will be worth 75 cents a yard for that work, and in fact I don't care to do it at that, but as you are in a pickle, I will help you out if you want." So John pays $10.50 to learn the lesson of the first paradox.

Next, Mr. Rubble informs John that the work on the foundation is completed and he is ready to settle, and claims pay for 174 perches. John and Peter proceed with their tapeline to measure the work which Peter makes out to be 160 perches, and John says he will pay for that amount and no more. Rubble refuses to accept the money and talks about sueing John. They finally agree to let Chipp, the carpenter, measure it. Chipp comes from Lincoln and he proceeds to measure the walls, according to the custom prevailing in that city, and reports 203 perches, at which John mutters something about a conspiracy to rob him and forthwith goes to Brief, the nearest lawyer, for advice. This gentleman has seen something of the world, and proceeds to question John and Peter about the way they measured the wall. Peter says, "I measured all the stone laid, taking the length, breadth and thickness of the wall and allowing 24¾ cubic feet for a perch because my arithmetic says that is the proper way to measure mason's work."

At this stage Rubble chances to pass by the door, and Brief calls him in and asks him how he measures masonry. He answers, "By the customary rule, of course. Measure all openings as solid wall and all corners double, and allow 25 cubic feet for a perch."

"How does it happen that Chipp makes so much more than you do?"

"He reckons 16½ cubic feet for a perch."

After some parleying, Mr. Henry pays Rubble for the 174 perches claimed, and Peter makes a note in his arithmetic under the rule for measuring mason's work. "This rule may give correct results in the school-room, but it won't work in practice."

(To be continued.)

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CORRESPONDENCE.

Answer to Handrailing Problem.

From G. S., *Colorado Springs, Col.*—I inclose an answer to "J. C.," of Cedar Rapids, Iowa. I take his drawing as it is, using the inside line for face of string. He has the balusters spaced equal. That cannot be and produce a good tread, unless the cylinder is larger. I first unfold the quarter circle and space for the risers, as shown in Fig. 1 of the sketches. Lay off the rail face to face as G B. Next square the center of the rail as C D for obtaining face mold for cylinder. Now, the number of risers in the circle is 4, which equals 28 inches. One-half of 28 inches is 14 inches. Extend the top line of square indefinitely, or 14 inches, which is half of the rise Call this 3, see Fig. 2, then draw the line from 3 to 2. Draw a line indefinitely in a horizontal direction and erect a perpendicular the length of 1 2. From 2 take 2 3, as shown in the diagram; square from these lines. For center strike one-half the width of the rail each side of the lines. For bevel for wreath set compasses at E and strike the other point as shown by the circle at F. Draw a line from F to 2. From 2 F to E is the bevel placed square of plank at each end. If "J. C." is a practical stairbuilder he will understand placing the bevel for right and left hand rail. Use mold for squaring wreath by sliding to lines of bevel on the wreath. I always cut the mold a little larger than the width of the rail. The cylinder is unfolded ready for bending.

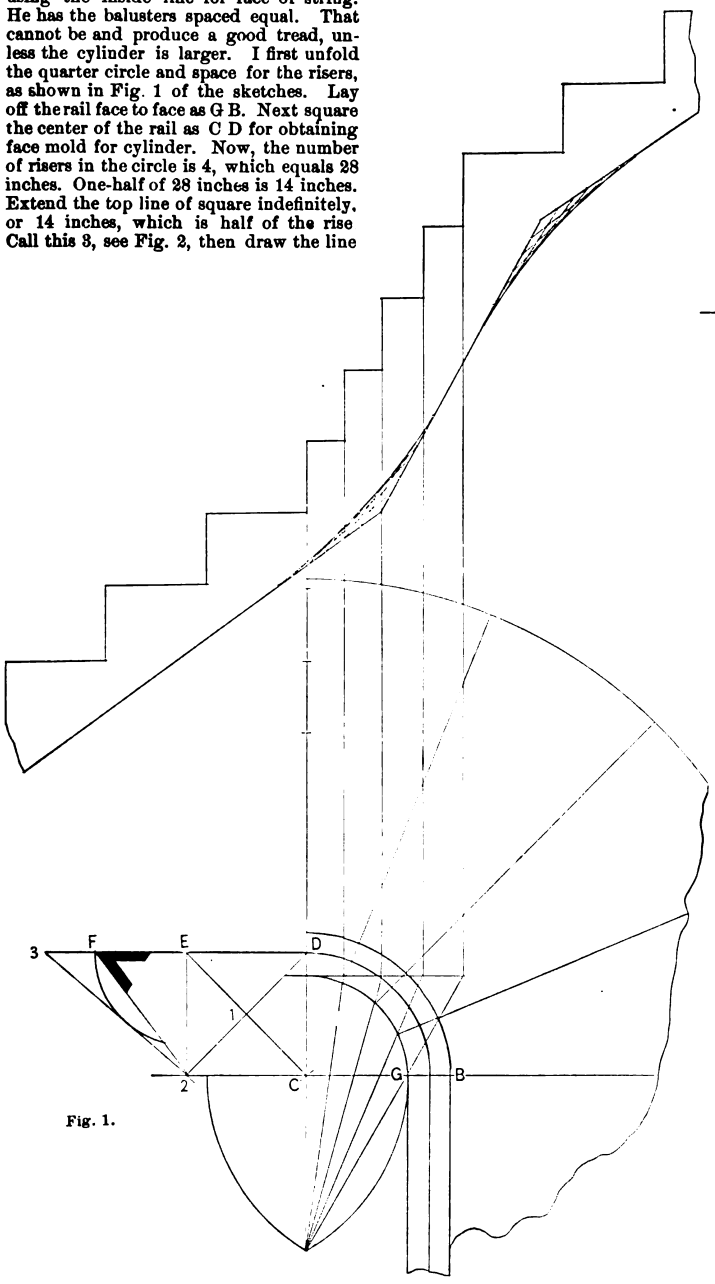


Fig. 1.

Answer to Handrailing Problem. Diagrams Accompanying Letter of "G. S."

Laying Gravel Roofs.

From L. H. D., *San Diego, Cal.*—I would like to inquire if there is a work of instruction published regarding the laying of gravel roofs. If there is nothing of the kind published I would like to be informed how a gravel roof is put on and its composition.

Answer.—1. We do not know of any books relating to gravel roofs. It would be difficult to give precise directions for applying a gravel or composition roof, as so much depends upon the kind of surface to be covered, quality of material used, and other circumstances peculiar to each case. A "gravel" roof can be constructed upon a foundation of paper with no particular strength, or upon one where the fabric is as strong as heavy canvas. Roofing felt can be procured weighing from 1 to 2½ pounds or over to the square yard, and it is also made two or three ply, with a waterproof composition between. Other varieties of what, for a better term, we call covering, have a coarse canvas as a foundation, which is combined with felt, paper, waterproof composition, &c.

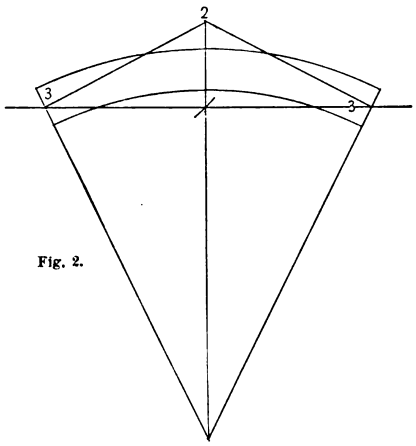


Fig. 2.

After the fabric or covering, whatever quality is chosen, has been laid on a roof, it is covered with some form of waterproof composition. To make the roof as fire proof as possible, and as a protection from the weather, sand or gravel is applied before the coating becomes dry or cool, the exact method of application depending in some measure on the nature of the material. The presence of the sand or gravel gives the distinctive name to this class of roofs, but as we have pointed out, their quality ranges from the very cheapest to something of real merit. The latter, however, costs something. It is the cheaper article that is most employed, and hence the reproach of the name gravel roof—or tar roof, as it is sometimes called.

Of the various water-proof compositions used for covering the felt or fabric, most of them have as a foundation asphalt or coal tar. There are also combinations of these in use. A heavy pitch is made by boiling down coal tar until it is sufficiently thick for use. Another kind of pitch not so frequently used now as formerly is made by combining rosin with coal tar until it becomes of the desired consistency. There is almost endless variety to the materials used in grade or quality. Most dealers in roofing materials can supply a roof coating that comes ready to be applied

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with a brush, and on this account is convenient to use. Such articles have largely superseded the home or domestic made article. The pitch usually used for gravel roofs is applied hot, and on this account is rather inconvenient to use, although roofers that make a specialty of the business manage the part very well. They have a large iron tank on wheels in which the kettle is placed. It is also provided with the necessary door and smoke pipe, and in various particulars is much more convenient than the ordinary iron kettle temporarily set up and so generally used for the purpose a short time since.

Now let us consider the laying of a roof. Supposing the roof is to be covered with some kind of material, of a thickness that only one layer is required, the usual way would be to commence at the bottom and lay toward the top. If the roof is a large one, or an old roof that is being recovered, and there is any danger of rain before the roof is finished, it may be found convenient to commence laying the material at the top of the roof. The work admits of being done in different ways. After the first sheet has been laid and secured at the top, it is but little trouble to slip the second under the first, and by proceeding in this manner, in case of a rain, while the upper part of the roofing may get wet, the water is not liable to run under the roofing. When laying the heavy material, it is customary to lap the sheets about 2 inches, and before nailing the edges, which is done with nails having large heads or with ordinary nails used with tin caps, roofing cement should be applied between the edges, so as to make a watertight joint. When nailing the edges it is always best to commence in the center of roof and nail toward the edge, so as to avoid getting the material crooked or making a wrinkle. A good finish can be made at the eaves by nailing on a strip of galvanized iron, 2 or 3 inches wide, which can be bent over the edge of the roof. If there is any danger from fire from other buildings, the under part of the roof boards should be covered with tin or iron if they project beyond the wall. The finish of roof at the edges would depend upon circumstances. A strip of wood can be nailed over the felting, or the felting can be bent over the edge and the strip nailed on it over the felting.

When the ordinary felting is to be used and is to be laid three ply, a strip one-third of the width of the roll and the necessary length can be cut off and laid at the eaves, over which is laid the strip two-thirds wide, and over these is laid a whole sheet, the three being even at the eaves. A sheet of felting is next laid on the above, one-third the width of a roll from the edge, and by continuing in this manner the roof will be covered with three thicknesses of felting. If there are fire walls or the roof joins a higher building the felting can be run up a suitable distance and secured by nailing on strips of wood, lath being often used for the purpose. Another method of finishing the roof against a wall is as follows: The felting is run to the angle and a separate strip used, 6 or 8 inches wide, lapping one-half on the roof and the other half on the wall, being carefully secured. The finish about chimneys or skylights can be made in a similar manner, or by the use of tin, as may be desired. Another method of finishing about walls is as follows: The roofing is run to the angle and fastened with a three-sided cleat, all of the joints being filled with roofing cement and well coated.

When the best quality of roof covering is used, gutters are lined by placing a separate strip in the bend or angle. The edges are well cemented between the laps, nailed closely and well coated with the roof covering. If the roof coating is to be applied hot, it is usual to spread it over the surface of the roof with a mop made for the purpose, and then clean gravel spread on before the coating becomes cool. When prepared coating is used, it is applied with a brush, and building sand sprinkled over before the coating becomes dry. As there is such a variety of material used in the construction of gravel of composition roofs, it would be difficult to give directions that would apply to all, and as has been previously stated, much information can best be derived from the circulars furnished by the manufacturers or dealers in roofing materials, describing the special kinds they supply.

"Rules of Thumb" and the Steel Square.

From O. P. HOOD, *Kansas State Agricultural College, Manhattan, Kan.*—I have frequently noticed that young carpenters write to the editor of *Carpentry and Building* for "thumb rules" which will enable them to solve, by means of the steel square, common problems in rafter cutting. Although the subject is often discussed, this is necessary for the reason that, like our schools, each year brings a new class which desires to go over much the same ground covered by earlier classes. Though we have as high as 180 students in the shop every day, *Carpentry and Building* probably has a great many more young students of carpentry added to its list every few months, so that going over this subject may not be old to all the readers of the paper.

These "thumb rules" are expressed in many different ways, each new way representing an endeavor to simplify and put in such form that they may be easily remembered. A young man furnished with a lot of thumb rules for doing things, and unable to prove any of them, is but half equipped, and the effort to keep the various rules separate and unconfused with each other, often costs as much as it would to prove the rule anew, if a little original study was put on the problem. These short rules that tell how, and not why, are necessary to many, however, and I venture the following, which are given with others, to our students in their practice in carpentry at our college. The pitch of a roof is usually expressed by a fraction as $\frac{1}{4}$ pitch, $\frac{1}{3}$ pitch. Multiply the fraction representing the pitch by 2, then multiply the denominator (lower part of the fraction) by some number that will make it 12. Multiply the numerator by the same number.

Thus, $\frac{1}{4}$ pitch: $\frac{1}{4} \times 2 = \frac{2}{4}$ $\frac{2}{4} \times \frac{4}{4} = \frac{8}{12}$

For common rafters, take the upper part of this fraction on the tongue of the square. Take the lower part of the fraction on the blade. Tongue gives the upper cut or down cut. Blade gives the lower cut or foot.

This is easily remembered because the upper part of the fraction gives the upper cut and the lower part of the fraction the lower cut. To find the length of the common rafter apply the square as many times as there are feet in the half span.

In the same fraction used for the common rafter change 12 to 17 and use as for the common rafter to find cuts and length of hip rafter. For the side cut on the hip where it fits against a ridge, take run of hip on the tongue, length of hip on the blade, blade gives the cut.

For side cut on jack rafters which fit against a hip, take length of common rafter on the blade, run of common rafter on the tongue, blade gives the cut. To find how much each jack is shorter than its neighbor take the length of the common rafter on the blade, the run of the common rafter on the tongue, lay the square on the edge of a board and scribe along the blade. Slide the square along this line until the tongue reads the space between jacks, the blade reading is then the required shortening.

These rules are true only for square plans and equal pitches on each side of the hip. To get these same cuts for hips and jacks, when the plans is not square and the pitch of the roof different on each side, a more complicated rule is required, which is hardly convenient enough for thumb rule. Students at this college take these as original problems and with the aid of the geometry they have learned easily work them out. In order to fix the results in mind they are required to reduce their geometrical results to such form that they may be used in connection with the steel square.

Hours of Labor.

From A. T. M., *New Brunswick, N. J.*—I write to correct an omission in the September issue of *Carpentry and Building*, which occurred in connection with the article taken from the *Carpenter* as to hours of labor. In the list of cities given, the name of New Brunswick, N. J., as a nine hour town is left out. We have had a lot of ups and downs in New Brunswick—principally downs; but we are made of the kind of stuff that does not stay down for a cent. The nine hour day is well established and acknowledged all around by employers and employees. While we cannot say building is booming, we are doing tolerably well as to work and are looking for the good times that are to come. We have a new railroad to South Amboy, which gives us a near cut to the sea shore and not a bad one to the city. The Standard Oil Company are about to start a branch of their works here; the United States Express Company have opened an office in our town, and we are promised better street railroad facilities, so that we are not asleep by any means.

Preventing Tools from Rusting.

From P. H. D., *Ipswich, Mass.*—I notice in recent issues of *Carpentry and Building* a number of letters from correspondents relative to means for preventing tools from rusting. There has recently come under my observation a recipe for tinning tools of iron or steel, giving them an appearance almost equal to nickel plate, while effectually preventing them from rusting. This may possibly be of interest to those correspondents who have inquired for a means of preventing tools of various kinds from becoming rusty, and I give it for the benefit of the trade at large. The tool to be treated should be made quite smooth, and the rust, if any, removed by the use of emery paper, although this is not necessary, except for the sake of appearance. A dipping solution, consisting of tinners' soldering fluid, to which sal ammoniac has been added, is first required. Another essential article is an iron pot or ladle, in which the tin is to be melted. This pot should be of sufficient size to hold enough melting tin to cover the article. The solution may be made by taking about 5 cents' worth of muriatic

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acid and adding to it as much sheet zinc as it will dissolve, then adding an equal bulk of water. In this solution should be dissolved a piece of sal ammoniac about as large as a hazel nut. When all this has been done the tin is melted, and the object to be treated placed in it until hot. When the tool, or whatever the article may be, has become so heated that no unmelted tin clings to it, plunge it into the solution for an instant and then into the melted tin. In removing the article from the solution to the tin, proper care should be exercised that the hot tin does not spatter on account of the wet article being suddenly immersed into the molten metal. As soon as the tool has attained a temperature equal to that of the tin it may be removed and the surplus metal wiped off with a stiff brush, or any other convenient material, when it will be found to be completely coated with tin and presenting an appearance almost equal to that of nickel plate. Although this method of preventing tools from rusting is a little more elaborate than those already published, it is certainly an effective means for accomplishing the purpose.

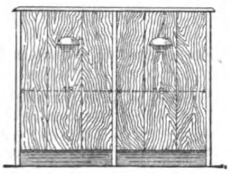
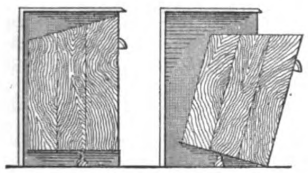


Fig. 1.—Front View of Flour Bin as made by "G. W. H."

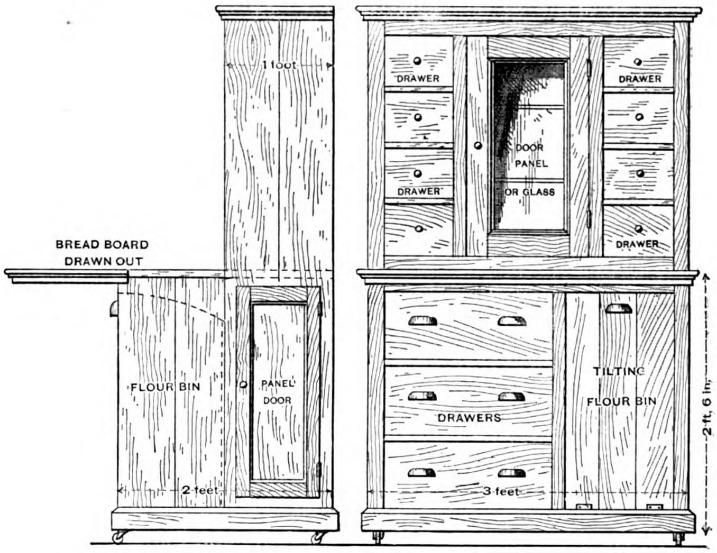


Figs. 2 and 3.—Side Views, Showing Bin in Position and also Tilted Forward for Use.

Designs for Flour Boxes.

From G. W. H., *Jefferson, N. Y.*—In the April issue there appeared an inquiry from a correspondent asking about flour bins, and, as being of possible interest to him, and perhaps to others, I inclose a sketch of bins for flour, sugar, meal, &c. The sketch so clearly indicates the method of construction that comparatively little description is necessary. The lower portion of the frame is open as far back as the piece upon which the bin rests. Fig. 1 of the sketches shows a front view of the device with the drawer pulls in position; Fig. 3 shows a side view, clearly indicating the position of the bin when in place, while Fig. 3 shows the bin tilted forward, as it would appear when in use. The rest which supports the bin is placed a trifle in front of the middle of the bin, so that there will be no danger of the bin tipping out except when it is wanted. In the bottom of the bin is a groove of sufficient depth to keep the bin from sliding off when it is open.

From H. C. B., *Portage, Wis.*—In glancing over recent issues of *Carpentry and Building*, I notice in the April issue that "R. G. M.," of Atchison, Kan., desires a sketch of a sort of kitchen cabinet, or flour box. Inclosed I send a sketch of one that may suit him, as it represents the front and end elevations of a cabinet which I built for a house. It is set on metal castors, so that it is easily moved from one place to another when desired. Fig. 5 shows a front elevation of the cabinet with the various parts plainly indicated. Fig. 4 is an end elevation with the bread board in position for kneading. This board is $\frac{7}{8}$ inch thick, with a $1\frac{1}{2}$ inch molding around, which drops below the bottom of the board, thus hiding the joint. The dotted lines in Fig. 4 indicate the space which the board occupies when it is pushed back into its place.



Figs. 4 and 5.—Front and End Elevations of Flour Cabinet, Submitted by "H. C. B."

Designs for Flour Boxes, Submitted from Different Correspondents.

Bevels for a Grain Spout.

From W. F., *Spring Creek, Texas.*—In the February issue of *Carpentry and Building* for the current year, "G. B. W.," of Taunton, Mass., goes into a somewhat lengthy geometrical calculation on the grain spout problem introduced by "I. H. D.," New Point, Ind., in the August issue of the journal for the year 1888. By the way, "J. H. D.'s" grain spout ought to be about as nearly worn out as his problem, if there has been as much grain run through it. However, if he should ever have occasion to erect another, and it is to rest at an angle of 60°, he can proceed as follows: Cut a V-shaped notch in a board and tack it to a trestle or saw horse. Lay the spout on the trestle with one corner in the notch referred to, then take the steel square, apply it to a straight edge with the 12-inch mark on the blade and the 6-inch mark on the tongue. Mark by the tongue. Set a long bevel square to this mark, so that the blade of the bevel will stand out from the handle like the blade of a pocket knife when three-quarters open. Apply this bevel to the spout as it now lies, resembling the comb of a roof of one-half pitch, having the handle of the bevel on the right hand side of the upper corner when facing the end to be cut, with the spout on the right, the blade pointing obliquely downward and toward that end of the spout. Mark by the blade, stoop down, move the handle of the bevel to the upper side of the corner, as viewed when facing the end and carry this bevel obliquely downward toward the end already cut. This end is then cut off and the spout is ready to set up. In measuring the length it should be taken from the extreme point and directly on the corner of the spout, for it is run from point to point. An ascent of 8 feet, with 60° pitch would be 7 feet and its length 10 feet, $7\frac{56}{100}$ inches. This is the length if I have made no error in extracting the square root of the sum of the squares of the base and the perpendicular. The bevel of each end can be obtained with the steel square alone, but not quite so quickly. It can all be done much quicker than it has taken to explain it and much quicker than it took "G. B. W." to bisect this and that line, connect that and the other line, and getting a fellow all tangled up by the lines and letters, so that he does not know a grain spout from a shot gun. When a man runs upon a job of this kind he wants a practical method for making the cuts immediately and not be compelled to monkey away his time in a geometrical calculation. Please give us something practical. I am the "W. F.," of Beaumont, Texas, "G. B. W." is after.

Oil Stones.

From G. W. S., *Detroit, Mich.*—I desire to ask the practical readers of *Carpentry and Building* a few questions relative to oil stones. 1, What is the best

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kind of oil stone? 2, Can genuine Turkey oil stones be obtained and how? 3, By what criterion can they be distinguished? 4, Is the Arkansas, as some claim, superior to the Turkey? 5, Does kerosene injure an oil stone? 6, Why do some oil stones prove to be very good when new and in a year or two seem to become hard and almost useless.

O G Rafters.

From M. W., *Scranton, Pa.*—In an issue of *Carpentry and Building* some time since I noticed an inquiry of "R. G.," Buffalo, N. Y., asking for a simple and accurate drawing showing the method of obtaining the angle rafter in an O G square ventilator so as to line with the common rafter. At this late day I offer him the accompanying diagram, which is simple and accurate, and the principle involved in it is of universal utility, inasmuch as it will do for finding the angle rafter of any kind of curved roof. Referring to the sketch, the line A B is the plan of the common rafter, the line A D the plan of the angle rafter. The method of construction is to divide the common rafter into any convenient number of parts, not necessarily equal, and from the points of division drop perpendicular lines to cut the plan of the angle rafter A D. Then fix the compass in the point A, and, taking the points of intersections of the perpendicular lines, with the plan of the angle rafter as radii, describe the arc of the line A B. Then raise perpendicular lines as shown, and from the points in the common rafter draw horizontal lines to intersect these last mentioned perpendicular lines. A curve traced through the intersections of the horizontal and perpendicular lines will be the correct form of the angle rafter.

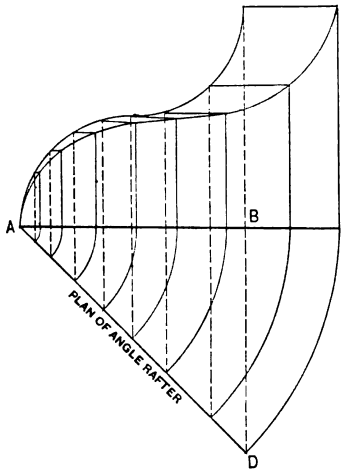


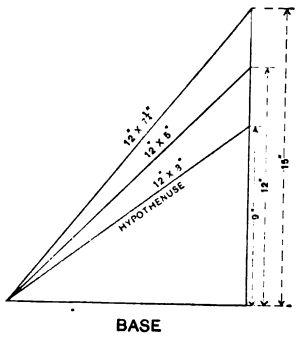
Diagram Submitted by "M. W."

Shingled Frieze.

From B. E. L., *Putnam, Conn.*—Will some reader of the paper kindly give full directions for a shingled frieze on a cottage? I have seen them shingled in a variety of ways, but I would like to know the correct way.

Estimating Roof Surfaces

From A. P. V., *Hackensack, N. J.*—In various issues of *Carpentry and Building* have been a number of very elaborate articles on the measurement of roofs. I thought I would give the readers the benefit of my rule, which may help many in estimating roofs that are complicated in plan, as it will apply to a roof of any pitch. By simply adding the difference between the base and hypothenuse to the area of base the area of roof will be obtained, as will be shown in a number of diagrams. In Fig. 1 is shown three different pitches, 9, 12 and 15 inches to the foot. The differences are 3, 5 and 7¼ inches respectively. In the first triangle the base is 12, the altitude 9 and the hypothenuse 12 x 3, or 15 inches. In the second triangle the hypothenuse is 12 x 5 and in the third 12 x 7¼ inches.



Estimating Roof Surfaces.—Fig. 1.—Diagram Showing Three Different Pitches to the Foot.

If a roof has a pitch of 9 inches to the foot, and we obtain the area of the plan, we must add to this amount $\frac{3}{12}$, as that is the difference between the base and hypothenuse, as shown in the diagram. In Fig. 2 is shown a roof having a pitch of 9 inches to the foot, A B C D being the elevation, and E F G H the plan. To obtain the area of the roof by means of the rule we first obtain the area of the plan of roof, and then add $\frac{3}{12}$ of the amount to itself. As the roof is 12 x 20 feet in plan we would have 12 x 20 = 240, and $\frac{3}{12}$ of 240 = 60. 240 x 60 = 300 square feet, the area of the roof. The usual method would be to multiply the slant hight by the length, which would be 15 x 20 = 300. In Fig. 3 the area of roof in plan is shown by E F G H and the $\frac{3}{12}$ added by G A B H.

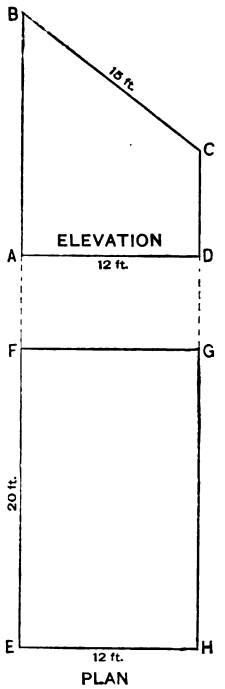


Fig. 2.—Obtaining Area of Roof by Means of Rule Given by A. P. V.

In Fig. 4 let A B C D E represent the elevation of a building having a gable roof, which is shown in plan by J F G H. The roof has a pitch of 12 inches in 1 foot. The diagram in Fig. 1 shows that a roof having this pitch gains 5 in 12, or $\frac{5}{12}$. To the area of plan we must add $\frac{5}{12}$ of amount to obtain the area of the roof, which operation is as follows: 20 x 12 = 240; $\frac{5}{12}$ of 240 = 100; 240 + 100 = 340 square feet, the area of roof. One may see by the elevation that the slant hight of one side of the roof is 8 feet 6 inches, and 8 feet 6 inches + 8 feet 6 inches = 17 feet, and 17 x 20 = 340—the same amount as obtained by the previous operation. In Fig. 6 is shown the area of roof in Fig. 4, which is the same in area as it would be if it was a shed roof, as shown by D C K.

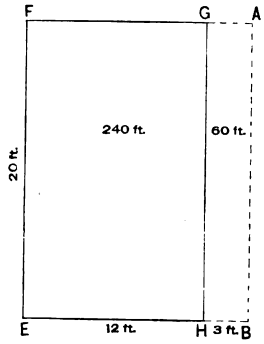


Fig. 3.—Area of Roof in Previous Figure.

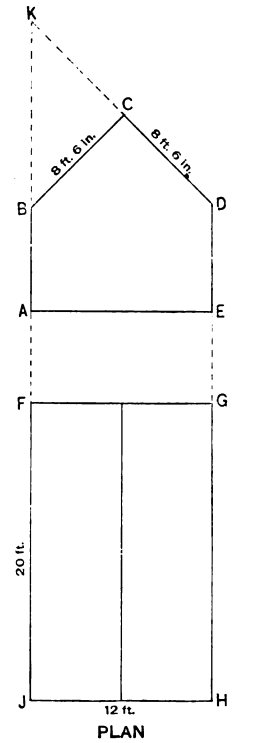


Fig. 4.—Elevation and Plan of Roof Having Pitch of 12 Inches to the Foot.

In Fig. 7 is shown in elevation and plan a roof, the area of which I will proceed to obtain. The pitch is 12 inches in

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1 foot. The area would be calculated by the use of the rule as follows :

Area of D A B C in plan, 12 × 20 = 240
Area of H E F G in plan, 4 × 12 = 48
Area of L J K M in plan, 4 × 12 = 48

336
Add $\frac{5}{12}$ of 336 140

476

Then the area of the roof is 476 square feet. In Fig. 5 is shown the area of one-

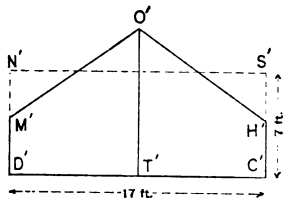


Fig. 5.—Area of One-fourth of Roof Shown in Fig. 6.

fourth of the roof, or of D M O H C of plan; D′ T′ C′ being equal to U V W of elevation. D′ N′ S′ C′ is the area, as 17 × 7 = 119 × 4 = 476 square feet, which is the same as obtained by previous process.

Fig. 8 is a *fac-simile* of a roof I put on last summer, which had a pitch of 15 inches to the foot. The area of the roof was obtained from the plan as follows:

Area of A B C D of plan, 31 x 36 = 1116
Area of E F G H of plan, 17 x 32 = 544
Area of J H K L of plan, 9 x 16 = 144

1804
Add $7\frac{1}{2}/_{12}$ of 1804 = 1090

2894

By the above calculation there were 2894 square feet in the roof, and there were 29 squares of metallic shingles actually used.

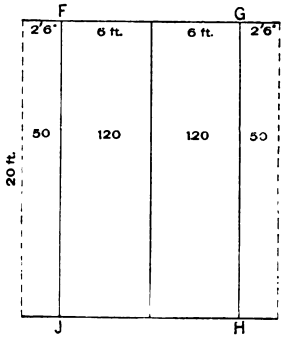


Fig. 6.—Area of Roof in Fig. 4.

If rafters are placed 2 feet from center to center, divide the number of square feet in the roof by 2, which will give the number of lineal feet of rafters required. If the rafters are 16 inches from center to center, add $\frac{1}{3}$ to the previous amount. Rafters 2 feet from center, 2894 ÷ 2 = 1447 lineal feet required. Rafters 16 inches from center, $\frac{1}{3}$ of 1447 = 482; 1447 + 482 = 1929. One bundle of 18 inch shingle will cover 32 square feet, and will require 72 lath.

Discussion of Handrailing Problems.

From J. B., *Omaha, Neb.*—In the November issue of *Carpentry and Building* for 1889, I notice J. H. Monckton's letter in reply to a communication of mine, which appeared in the February issue of the paper for that year. Mr. Monckton has, with red hot shot and shell from his old flint-lock blunderbuss, replied to "J. B.," one of his old pupils. Without going into details of the allegations, permit me to say that had I not known "J. H. M." I should have concluded he was in his dotage. With reference to the circle, I say all tangents must have circles. If "J. H. M." had lost his poodle dog and set about to find it, hunting all around his barn or stable and finally discovered the tip of the dog's tail behind some boards or hay, he would conclude the dog was not far off. So it is with the circle, if tangents are mentioned. Another, and at the same time amusing, feature of "J. H. M.'s" criticism is respecting the sliding of the mold up and down to obtain the correct spring, &c. I am under the impression

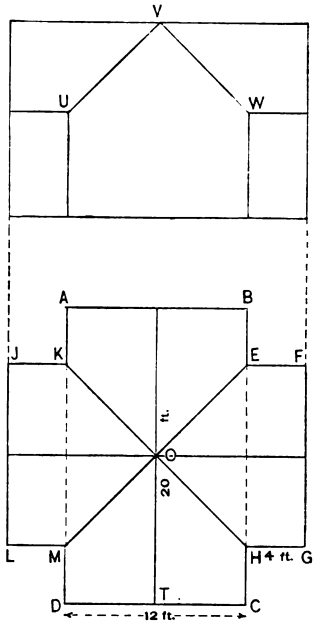


Fig. 7.—Elevation and Plan of Roof Having Two Slopes and Two Gables.—Pitches 12 Inches to the Foot.

that his ideas are getting blunt—that his faculties are about to leave him. Then the great champion shows another weak point or points, when he recommends covering the face of the mold all over with lines parallel to the major axis. When the face mold is applied to the wood intended for the rail, the joints at each end are made and the bevels applied. Next, the square section of the rail is applied, also marked at the ends. We say nothing about tangent lines as we are supposed to be entirely ignorant of their nature and use. The inside of the rail is made in cylindrical form, and when in position will, in all respects, coincide with its plan. The next step is to obtain the spring line. "J. H. M." says it is impossible. "J. B." asserts it is as simple as A B C It is sometimes necessary to fasten the mold, in order to obtain the spring, &c. The stairs are badly planned, and to avoid the disgraceful common pitch I prefer a longer ramp, also a slight curve in the wreath. This is the reason for the thick piece of paper for the inside mold.

Permit me to make a few remarks about the drawing of "J. H. M.," in *Carpentry and Building* for October, 1889. He seems to have got over the difficulty on the small circle on the floor, but has created a worse blunder by leaving the rail above riser 22.

By all means this is to be close to the riser line. Here "J. H. M." gives a very steep pitch of rail. "J. B." would keep the rail above the point T to prevent any one falling over the rail. The great danger is in coming down. We wish the rail to be lifted, as shown in the drawing of "J. H. M.;" by all means unfold the circle and lift it up as fancy directs. We gave the correct length of each and all the balusters without the great amount of cob-webby drawing—a compound of complications. "J. B." says, enlighten our darkness; "J. H. M.," on the other hand, says, darken our enlightenment. "J. B." will excuse "J. H. M.," because he knoweth not what he doth. Again, "J. B." implores "J. H. M." to study some of the standard works referred to and learn the exact extent of that branch of knowledge of to-day. Which of the three words is applicable to this assertion—verbosity, verdancy or surplusage? "J. H. M.," in his work published about 1872, and Riddle's first book, published about 1855 to 1857, made use of the ordinate for finding the face mold. "J. H. M." makes use of the ordinate to-day in *Carpentry and Building* for October, 1889. Riddle did not dispense with the ordinate in 1875, but in 1876 he did not make use of it. How strange these great writers did not conceive the idea of doing away with ordinates long before. We all know that Peter Nicholson is the father, or was the first to discover, about the year 1798, the ordinate for finding the face mold. Next comes Mr. Western. He gave the boys lessons in handrailings at nights—also Sunday mornings. His home was in Red Cross street, London. The method "J. B." gave in *Carpentry and Building* for September, 1889, is similar to Mr. Western's method published about 1855. If "J. H. M." would cast aside his round-

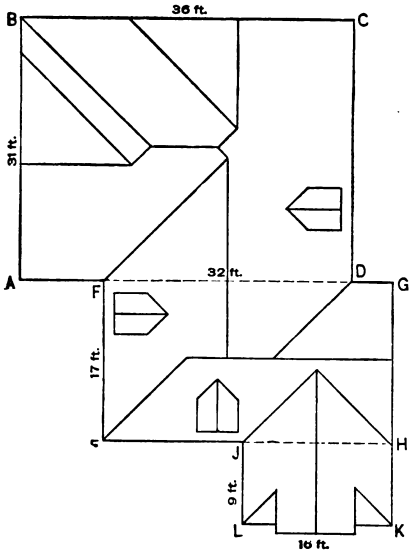


Fig. 8.—Plan of Roof from which Estimate was Made.

about system and adhere to Mr. Western's old method he would be able to cope with "J. B" and not before. I am willing to give "J. H. M." the medal for the theory, but in practice I must retain the medal.

In reviewing my drawing published in September, 1889, on unfolding the tangent, I have misplaced the tangent on the stretchout on winders on the floor at 5. The rail will be too low. All the rest is correct. If "J H. M." will look up some of the back numbers of *Carpentry and Building*, more especially the issue for April, 1884, he will there find his system improved by "J. B.," namely, the obtuse plan with two unequal pitches. Also turn to *Carpentry and Building* for November, 1884, and observe the article, "Railing or Obtuse Angle on Plan." The author is not mentioned.

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The Walking Delegate and the Building Trades.

THE READERS of *Carpentry and Building* are doubtless more or less familiar with the strained conditions now existing in the building trades in the metropolis growing out of the action of the brickmakers in refusing to ship supplies of their product to New York so long as the walking delegates of the bricklayers continue to boycott it. This action on the part of the walking delegates is claimed to be based upon the refusal of the brickmakers to discharge from their employ certain non-union workingmen. The effect of this has been a scarcity of building material and an increase in the price of brick. If the boycott is protracted only one result can come out of it. Building operations will cease, and other places where the conditions are more favorable will be built up and prosper at the expense of those where unfavorable influences prevail.

In speaking of the effects of the action of the walking delegates a recent issue of the Philadelphia *Ledger* contains the following:

The difficulty, which has grown day by day until it has assumed great proportions, between the walking delegates of the brickmakers of the one part and the brick manufacturers of the other part of New York, seems to present the spectacle of an innocent third party suffering from the quarrels of others. The trouble arose originally from the employment by manufacturers of non-union workmen. The walking delegates of the bricklayers served notice upon the brickmakers that they must discharge their non-union employees. This notice was disregarded, the consequence of which was the walking delegates ordered the bricklayers of their organization to refuse to lay any brick made by the recalcitrant manufacturers. Thereupon all, or nearly all, the leading manufacturers entered into an agreement not to ship any bricks to the City of New York so long as the walking delegates' boycott of the bricks of any of their number was continued. Despite this retaliatory resolution, bricks were still sent to New York, though in limited quantities; to make their resolution effective the manufacturers have agreed not to manufacture any more bricks after September 27 until the difficulty with the walking delegates shall be settled.

Of course this double boycott is occasioning very serious losses to both the parties directly involved in the contention, but it is also inflicting serious losses upon those builders who have brick buildings in course of erection, and which, according to contract, have to be completed on fixed dates. More surely than that bricks cannot be made without straw buildings cannot be erected without bricks, of which the builders cannot get sufficient quantities. They cannot, consequently, fulfill their contracts, and they must pay the prescribed penalties for their failure to do so.

But the builders are not the only innocent sufferers in this case. The owners of the buildings in course of construction want them finished, either that they may receive the rent of them or themselves enjoy the use of them. The losses cut severely in every direction, and are apparently shared by nearly everybody except the walking delegates who ordered the boycott which has virtually brought building operations to a standstill in New York. The manufacturers are losing their profits, the bricklayers and the brickmakers are losing their wages, the contractors are losing the penalties exacted for failure of contract, the owners are losing the enjoyment of their property which remains unfinished, the city is losing generally expected improvements in values, and the merchants and shopkeepers are losing because large numbers of heads of families are out of employment. The walking delegates, however, it is stated, are doing exceedingly well. They are receiving their salaries as usual, and do not appear to be greatly concerned regarding the continuance of the trouble. As they began it, they should not be too confidently expected to end it. The bricklayers, the real workmen, and the manufacturers should get together, and at least try to settle the trouble without the interference of the walking delegates. They have losses to consider, while the walking delegates have none, and the chances are that any half-dozen of them on either side of intelligence and fairness could settle the trouble satisfactorily and speedily. As it is, the difficulty is one which peculiarly demonstrates the inutility of force as an argument between men.

The following account was given to a *Tribune* reporter by a captain of a brick barge, and is interesting in that it shows how much power the unions possess for the enforcement of a petty tyranny which delays business and is sure in the end to react upon the union. The captain said:

When a brick barge arrives in the market the brick handlers or 'longshoremen come to you and request a job of unloading your boat. If the captain wants one or two men he must hire the first man that asks for a job, whether he can do the job or not. If this man works awhile and goes off and gets drunk, you cannot get another man to take his place unless you pay him what the first man has earned. If you are in the market with your boat and want to hire a man by the month you have not that privilege. If you should hire one by the month the brick handlers will not work with him. If your boat is stationed in a bad berth they will not work. Their pay is 40 cents a thousand, and if they cannot make at that rate $5 a day they will not work. If you have a man on your boat they do not fancy they won't work. If you have any trouble with the cartmen they will not work. If they want to carry a beer pail all day, and you say anything to them, they will not work. If you discharge one of them you cannot get another to take his place. If you have a small crew on your boat and don't hire just so many men you can't get any to work for you. If you want to shift your boat while working, the brick handlers will start for some gin mill and the crew has to shift the boat alone. If you say anything to them when they return they are liable to get mad and quit work, and you cannot get other men in their places. If the captain and crew put off eight or ten thousand brick before the brick handlers come in the morning you must pay them for what you have done. If you have a few thousand brick on your boat, it might take three or five hours to get off, you must pay $4, a day's wages; if you don't they won't work. If there is a contractor carting brick off your boat, and the captain doesn't have one or two 'longshoremen hired, the walking delegates will come and tell the contractor to take the carts off and not cart the brick.

LAW IN THE BUILDING TRADES.

THE FOLLOWING summary of recent decisions of the courts relating to matters in the building trade will be found of interest to our readers:

PAYMENT UNDER BUILDING CONTRACT.

A contractor built a house under a contract, and brought suit for a balance claimed to be due him. The owner of the house testified that he had paid the amount due. The burden of proof is on the contractor to show that there was something owing him on the contract, failing which he cannot recover.—Hall *vs.* Abells, Supreme Court of New York, 10 N.Y. Sup., 581.

CONFLICT OF EXPERT EVIDENCE AS TO BUILDING.

Where experts are employed to estimate and testify as to the cost of a building, or the value of work therein, they are presumed to act with a natural leaning toward the interests of their craft, and when the estimates differ widely a court is justified in accepting as the measure the lowest estimate made in good faith by a fair expert. —Hart *vs.* Dreyfous, Supreme Court of Louisiana, 7 South. Rep., 781.

EXTRA WORK UNDER BUILDING CONTRACT.

A contractor entered into a contract with a church corporation to erect a church edifice. The contract provided that no extra work should be paid for except upon a certificate of the superintendent and building committee. A subcontractor did some extra work under the oral direction of a portion of the building committee, for which he seeks to recover. The subcontractor was chargeable with notice of the provision of the contract and cannot recover in absence of the certificate it called for.—Shaw *vs.* First Baptist Church of Winona, Supreme Court of Minnesota, 46 N. W. Rep., 146.

RIGHT OF LABORERS UNDER MECHANIC'S LIEN.

A contractor was, by the terms of his contract, to receive only 80 per cent. of the contract price until three months after the completion of the work. He abandoned the contract before its completion, having received the 80 per cent. due him. An employee had no lien on the remaining 20 per cent., because no part of it ever became due to the contractor, though the work was completed by his sureties — Weisman *vs.* City of Buffalo, Supreme Court of New York, 10 N. Y. Sup., 569.

PARTICULARS IN ACCOUNT FOR LIEN.

In Rhode Island a petition for lien must set forth particularly and specifically the items of the claim for which the lien is demanded and the particulars of the lien sought, and a demand for lien upon the whole of premises in which it is admitted the purchaser of the materials for which a lien is sought has only an individual half interest renders the petition defective, although it may be amended. The provision of the statute requiring the town clerk to enter upon a petition the exact hour at which it was filed is mandatory to the clerk, and his failure to comply therewith does not invalidate the lien.—Spencer *vs.* Doherty, Supreme Court of Rhode Island, 20 At. Rep., 232.

DESCRIPTION OF LAND IN MECHANIC'S LIEN.

The Texas statute, which requires that a contract filed to secure a mechanic's lien shall be accompanied by a description of the lands, lots, houses and improvements made, against which the lien is claimed, is satisfied with the following description: "The brick city hall building to be erected in the city of Hillsboro."—Scholes *vs.* Hughes, Supreme Court of Texas, 14 S. W. Rep., 148.

MECHANIC'S LIEN DOES NOT ATTACH TO SCHOOL HOUSE.

Mechanic's lien laws do not, in the absence of express provisions, apply to public buildings erected by States, counties and towns for public uses, and school houses erected for the use of public schools come within the above exemption. Such buildings are exempt from attachment and from sale upon execution, and for the same reason are exempt from liens which might result in an adverse sale.—Hovey *vs.* Town of East Providence, Supreme Court of Rhode Island, 20 At Rep., 205.

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The Builders' Exchange

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The next convention will be held in New York City, on the second Tuesday of February, 1891.

Practical Illustration of the Value of Builders' Exchanges.

The position from which the builders and contractors of Wheeling, W. Va., have at last succeeded in freeing themselves, is an example of the injurious conditions that can be and are repeatedly begotten of unmolested and improperly managed trades unions.

The unions in Wheeling of various trades allied to building have been very strong and thoroughly imbued with the knowledge that combined action produces almost inimitable strength, and have all worked together, using any and every means in their power to force employers to yield to their demands.

The position of the parties affected by the strike and the conditions existing during its maintenance have been given, as they have transpired, in *The Builders' Exchange*, but the power that has been discovered in the Wheeling Builders' Exchange, and the unity of purpose and persistent conservativeness which has actuated its every move, has so fully demonstrated the value and benefits of a Builders' Exchange that a *resumé* of its workings in the present instance will be valuable to members of like associations.

THE WHEELING EXCHANGE.

Not long after the Wheeling Exchange was organized, and its importance made manifest in the fact that the best interests of contracting builders in all branches of the business were identifying themselves with it, the amalgamated trades unions, as was evinced in their action, determined to force it out of existence. Recognizing the fact that a combining of the employing builders would mean death to the particularly high handed manner in which the unions had been carrying things, they began by making most unreasonable demands for shorter hours and more pay and using the boycott, to accomplish their purpose, on all who had any dealings with the persons who refused their demands. They even went so far as to boycott and call out the employees of a mill owner who had permitted a blacklisted contractor to take away from his mill yard some lumber that had been bought and paid for by the contractor. The full details of the strike are not necessary to give a correct knowledge of the course pursued by the unions.

ACTION OF THE UNIONS.

The first move made by the unions was the stone masons' demand for an increase of pay of 25 cents per day and a full day's pay for eight hours work on Saturday. This demand was made upon the contractors without the slightest warning, on January 28, and the time set for the change was February 1, or four days later. Of course it was impossible to grant the increased pay on so short notice, but a meeting of the Builders' Exchange was hastily called and the subject carefully considered. Contracts having been made with labor at a certain price, it would have been impossible to complete them at the increased expense of extra pay without loss, and the contractors concluded to make an offer to the masons granting their request on April 1, thus giving contractors an opportunity to finish the contracts on hand.

Before the committee appointed for the purpose could report to the union the masons had struck.

A second committee was appointed to treat with the strikers and try to secure their consent to return to work, and wait until April 1, at which time their demand would be conceded. The members of the committee from the union were more or less under the influence of liquor, and all totally unfit for conference, and told the gentlemen from the Builders' Exchange that they (the union committee)

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had simply come to hear what the contractors had to say, and had no power whatever to make a settlement save upon the terms already presented.

Previous to the occurrence of the strike, a carpenter contractor, named Harttong, had taken a contract to build a dwelling, and sub-let the mason work for a stone foundation. The sills were put on props, owing to the slowness of the mason work, and the building was progressing favorably when the masons struck. The carpenters, having no grievance, continued working for about a week, when, without the least notice to Mr. Harttong, they quit at the instance of the carpenters' council. There was no reason given for their action at the time, and if there was one it still remains undiscovered. Mr. Harttong, being a capable man continued the carpenter work alone until the mill owners who were furnishing him the lumber were ordered to stop and to work no more material for him. It happened that the material for this job had all been finished and paid for by Harttong, and was piled in the mill yard. Wilson & Co., the mill owners had no right to prevent Harttong from hauling away his own lumber, but because they did not prevent him from so doing the trades unions called out the mill hands in the middle of the day, and again without a word of warning or explanation.

CONDITIONS OF SETTLEMENT.

A few days later, on February 20, Messrs. Wilson & Co. were waited upon by a committee of carpenters who refused to give their names and who presented the following conditions for settlement, or, in other words, if Wilson & Co. would turn the control of their business over to the journeymen carpenters of Wheeling, their mill hands would be permitted to return to work. The document for the signature of Wilson & Co. read as follows:

"An agreement made and entered into this —— day of ——, by and between Local Union No. 3, of the United Brotherhood of Carpenters and Joiners of America, of the first part, and Messrs. Wilson & Co., of the second part:

"*Witnesseth*, That whereas Messrs. Wilson & Co., of the second part, hereby agree that after they deliver all their lumber or other material that is at present in their mill, ready to be delivered to the Frederick House on the Island, that they will not compel, or otherwise make their men employed by them, to get work out that is not yet started for this or any other job that is at present or may be placed on the blacklist of the Carpenters' Union.

"Be it further said, that Wilson & Co. also agree that they will reinstate all of their men employed by them, or that were in their employ before this trouble arose."

This *somewhat peculiar* document Wilson & Co. declined to sign, for it will be observed that even if they had signed it the carpenters promised nothing in return.

On February 26 Wilson & Co. were served with the following witten on a letter-head of the United Brotherhood of Carpenters and Joiners of America:

"*Wilson & Co.:*

"GENTLEMEN:—At a special meeting of Local Union No. 3, held on the above date, it was decided that all carpenters employed by various firms in the city would cease work on Thursday, February 27, unless the stone masons' lockout and the existing trouble with Wilson & Co. and others be adjusted on or before that date.

"By order of the Union,

"ALEX. BEBOUT, R. S."

Similar notices to this were served on such planing mill owners and carpenter contractors as were members of the Builders' Exchange. It will be seen that the union attributed to the Exchange the ability to settle for all other branches of the business and all inside of twenty-four hours. As it was an actual impossibility for the contractors to get together and arrive at any decision in so short a time, the carpenters struck the next morning after serving the notice, and the other trades followed suit as fast as they could be notified, so that in forty-eight hours from the time the notification was received by the contractors every union man in every branch of the business had quit work. The absence of reason in this action needs no comment.

ACTION OF THE BUILDERS' EXCHANGE.

Through the whole of the strike proceedings the Builders' Exchange has been unable to determine what action on their part had excited such bitter antagonism in the trades unions.

The day after the general strike occurred a meeting of the Exchange was called for the purpose, drawing up a set of resolutions to be submitted to the unions, in an effort to effect some kind of a settlement. The following were the six resolutions submitted to the unions:

Resolved, That nine hours be a day's work and workmen be paid by the hour.

Resolved, That master builders be allowed to work on their work without being members of any labor organization.

Resolved, That dealers be allowed to sell customers without interference from their workmen.

Resolved, That any employer be allowed to discharge a workman for neglect of duty or incompetency.

Resolved, That the question of wages be settled in the month of December for the coming year; there will then be no changes thereafter for that year, and for the year 1890 the wages be left as they are at present.

Resloved, That all differences or grievances between employer and employee shall be settled by a joint committee of the Builders' Exchange and the trades union to which such trade belongs, and said committee to have power to make a settlement, and the same shall be binding on both parties. But in no case are the workmen to be called off work unless the said committee fail to make a settlement after the expiration of at least three days.

After reading the resolutions the Trades Council Committee informed the Exchange Committee that the matter must be referred to the several local unions, and that when ready they would let the other committee know. Nothing was heard from the Trades' Committee from that day until Thursday, April 3, when the latter reported readiness. On the same day the two committees met, with President Roland and Vice-President Schwartz, of the Carpenters' and Joiners' Union of America, present. The resolutions were taken up and adjournment had without agreement, but with the second suggestion from the Exchange Committee that they meet on Saturday, the Union's Committee "to have power to settle, if a settlement could be had," and to present six resolutions of their own embodying their ideas of a proper adjustment of difficulties. The result of Thursday's meeting was reported to the Exchange on Friday, and next day the two committees met. In response to the inquiry the Trades Committee affirmed power to settle, and presented the following resolutions:

Resolved, That nine hours be a day's work, with eight hours on Saturday, and all overtime to be paid for at time and half time and double time on Sunday.

Resolved, That master builders, pertaining to carpenters only, be allowed to work on their own work without being members of any labor organization, providing that any person becoming a member of any carpenter firm in the future shall give satisfactory evidence that he is a *bona fide* partner in said firm.

Resolved, That dealers be allowed to sell indiscriminately, provided union men are not required to perform any labor thereon, or no union man be required to perform any labor for any non-union contractor, or any unfair person, to whom said material is furnished.

Resolved, That any employer be allowed to discharge a workman for neglect of duty or incompetency, in the future as in the past.

Resolved, That on and after May 1, we will demand 20 per cent. advance over present wages, and all future demands be formulated in the month of December, to take effect April 1 thereafter.

Resolved, That all differences and grievances between employer and employee shall be settled by a joint committee, composed of men from that craft to which they belong; in no case shall any workman be called off work until all necessary endeavors have been made to adjust the difficulty.

The contractors could not submit to the conditions which would necessitate their being obliged to solicit the privilege of working on their own contracts, or the endless complications that would have arisen from the third resolution.

This, then, is the condition that has existed in Wheeling during the entire season and until the last meeting of the Carpenters' Union, at which time all boycotts and strikes were declared off.

Every move that was arbitrary and aggressive throughout the trouble was taken by the unions, and the members of the Builders' Exchange have striven continually and in every way possible to settle satisfactorily the complications caused by the action of the workmen

VALUE OF BUILDERS' EXCHANGES.

The value of a Builders' Exchange has been thoroughly demonstrated in this case. The conditions which existed in Wheeling prior to the organization of the Exchange were the result of years of neglect by the contractors of their own interests, and of organization and increasing strength of trades unions. Individual contractors were unable to frustrate the actions of the unions, and yielded one point after another until their constant concessions established a most dangerous precedent, which was no less than giving almost absolute control of the methods of conducting their business into the hands of the unions. Under the influence of that success, and the knowledge that the strength of their numbers placed in their hands the power that made asking only a formality, the unions be-

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came so unreasonably dictatorial that the contractors were compelled to stop their course at any cost.

The Builders' Exchange was formed; the leading contractors in all branches, as well as the "material men" at once joined, and under the influence of continued personal contact began to learn just how much a careful and harmonious organization of employers was wanted. A recent letter from Mr. M. F. Giesey, secretary of the Exchange, says that the building business of Wheeling has undergone a complete revolution since its institution. The present result of the strike is attributed directly and entirely to the fact that a Builders' Exchange was formed; not an association of master carpenters or masters of any other branch of the business, but an exchange where all their interests, so diverse and so mutual, so separate and so combined, are brought under the search light of their common knowledge.

The constant personal contact of members representing all the various branches of the business teaches them all, involuntarily, perhaps, the needs of each other, and the natural ventilation given to the practices that exist in the several branches, through recurrent conversation, tends more strongly than anything else to make apparent the defects and necessitics for reform and improvement. The continual meetings at an exchange bring the members into nearer touch with each other and create a feeling of fellowship, the possibilities of which are exemplified in the firm and united stand taken by the members of the Wheeling Exchange for each other in their hour of need.

The visible result of this "stand" is the fact that work is proceeding to-day in all branches of the building business in Wheeling upon a basis of justice and fairness to all concerned, and that the utmost harmony prevails among the contractors. The invisible results are incalculable, for it is not possible to compute the actual value of the establishment of the dignity of the builder upon the proper plane, the creation of harmony out of discord, or the benefit of the lesson taught the workmen of the futility of unions founded upon principles remote from justice and fair dealing.

Prospective Trade Schools in Boston.

Mr. Albert L. Murdock has for some time past been taking active steps in a most philanthropic and laudable undertaking for the benefit of the Young America who desires to learn a trade.

It is Mr. Murdock's purpose to establish a free mechanical school, to be founded on nearly the same lines as are in force in the Auchmuty Trade Schools, of New York. The following is the announcement made by the founder, and serves to show what is proposed:

MURDOCK'S FREE MECHANICAL SCHOOL.

Wanted, for each school, 50 high school boys for a free course of instruction in stonecutting; 60 high school boys for a free course of instruction in bricklaying; 40 high school boys for a free course of instruction in carpentry; 30 high schools boys for a free course of instruction in plastering; 30 high school boys for a free course of instruction in painting; 20 high school boys for a free course of instruction in plumbing.

Mechanical drawings will be taught one hour daily. Applications can be made by mail or in person, stating which branch pupils wish to enter. The school will open September 15, 1890. Day sessions from 9 to 12 a. m. and from 1 to 4 p. m. Evening, for journeymen, from 7 to 9.30. Day and evening school terms each five months. A fee of $5 a term will be charged for the use of tools and stock. Next year we shall open a free mechanical school for girls.

This school is under the management and control of the master mechanics of Boston. The instruction in stonecutting is furnished by the Stone Contractors' Association; in bricklaying, by the Mason Contractors' Association; in plastering, by the Plasterers' Contractors' Association; in plumbing, by the Plumbers' Contractors' Association; in carpentry, by the Carpenters' Contractors' Association, and in painting, by the Painters' Contractors' Association.

In the Board of Directors and corps of instructors are some of the officers of the School of Technology, the Massachusetts Mechanics' Charitable Association and the Master Builders' Association.

MURDOCK'S FREE MECHANICAL SCHOOL,
Huntington avenue and Gainsboro street,
Boston, Mass.

The consent of the various associations quoted in the foregoing has been gained, and every assistance will be given Mr. Murdock in what is to him a labor of love.

Exchange News.

Boston, Mass.

Affairs in the building business in and about Boston are in a more nearly normal condition at present than they have been for some time past.

The striking carpenters are practically all back at work again, having gradually come to the conclusion that their strike was fruitless. But little is heard of the strike, and the contractors are working all the men they require without any disturbance.

The condition of the freestone cutters who were locked out last February, and who have remained out ever since, remains unchanged. The new Freestone Cutters' Association has proved fully adequate to the demands of the occasion, and the rules and conditions under which they were organized make them the only association of stonecutters in New England with whom the Contractors' Association can treat or whom they can recognize.

The alterations in the building owned and occupied by the Master Builders' Association are being pushed forward as rapidly as possible, and when completed will make an appropriate home for the association, improving the facilities, and adding conveniences that will make it second to none for the purpose for which it is intended.

The commission on the revision of the building laws, of which it has been mentioned that Mr. W. H. Sayward is a member, are hard at work considering the building laws of various cities throughout the world.

The work is very great, covering as it does the exhaustive laws of the different cities; but it is expected that when the revision is completed, with the assistance gained from such extensive comparison as is afforded by the matter in hand, a model building law will be produced.

Just as this issue goes to the printer the case of Neil McNeil against the Boston Chamber of Commerce for $40,000 damages comes up. McNeil bases his action upon the fact that his estimate was the lowest among those invited to bid for the contract, and he was not awarded the job.

The conditions were somewhat peculiar and are briefly these: At the time the bids were requested by the Building Committee of the Chamber of Commerce four of the concerns that were asked to submit an estimate—McNeil among the number—refused to bid on account of certain improper conditions in the specifications. The committee then asked the builders to meet them, which request was complied with. At the meeting the reasons why the contractors refused to bid were made known, and upon the removal of the objectionable features, and the assurance of the committee that the contract would be awarded to the concern whose estimate was the lowest, the builders who had previously refused to do so consented to bid.

Mr. McNeil's figure was $400,000 and the lowest. It was understood that should the amount of the lowest bid be too high, alterations were to be made in plans and specifications, and the lowest bidder to bid on the altered plans without competition.

Failure of the Building Committee to live up to this agreement causes the present suit for damages, the result of which is looked for with greatest interest by builders, on account of the principle involved.

Worcester, Mass.

Mr. H. W. Eddy, president of the Builders' Exchange, in a recent letter to the secretary of the National Association regarding the condition of the labor market, said that at present the contractors are having no difficulty in securing workmen. The carpenters' strike has died a natural death. Last spring the carpenters' union called on the Builders' Exchange and requested that a committee be appointed to confer with a committee from the union in relation to the hours of labor. Such conference was granted, with what was substantially the following result: The carpenters at first asked for nine hours for five days and eight for Saturday. This not being satisfactory to the employers, they finally said that they would be content with nine hours for the six days, the pay to be by the hour and to regulate itself. At this stage a general meeting of the contractors of Worcester was called, in which the Builders' Exchange took a prominent part, and resulted in granting the nine hours for a day's work, but reserved the right for contractors to employ carpenters ten hours per day where the men wished to work the extra hour, the payment in all cases to be by the hour.

The committee chosen to report the decision of the contractors to the carpenters consisted of O. W. Norcross and H. W. Eddy, and it was evident, upon submitting the report, that it would not be accepted by the union. No conclusion was arrived at, and the threats of a strike continued until the building business was greatly injured for the present season.

Finally on June 23 a strike was declared by the carpenters' union, which proved a solution of the difficulty for the contractors, as there were plenty of men anxious to work. The places of the strikers were filled as rapidly as possible, and work has progressed without interruption since the strike occurred. Besides the injury to the building interests of the city the strikers accomplished nothing, and everything is now moving along the same as usual, with the union men returning to work as fast as they can obtain employment.

Wilmington, Del.

The contractors and employers are in a condition of armed neutrality toward the trade unions. Everything is running smoothly, but the contractors are much dissatisfied at the workings of the apprenticeship system. The rule in Wilmington is to allow each contracting mason or bricklayer two apprentices, regardless of any conditions, which of course places such men as are employing 50 or 100 men exactly on the same level with the man who only employs one or two laborers. The members of the Builders' Exchange have long been considering the question, but as yet have found no practical solution.

St. Louis, Mo.

The condition of the labor market in St. Louis and vicinity is reported as excellent No strikes, no indication of any and prospects for fall contracts good.

The Mechanics' Exchange is in a healthy and prosperous condition, and the effort to secure a building of its own is gradually being perfected.

Milwaukee, Wis.

A portion of a letter from Mr. Clifford Chase, president of the Builders' and Traders Exchange, will give a correct impression of the condition of the labor market in Milwaukee. He says: "There has been less friction between contractors and labor organizations this season than is generally the

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case. I account for it by the fact of there being more work than for two or three seasons previous, at somewhat better prices, and a great scarcity of mechanics and common laborers, especially the latter." The affairs of the exchange are moving along pleasantly, with everybody busy.

Grand Rapids, Mich.

Very little trouble has been experienced with trades unions during the present season, and everything is quiet at present. The relationship between employers and employees is harmonious in all branches except the stone carvers, who struck early in May and have not yet come to an understanding with the contractors.

Buffalo, N. Y.

The members of the Exchange are nearly all busy, with good prospects for the balance of the season. The majority of workmen are working nine hours per day. The carpenters have been receiving the same wages, since June 1, 1890, for nine hours' work that they formerly received for a ten-hour day. The mill hands wanted the same conditions, but as Buffalo mills come into competition with those of Western points, it was considered unwise to make the concession. The operatives at once struck upon learning the decision of the mill owners, but as the latter did not deem it necessary to attend a conference, the strike was declared off after 17 days and the workmen returned to work.

Some difficulty has been experienced by contractors in securing the treatment they desire at the hands of the architects, and the master steam and hot water fitters took an initiative step by issuing the following announcement:

At at meeting held Wednesday, August 20, 1890, it was resolved that we, the undersigned, hereafter absolutely refuse to present proposals for any steam or hot water heating work upon engineers' or architects' specifications and plans, unless a time and place are specified for opening the said proposals and all bidders invited to be present at such time.

Respectfully,

Sigued by four prominent steam and hot water fitting concerns.

The attitude of certain of the architects is exemplified in the following reply, addressed to one of the concerns who signed the foregoing by a practicing architect:

GENTLEMEN—Go to h—l with your steam and hot water heating.

Yours, faithfully, ————

It would seem that there is need for correction in the methods used in the submission of bids that would make all concerned more absolutely sure of fair treatment.

Cleveland, Ohio.

Affairs relating to the Exchange are moving along about the same as usual, with building fairly active.

The lumber dock laborers have organized a union and propose to control the handling of Cleveland's lumber in the future. Their object is to do away with the contractors in this line and transact their business directly with the owners.

Rochester, N. Y.

The season, in the building business has passed off so far without unpleasantness between the contractors and workmen. That the summer has been a peaceful one, is evidenced in the fact that the arbitration committee of the Builders' Exchange, of which Mr. W. H. Gorseline is chairman, met only once, and that was at the time of its formation. This speaks for itself, as there can be no strike or lockout in the building trades in Rochester without previous action by the committee.

The Sunday Liquor Law has recently been enforced, and contractors say that its effect is felt in the building business by preventing the occurrence of so many blue Mondays.

Omaha, Neb.

The present season has not been as active, in the building business, as usual, and has, perhaps, been the cause of the undisturbed relations between the employers and employees. There have been no strikes of any consequence and no trouble is anticipated.

The following letter has been issued by the Builders' and Traders' Exchange, and is given for the purpose of showing the work being done by secretary Collins to place his Exchange properly before the community in which it is situated:

OMAHA, NEB., September 1, 1890.

DEAR SIR: We desire to bring to your attention the fact that Omaha has a Builders' and Traders' Exchange, the membership of which comprises nearly all of the reputable contractors and firms in the building trades Those who are not with us now will be in the near future. You can find at the Exchange carpenters, brick and stone masons, plasterers, painters, plumbers, steam, hot water and gas fitters, mill workers, cellar excavators, galvanized iron and tin workers, boiler makers, cast and wrought iron workers, slate, gravel and felt roofers, and makers of artificial stone pavements. Also, you can find firms who deal in all kinds of building materials, art stained glass, brick, common and pressed, broken stone, granite, coal and coke, fire proofing and stucco, sewer pipe, glass, hardware, lumber, sash, doors and blinds, fire brick, lime, hair, cement, sand, gravel and terra cotta. In fact, you find everybody and everything necessary to the erection and competion of buildings. The regular Exchange hour is from 11 to 12 a.m. daily. Should you desire to see any of the members, they may be found at the Exchange during that hour. Each member has a private box, and if you should be unable to be at the rooms during Exchange hour, you can leave any orders with the secretary, who will place them in the box of the member you desire to reach. One of the objects for which the Exchange was organized was for the convenience of contractors and their patrons. We trust you will appreciate and avail yourself of the opportunities thus offered. Come and visit us, so that, as a good citizen of Omaha, you will know more about one of its institutions. Very respectfully,

BUILDERS' AND TRADERS' EXCHANGE,
D. J. COLLINS, Secretary.

St. Paul, Minn.

Acting Mayor Cullen recently received a visit from J. W. L. Corning, Edward E. Scribner and O. L. Rheaume, a committee from the Builders' Exchange of St. Paul, appointed to prevail upon the Mayor or acting Mayor, to veto the resolution passed at the last council meeting which in effect requires the city engineer to give the laborers in his employ ten hours' pay for eight hours' work. They presented to Mr. Cullen the following resolutions, which had just been adopted by the Builders' Exchange:

Resolved, That the Builders' Exchange of St. Paul, feels it to be its duty to protest most earnestly against the discrimination proposed to be made by the Mayor and common council of this city against a large class of mechanics and workingmen in favor of laborers, clerks, &c., employed by the City Government, by paying such employees for ten hours' work while requiring only eight hours' service to constitute a day's work.

Resolved, That a committee of three be appointed by the chair, said committee to be instructed to call upon the Mayor of this city, or, in his absence, upon the president of the council, Mr. O. O. Cullen, and represent to him the earnest feeling of this body that the proposed legislation is unfair and unjust to a large body of taxpayers, themselves workingmen and worthy citizens, and urging the Mayor, or, in his absence, the president of the council, to withhold his signature from the ordinance proposed by the council on September 19, or, if necessary to prevent its becomming a law, to return the same to the council with his veto.

Mr. Cullen questioned the committee upon the wages paid by builders, and was informed that they employed carpenters, masons, stonecutters and other mechanics and laborers by the hour, permitting them to work eight, nine or ten hours, as they chose. The price they paid to laborers, they said, was 15 cents per hour, except in the cases of particularly good men who are adapted to particular kinds of work; to these they sometimes paid 17½ cents per hour, and even as high as 20 cents per hour.

The ordinance above referred to was a supplement to one that had been passed and signed about two weeks previous, and which had changed the hours of labor on city work from ten to eight, but was silent as to the rate of wages, thus presumably reducing the pay in proportion. Then the subsequent ordinance was passed making the rate per day the same as before. It was in relation to this last that the committees from the Builders' Exchange, the Contracting Carpenters' Association and the Contracting Brick and Stone Masons' Association waited upon the acting Mayor. It was owing largely to the representations of these committees that the ordinance was returned vetoed to the council and failed to pass over the veto.

Being determined to secure their end the promoters of this movement raked up an old forgotten ordinance which fixed the rate of pay for city laborers, by the day, instead of by the hour, so that the position now is, that by the aid of the first passed ordinance (above referred to), and the one that was resurrected, the city laborers will be paid the same wages for a day of eight hours as they formerly were for a day of ten hours.

The labor unions are jubilant over what they term a great success, but the citizens generally are not in accord with the present condition of affairs or the action of the council.

Saginaw, Mich.

Saginaw builders have been troubled more or less all the season by the dictatorial course the trades unions have attempted to pursue. About July 1 the builders and manufacturers concluded to employ such competent men as they saw fit and pay such wages as were just and warrantable, and as a result the union employees in various branches of the business at once struck, to prevent the employing of non-union men.

The contractors and employers made a firm and united stand, continuing work with such men as were available, and after staying out for about ten days the strikers made application to be permitted to return to work. No effort on the part of the employers was made to further impress upon the workman, the fact that competent men would be employed regardless of whether they were union men or not, and everything has moved along without disturbance since this condition was established.

The effect that the action of the trades unions taken early in the season, was to make the business very dull, as capitalists were slow to invest under the conditions that existed in the labor market; but the position taken and maintained by the master builders and others has had a tendency to lift the business up into greater activity.

The stand taken by the employers is, briefly, to endeavor to conduct their business so that fair wages may be paid for labor and to demand a fair day's work in return, and to ignore the fact that the discharge or employment of an individual is a subject for investigation or arbitration.

About one-quarter of the usual amount of building has been done this season, which is directly owing to the unsettled condition of the labor field. The combining of the two cities, Saginaw and East Saginaw, gave promise of an increased activity in all business circles, which was not borne out in the building line for reasons stated.

Kansas City.

The following description, from the columns of a Kansas City newspaper, is submitted by a member of the Builders' and Traders' Exchange, as descriptive of the new building, built and owned by that association.

This subject has been presented before in *The Builders' Exchange*, but is given again, for the reason that it is impossible to give too much prominence to so successful a move and one that is destined to not only benefit the builders and business of Kansas City by its practicability, but to improve by its example the condition of other Exchanges, who, seeing the effect of centralizing the building interests, will go and do likewise.

"Among the many valuable commercial institutions of which our city can boast there is none whose usefulness and many advantages can possibly rank higher than that of the one now under notice. The inception and the building of this great and model Exchange is entirely owing to the unwearied perseverance and energy of the secretary, Mr. C. L. McDon-

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ald, who richly deserves the highest meed of praise for the herculean efforts he has made, which has at last been rewarded by the erection, completion and grand success of the Builders' and Traders' Exchange.

On the ground floor of the building their are eight offices, besides an airway and a handsome stairway, which leads up to the exhibit hall on the next floor. This hall is without exception one of the finest in the country. The ceilings are high, giving ample space for exhibitors to make an artistic display of their goods and wares, many of whom have employed skilled architects to design for them special arrangements of their particular specialty, that it may be seen to its best advantage by the visitors to the hall. The frieze and ceiling are handsomely decorated with ornamental stucco and moldings, the wall being left plain for the use of exhibitors.

On the north side, opposite the exhibit hall, is the large, handsome and beautifully decorated Exchange room, elegantly furnished and supplied with stationery, daily papers, trade journals and every thing useful or convenient. The "'Change hour" is from 11 to 12, when members meet daily for the transaction of business or friendly intercourse.

The third, fourth and fifth floors are devoted to offices, which are light, airy and well ventilated, being beautifully finished and well appointed with every convenience.

There are some 58 offices in the building, all provided with fine marble lavatories, lighted with combination gas and electric lights, and there is not one that is undesirable in that number. In fact it is a model office building, and the best without exception in the city."

Philadelphia.

A special meeting of the corporate members of the Master Builders' Exchange was called recently to consider the various subjects referred to standing committees at the last convention.

The matter of sub-contracting received the most thorough handling, there being considerable diversity of opinion expressed on the subject. It was finally decided inexpedient to make any recommendation to the next convention that should provide a general rule for all, it being thought best to let each local association govern itself on the subject.

The result of the consideration of the question of arbitration was an indorsement of the principles of the National Association on the subject.

At the time of going to press, it was expected that Messrs. Stacy Reeves, David A. Woelpper and Wm. Harkness, Jr., would attend the mid-year meeting of the officers and directors in New York.

The Mid-Year Meeting.

The mid-year meeting of the officers and directors and members of standing committees was called to order on the morning of September 22, with representations present from twenty-eight cities.

The morning's work began with the short address of welcome by President John J. Tucker and the outlining of the work and purpose of the meeting. The various committees were instructed to prepare their reports which are to be submitted to the fifth convention and present the same for consideration of the directors at stated intervals during the meeting.

Secretary W. H. Sayward made a short address touching upon the importance of the work in hand and the necessity of the committees being careful and thorough in the consideration and formulation of their reports. He also, in the absence of the treasurer, read a summary of the financial condition of the National Association.

An animated discussion was held upon the manner in which committee reports were to be formulated, and the final decision was that the committees should prepare their reports previous to open discussions on topics in their several provinces, and suggested amendments to be offered upon the submitting of the various papers, thus leaving the committees free to make such report as their year's consideration of the subjects prompted.

The morning session closed with a most cordial invitation by S. M. Wright, the secretary of the Building Trades' Club, to the delegates to use the beautiful rooms of the club as their own.

The first business of the afternoon was the appointing of proxies for such exchanges as had no personal representation. Considerable discussion was had on the subject of the duration of the fifth convention, to be held in New York in February next, and the final decision was to begin on Monday, instead of Tuesday, as was decided at St. Paul, and the convention to last until Thursday night. The time at St. Paul was too limited, and consideration of important topics was somewhat abridged.

The secretary explained the reasons for the incorporation of the *Builders' Exchange* with *Carpentry and Building*, of New York, and received the earnest approval of the directors for the action. The "missionary tour" of the secretary was taken up by the directors, and he was instructed to visit as many exchanges as possible in the near future, as the benefits of such visits had been fully demonstrated.

A committee was appointed to select a badge or insignia for the National Association, to be worn by the members, similar to the badge of the Loyal Legion and other associations.

Wm. Harkness gave a very full description of the workings of the Philadelphia Trade Schools, and the prospects of success it so surely offered. The subject was considered at some length, and the advisability of establishing trade schools in connection with every exchange advocated.

The Committee on Reforms in Sub Contracting submitted their report, and the discussion on the same was very full and free, and a number of amendments were suggested for action at the convention.

The last day was devoted to the reports of the committees on Arbitration and the Builders' Surety Company. The former report was prolific of much argument on the methods of arbitration and the subjects that should be submitted to arbitration. The directors were almost united in the belief that arbitration is just and fair and should be advocated. Refusal to arbitrate or to meet with the employees simply widens the breach between trades unions and employers, and while strikes may be won by the employers by starving out the unions, the result is not a settlement, and is only a temporary quiet that breeds bitterness between the two branches of the business. The contact between properly organized labor unions and organizations will serve to show the former where their demands are unreasonable and unjust to themselves and to the employers. Without meeting, neither can become either familiar with the needs of the other or the possibilities that lie in joint harmonious action. The report was very thoroughly considered.

The report of the Builders' Surety Company contained much revision from that made at the last convention, and the committee stated that their conclusions had been arrived at with the assistance of an expert in such matters and that there was no doubt but that such a company established on a proper and successful basis would prove of the greatest benefit to the building fraternity.

Full report of the meeting and the reports of the committees will be given in the next issue of this journal, together with the arguments on the subjects by the directors.

The members of the Building Trades' Club made their hospitality to the delegates more impressive, if possible, by the delightful *finale* which they extended the visitors in the shape of an informal reception. The beautiful rooms were tastefully decorated with a profusion of flowers, and the collation was such as to give the delegates a yearning for the banquet at convention time. The affair simply typified the warm and brotherly welcome the association members of the fraternity in New York extended throughout to the visitors to the mid-year meeting, and proved most conclusively that they have hearts as big as their city.

NOTES.

Australian builders, to whom allusion has been made at various times in these columns, have reached the conclusion that the best of organization, for an association of master builders, is that advocated by the National Association of Builders of the United States.

The numerous organizations located in the prominent Australian cities have heretofore endeavored to advance the cause of the builder, at monthly or quarterly meetings, and with a greater or less degree of success, owing to the activity of their memberships.

The first association to recognize and advocate the establishment of a Builders' Exchange, such as we have in this country, was the Melbourne Association, and after thorough consideration of the subject and a careful canvass of its capabilities and benefits, a Builders' Exchange has been established upon what are essentially the same lines as govern in our own organizations. This exchange has gone actively to work to prepare suitable quarters for itself, by securing a building and projecting such alterations as shall make it most favorably adapted to the uses of an exchange. These alterations in the building they have selected are now taking place and are being rapidly pushed to completion, under the very substantial assistance of the members, many of whom are providing material and labor at cost.

Mr. A. D. Smith, president of the Builders' Exchange, of Portland, Me., and delegate to the Fourth Convention of the National Association, held at St. Paul, has been elected one of the representatives to the State Legislature from his city.

A rather vivid contrast between the position of the individual employer and the "organized" workman is shown in the following statement of the condition of affairs, given in the last issue of the *Canadian Architect:* The tyranny exercised by "organized labor" was well exemplified at Ottawa the other day. The dispatch states that a certain contractor of that city agreed, at the dictation of the bricklayers' union, to dismiss the tuck pointers or foundation men he had employed on a certain building contract, but found that his agreement with the men precluded his dismissing them. Then the union called off all the bricklayers, and the contractor was unable to proceed with his contract. Finally, on paying a fine of $10, he was allowed to have the men back again. Such a method of extorting money would be worthy of the greatest brigand. At the same time, the contractor who meekly agrees to dismiss his employees who have been guilty of no offense at the dictation of the trades unions, is deserving of little sympathy.

The master plumbers of Texas have organized a State Association, with the ultimate intention of joining the National Association of Master Plumbers. The officers are: President, F. J. Madden, of Sherman; vice-president, A. McWirk, of Dallas; secretary J. S. Brazelton, Waco, and treasurer, P. Pettit, Dennison.

Many of the builders' associations of Australia at present exclude from their membership sub-contractors and material dealers, but the establishment of a Builders' Exchange will serve to correct what seems to us to be unwise. The admission of these members of the building business into the associations is now being discussed, and the decisions arrived at will be given in the next issue of this journal.

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TRADE NOTES.

W. H. MULLINS, Salem, Ohio, has issued some advance sheets of a catalogue which he has in preparation. The sheets illustrate Architectural Sheet Metal Work of various descriptions, including fronts of buildings, cornices of varied and interesting design and crestings. The elevations of the buildings shown are drawn to scale and are also presented in section, indicating the method of construction. The designs of the sheet metal work indicated upon the sheets show evidence of careful thought and study upon the part of the designer and are a credit not alone to him, but also to the house executing the work.

CHARLES A. STRELINGER & Co., Detroit, Mich., are sending out a neat price-list of Builders' Hardware applying to Catalogue No 3. It is known as the "No. 5 Net Price-List" and supersedes all lists of previous date. In addition to prices, remarks upon the decorative use of metals are presented, as well as specifications for hardware. Accompanying the price-list is a pocket catalogue of Yale and Standard Locks, the illustrations in which are said to be one-fourth actual size.

THE WESTON ENGINE COMPANY, Painted Post, N. Y., have issued an illustrated catalogue of specialties which they are prepared to furnish the trade. The work is of convenient size for reference, and is arranged in a manner to prove interesting. Among the opening pages is an index, together with a blank form of estimate. Attention is given to the Bronson Magazine and Base Burning Water Tube Steam and Hot Water Heating Boiler, which is shown in general view and in section, and is carefully described. A number of tables are presented of general interest and value in this connection, as well as a chapter containing general directions for using the heater. A number of pages are devoted to testimonial letters and advertisements of concerns manufacturing goods of interest to the steam and hot water heating trades. The company also manufacture the Weston Automatic Portable and Stationary Engines and Boilers.

VAN WAGONER & WILLIAMS COMPANY, 82 Beekman street, New York, are sending out a condensed price-list of their specialties, which will be found of general interest to the building trades. It is bound in leather covers and is of a size convenient to carry in the pocket. A number of blank pages are inserted at the close of the price-list for purposes of memoranda.

AMONG THE RECENT sales of the "Beck" Automatic Engine by the Taylor Mfg. Company, of Chambersburg, Pa., may be noted the following: Two engines to the Brennan Hotel Company, New York; an engine to the Newberry Oil Mill Company, Newberry, S. C.; an engine, with complete steam plant, to the Bedford City, Va., Land Company; an engine, with complete steam plant, to Streator, Ill., Gas and Electric Light Company; an engine to People's Gas and Electric Light Company, Canton, Ill.; an engine for the Grace Baptist Church, Philadelphia; an engine for the Pogue Company, Cincinnati, Ohio; an engine for Alex. Crow's Mills, Philadelphia; engine, with four boilers, to Fort Scott, Kan., Rapid Transit Railway Company; second engine and complete steam plant to Wonderland Theatre, Buffalo, N. Y; an engine, with complete steam plant, to Thomson-Houston E. L. Company, Kitanning, Pa.; an engine for the Greenwood, S. C., Oil Company; an engine for H. H. Yard, Belmar, N. J.; an engine to the Old Dominion Paper Bag Company, Roanoke, Va.; an engine, with complete steam plant, to Albertson, Murphy & Co., Waycross, Ga.; an engine for Abbeville, S. C., Cotton Seed Oil Mill and Fertilizer Company; an engine for Bridgewater Carriage Company, Roanoke, Va.; an engine for the Devon Inn, Devon, Pa.; second engine to Brooks & Sons, Philadelphia, Pa.; an engine, with complete steam plant, to W. M. Blount, Bainbridge, Ga.; two engines for Pittsburgh Plate Glass Works, at Ford City, Pa.; an engine, with boilers, for the Albany, Ga., Fertilizer and Farm Implement Co; two engines for the Tampa Bay Hotel Company, Tampa, Fla.; an engine, with complete steam plant, to the Butler, Pa., Light, Heat and Motor Company; also the following sales of their Vertical Automatic Engines: Two engines, on combination bases for dynamos, to the United Edison Mfg. Company, Toronto, Canada, and another of same style to steamer Naugatuck, of New York City; also a vertical automatic engine on plain base to Edison Company for West Bay City, Mich.; another of same type to Carnegie Bros., of Pittsburgh, for their works at Bessemer, Pa.; and another to the Quaker City Electric Company, of Philadelphia, for Lancaster, Pa.

THE SPRINGFIELD FOUNDRY COMPANY, of Springfield, Mass., have recently completed some extensive improvements and additions to their works on Liberty street, which were commenced something like a year ago. Among the recent additions to their plant may be mentioned a three story brick machine shop, 116 x 41 feet, with a two story L 68 x 32 feet in size; a two story brick structure 80 x 33 feet in dimensions; a two story addition to their iron foundry 85 x 33 feet in plan, together with a new cupola house, a cleaning room, two core ovens and a new brass foundry. A 10 ton iron power crane, built by the Farrel Foundry and Machine Company, of Ansonia, Conn.; a hydraulic elevator, a Colliau hot blast cupola to melt 6 tons an hour and a Baker blower have been placed in the iron foundry. An 80 horse-power Hawkins boiler, several large lathes—84, 42 and 28 inches respectively; a number of smaller lathes, planers and iron working machinery; an 18 foot planer, a 4 x 14 foot boring machine, three hydraulic elevators, wood working machinery and an incandescent electric light plant, with Thomson-Houston dynamo, are also among the improvements recently incorporated in their works. The business was established in 1854 by the late Daniel L. Harris and William Birnie. Since that time the works have been conducted by Wright & Emerson, and for the last eight years by the present owners. Joel B. Harris, of Rutland, Vt., is president, William A. Harris, secretary, and Edward W. Seeger, treasurer. The superintendent of the works is James Gibbins, well known for the past 20 years as a builder of steam engines, elevators and machinery. The superintendent of the foundry department is James Simpson.

THE EASTERN PLASTER BOARD COMPANY, with office at 52 Broad street, New York City, are distributing an illustrated pamphlet, in which are fully set forth the merits of the material known as Mackite Plaster Board. This material is adapted for use in a variety of ways in building construction, and is claimed to secure very good results. The pamphlet contains a number of engravings showing some of the uses of this material, while numerous testimonials indicate, in some measure at least, the estimation in which it is held not only in this country, but also in Europe. At the close of the pamphlet is a page devoted to instructions for handling Mackite and applying hard coat upon it. Accompanying the pamphlet is a price-list of Mackite, free on board at Bergen Point, N. J.

HENRY B. WALBRIDGE, of Brooklyn, N. Y., has recently patented an improvement in the construction of buildings, relating more especially to frame structures. The object of the invention is to provide a means whereby the outer walls of a building may be rendered thoroughly waterproof and, at the same time, made to represent blocks of stone or other material. The construction is such that the means of attachment of the blocks to the framing of the house are invisible.

L. PATRIC & Co., 19 West Washington street, Springfield, Ohio, have just issued a catalogue of the Springfield Warm Air Furnace, adapted for hard and soft coal and natural gas. Its constructive features are such as to render it powerful in operation and to adapt it for heating dwellings, school rooms, halls and areas of large size. More than half the publication is taken up with testimonials of those who have used the goods manufactured by L. Patric & Co., and show the estimation in which they are held.

F. A. REQUARTH & Co., Dayton, Ohio, favor us with a copy of an interesting little pamphlet which they have recently issued, relating to Prismatic Cut or True Square Turned Balusters, Head, Center and Base Blocks. It is a volume of nearly 50 pages of letterpress, and contains a list of patterns, which the firm are prepared to execute. Their specialty is stair work, with the newest and latest feature of square turned work, especially verandah columns. The volume is neatly arranged and tastefully gotten up, and will, we have no doubt, prove interesting and valuable to those into whose hands a copy may come.

THE MANUFACTURERS OF THE United States Gutta Percha Paint, of Providence, R.I., whose announcement will be found elsewhere in this issue, claim to be an exception among paint manufacturers, in that they make an article conforming to the best known and generally accepted ideas among practical painters and scientific men as to what constitutes a perfectly reliable paint. This company's method of manufacturing paint is claimed to be unlike others in several important particulars, prominent among which is the introduction of gutta percha and other valuable materials into pure linseed oil by a process which they control for this country. The manufacturers request those interested to apply for circulars giving full information.

"THE STAR VENTILATOR" is the subject of an interesting little pamphlet of something over 20 pages, recently issued by Merchant & Co., of Philadelphia, Pa. The device is claimed to be simple, durable, economical and storm proof, and adapted for the ventilation of churches, school houses, public buildings of various kinds, dwellings, stables, mills, foundries, machine shops, dye houses, factories and the like. The construction and application of the device are fully set forth within the covers of this little work, and numerous illustrations are presented, showing the manner in which it may be used, and of buildings in connection with which the ventilator has been employed. Several testimonials are also given. Accompanying the pamphlet is a folded circular containing information for all interested in tin roofing.

J. M. MARSTON & Co., 86 Lenox street, Boston, Mass., are distributing a pamphlet of 16 pages, relating to Marston's Patent Hand and Foot Power Machinery. The firm have been engaged in the manufacture of hand and foot power machinery for something like 25 years, and claim to be the first to introduce the use of cut gears in such machinery as a factor to increase the speed, in place of the belts which were in general use on old style machines of this class previous to 1867. The firm state it is their endeavor to improve and perfect their machines in every little detail, and to that end have fitted their works with the latest and most improved machinery and employ only the most skilled labor. The statement is made that on their No. 1 and No. 2 machines all the various kinds of general shop work, such as ripping, cutting off, rabetting, grooving, cutting tenons, mitering, cutting bevels and borings can be executed. The pamphlet illustrates and describes some of the leading machinery made by the firm and presents a price-list of machines, saws and extra tools, band saw blades, machine bits, &c., while several pages are devoted to testimonials from those who have used the firm's goods.

J. J. HAMMER, 2701 Lucas avenue, St. Louis, Mo., is distributing an illustrated circular of his Patent Scaffold, designed for the use of bricklayers, plasterers, carpenters, painters, frescoers, pipe hangers, contractors, and for all places where a scaffold is required. Reference is made by the manufacturer to the economy resulting from the use of this scaffold, the ease with which it may be removed from place to place, its safety, and to the fact that it may be raised to any hight while loaded with material. The manufacturer states that is just the thing for high interior work, such as halls, churches and the like.

"THE SEWERAGE of Columbus, Ohio," is the subject of an address delivered by Col. George E. Waring, Jr., at the Board of Trade Auditorium, Columbus, Ohio, Monday evening, June 23 This address, together with the discussion following, has been published in pamphlet form and will be an interesting brochure for those who follow and read sanitary matters. Colonel Waring in the address mentioned that the Board of Public Works, of Columbus, Ohio, asked him to visit Columbus and report upon the efficiency of an intercepting sewer that had been provided. The speaker proceeded to describe the situation as he found it, and incidentally said a great deal about plumbing and other sanitary matters. Following his address, which was well received, Colonel Waring answered a number of questions propounded by different people in the audience.

AMONG THE RECENT CONTRACTS booked by W. J. Burton & Co., Detroit, Mich., may be mentioned the following: The galvanized iron cornices, tin work and metal shingle roofing of the St. Joseph's School, at Port Huron, Mich.; the galvanized iron cornices, tin work and roofing of the House of Providence, Detroit, Mich., and the work on the Central School Building, at Coldwater, Mich., said to be one of the largest and finest structures of its kind in the State. The galvanized iron cornices and roofing will be executed by the firm's agents at Coldwater, Messrs. D. C. Allen & Co. The company state that their cornice shop, as well as shingle works, are running full capacity and the present season's output of Eastlake Metal Shingles will be more than three times that of last season.

THE IMPROVED REFLECTORS for gas-light, kerosene or day light, which are being offered the trade by I. P. Frink, of 551 Pearl street, New York City, are meeting with a great deal of favor. Mr. Frink is constantly in receipt of letters from those who have used his goods, speaking in high terms of their merits and of the general satisfaction which they have given wherever employed. Among recent letters of this kind is one from James Pierce, a carpenter and builder, of Waverly, Ill., in which he says that he has used Mr. Frink's Reflectors for lighting 11 churches, which were constructed in the past few years, with the very best results. Mr. Pierce has two more churches under way, which he is confident will be lighted with the Frink Reflectors.

THOMAS MORTON, of 65 Elizabeth street, New York, shows in our advertising pages this month some illustrations of Cable Chains for window sash which he is prepared to furnish the trade on short notice. The statement is made that the principal product consists of two leading kinds of Sash Chains, known in the trade as Morton's Champion Chain and Morton's Cable Chain. In the announcement referred to will be found some interesting facts relating to both kinds of these Chains.

I. P. FRINK, 551 Pearl street, New York, has just issued a somewhat extensive catalogue of Frink's Patent Reflectors for gas, kerosene, electric or day light. These specialties are fully illustrated in the catalogue, among the designs being several which have recently been added to the assortment. A price-list is included, as well as a long list of testimonials from all parts of the country from those who have made use of the goods turned out by Mr. Frink.

"FINE TOOLS FOR MECHANICS" is the title of an announcement presented elsewhere in this issue by L. S. Starrett, of Athol, Mass. It is stated that a large line of modern fine Tools for mechanics' use is manufactured, and that orders will receive prompt attention. Upon receipt of a 2-cent postage stamp Mr. Starrett will forward a full list of tools to any address.

THE BRIDGEPORT GUN IMPLEMENT COMPANY, 17½ Maiden Lane, New York, set forth in another part of this issue some of the merits claimed for the Forstner Auger Bit. It is said that this device will bore smooth, round, oval and square holes and can be guided in any direction. An illustrated price-list will be sent upon application to any address, or a sample bit will be forwarded upon receipt of 50 cents.

(*Continued on page* xxv.)

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CARPENTRY AND BUILDING.

A MONTHLY JOURNAL FOR THE BUILDING TRADES.
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NOVEMBER, 1890.

The American Institute.

The twenty-fourth annual convention of the American Institute of Architects was held in Washington, D. C., beginning October 22. The sessions were held in the Arlington Hotel, the members being called to order at 4 o'clock in the afternoon. A very interesting programme was presented, the address of welcome being given by the Hon. J. W. Douglass, president of the Board of Commissioners of the District of Columbia. An address was also given by R. M. Hunt, president of the American Institute of Architects, following which were reports of the Board of Directors, treasurer, committees and chapters. The Thursday morning session was given up to the reports of committees and the presentation of papers. These included one by A. J. Bloor, entitled "Sketch of the History and Status of the American Institute of Architects," one by S. E. Chamberlain on "Foundations for Kansas City Hall," and one by Henry Rutgers Marshall on "Science of Æsthetics." The Washington architects tendered the visitors an excursion to Mount Vernon, an oyster lunch being served on the boat. Friday morning's session was given up to the election of officers and the disposition of other business which came before the convention. The afternoon was devoted to a visit to the White House and sight seeing about the city. The committee of arrangements were J. W. Root, of Chicago; William Poindexter and Glenn Brown, of Washington, D. C.

The Mechanical Apprentice.

Although the American apprentice is more or less an imaginary quantity, since the system under which he formerly lived has gone out of existence, the term, nevertheless, may be used to designate what ought to be an important division of the country's population. We mean young men who are learning trades. It is not likely that the regular apprentice system will ever be revived, for it would be quite impossible to impose such conditions on the American youth of the present day as were current when the apprentice system prevailed. The difficulty met with just now is, however, that with the decadence of the old system there has been no corresponding growth of a new system or substitute. Modified plans of the old apprentice plan have been tried, but with no very marked success, the principal hope at present resting in the trade schools that are gradually coming to play an important part in the industrial economy of the country. When such schools were started they were looked upon by many as advanced kindergartens, and it was not considered that any really valuable instruction could be gained at them. Little by little they have progressed, however, from the standpoint of the mere manual training schools, until at present some of them turn out a very excellent lot of journeymen. In their highest development all the trades will have their respective places of instruction, and the certificate of graduation will be equivalent to the papers formerly granted to indentured apprentices at the end of their term of service.

The Right to Learn a Trade.

There is, perhaps, no one whose name is more intimately associated with the apprentice question and the advance of American youth than Col. R. T. Auchmuty, who is also well known in connection with the New York Trade Schools, which he founded. In a recent address, delivered before the American Social Science Association, Colonel Auchmuty had much to say on trade schools. He pointed out that the old apprentice system cannot be revived, for the simple reason that the conditions under which it existed have ended. In the existing state of the world few conscientious master mechanics would assume the responsibilities that would devolve upon them under the old apprentice laws, and, furthermore, no respectable parent would bind his son to a master for a long term of years under the rigorous agreement formerly entered into. The sense of independence is too strong nowadays to permit such a system of industrial servitude to continue. Later on the speaker referred to the present demands of labor organizations as being so unreasonable, and added "that these organizations, often composed of, and usually controlled by, foreigners who are earning high wages, from which they seek to exclude our countrymen, makes submission to trade union apprentice rules a discredit to American manhood." The patriotic tone that pervaded this address of Colonel Auchmuty is wonderfully refreshing, when we hear so much about the obligations to a trade and so little about obligations to a fellow countryman. The speaker pointed out that the question of the moment is whether within the American Republic there is to be established another government of knights, of federation and of supreme councils, sitting in secret, judging in secret and issuing decrees that must be obeyed at the peril of life and property. "Trade unions, all admit, are necessary," he said, "for the protection of the wage earner, but what is wanted is trade unions controlled by Americans, and not, as at present, by foreigners Barriers have been erected against the entrance of our countrymen into the trades, while the foreigner is made welcome. Let us have manhood enough to throw these barriers down. It cannot be done easily, but the time has come to try to do it. Our young men, the graduates of our public schools, stand on every street corner begging for the privilege of being allowed to work in the land of their birth. Fill the workshops with them. They will then control the trade organizations and labor difficulties will disappear, for intelligent, well educated American workmen, while maintaining their own rights, will respect the rights of others."

Chicago Polytechnic Institute.

The Chicago Polytechnic Institute, which was recently opened, occupies the three upper floors of the building at the southeast corner of Madison street and Fifth avenue, of that city, these premises having been fitted up especially for this purpose. The plan of the Polytechnic, as the name implies, is to comprise in one great system all the departments of technical and industrial education, with a special reference to whatever will fit young men or women for the practical duties of life, and enable them to earn a living by skilled labor. In the trade school will be taught bricklaying, plastering, plumbing, carpentry, house and sign painting, stonecutting, machinists' work, tailoring, watchmaking, wood-working, architecture, &c. Special lessons will also be given in all English branches and high school studies, languages, bookkeeping, shorthand and typewriting. All trades are supervised by a committee of the masters' associations of the city, including the Traders' and Builders' Exchange. The instruction will be scientific as well as technical. The slojd work is free, but nominal tuition is charged in the other departments. This school is modeled after the Polytechnic and People's Palace, of London, and is philanthropic in its character, but believes that our youth should not be educated to get something for nothing, and that independence of character should be cultivated by giving its students more or less financial responsibility and interest. The members will form a society, meeting monthly, and will publish a magazine called the *Polytechnic*. A lyceum, a mutual benefit association and choral union will also be organized among the members. The Slojd school on handicraft in wood is under the charge of experienced teachers, and is intended as a connecting link in manual training between the kindergarten and industrial school.

The Chicago Plumbing School.

In the past we have drawn attention to New York and Philadelphia Trade Schools, where plumbing is taught, and are glad to learn that a class in the same trade will be established this winter at the Chicago Polytechnic Institute, referred to above. From the prospectus of the institution we learn that the plumbing class will

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begin January 7, 1891, and continue five months, meeting every Monday and Wednesday evening, from 7 until 9.30 o'clock, for practice work, while scientific instruction will be given on Friday evening. Manual instruction will cover the usual line of such work in trade schools and will include lead seams, overcast joints, traps, wipe joints, branch joints, horizontal, upright and stop cock wiping, ferrule wiping, calking and putting on overflow pipes in a safe waste, &c. At the conclusion of this course, miscellaneous and fancy work, such as sand bends, &c., will be done. The scientific instruction, which is a very important feature of plumbing classes, will cover the proper arrangement of service and waste pipes, drainage and ventilation, and will be divided as follows: Soil and drain pipes, trapping and ventilation, supply pipes, boilers, tanks, fixtures, trapping and ventilating fixtures, plumbing mistakes and pumps. It appears that the plan followed in Chicago resembles the one employed in connection with the New York Trade Schools; for, at the termination of the course of instruction, a committee of the Chicago Master Plumbers' Association will examine the members of the plumbing class regarding their manual and scientific knowledge. Those who pass satisfactorily will receive certificates, which will undoubtedly prove very useful in securing work, and, furthermore, will reduce the term for which helpers are usually employed in Chicago by one year.

College Education.

While considering the advantages of trade schools, the importance of what is sometimes termed a liberal education should not be lost sight of. In discussing the expediency of sending a boy to college as a preparation for a business career, President Low, of Columbia College, said, a short time since: "The college training of the present day fits a man for practical business to the extent that it develops his capacity for accurate thinking and expression, develops his powers of observation and reflection, and makes him appreciate that, if he knows but little, he has at least the capacity to learn through diligent attention to the work in hand. In addition to this, a college education, in giving to a man the right of eminent domain in the realm of literature, ancient and modern, enlarges the circle of his vision and makes him a man capable of broader sympathies. I look upon college education as a great opportunity. For those who are able to enjoy it, I think the question should be, Why should I not take the college course? rather than, Why should I?" Commenting on the utterances of the president of Columbia College, from which the above is a very brief extract, the *Christian Union* says: "Only a few years ago the greater number of students who entered colleges were the sons of professional men, who seemed to have the monopoly of this opportunity. To-day it is the question of men in all walks of life, 'Shall I send my boy to college?' And a still healthier symptom is that boys and girls are not sent to college to-day merely to acquire book knowledge; fathers and mothers recognize that side by side with the mere getting of knowledge there is a discipline that will train the student to live in the world, not as the one wonder of adoring love, but as an individual among peers so trained as to recognize the great fact that to every human being is given an equipment that would, with proper training, give him his place in the world."

The Slate Industry of the United States.

Some very interesting statistics relative to the slate industry of this country are contained in a census bulletin issued a few days since by the Department of the Interior. According to the figures there given, the total value of all slate produced in the United States in 1889 is shown to be $3,444,863. Of this amount $2,775,271 is the value of the 828,990 squares of roofing slate, and $669,592 is the value of slate for all other purposes besides roofing. As compared with the census report of 1880 on stone, the roofing slate product of 1889 is nearly twice as great in number of squares and in value. Slate used for purposes other than roofing was omitted from the tenth census report. The total value of all slate produced in 1880 is more than twice as great as that considered in the tenth census. According to "Mineral Resources of the United States for 1888," the total number of squares of roofing slate produced in that year was 662,400, valued at $2,053,440.

Twelve States at present produce slate. A line drawn on the map from Piscataquis County, Maine, to Polk County, Ga., and approximately following the coast line, passes through all the important slate-producing localities. According to the amount and value of the product, the most important States are, in the order named, Pennsylvania, Vermont, Maine, New York, Maryland and Virginia. In the remaining six States productive operations are of limited extent; and in the case of Arkansas, California and Utah, of recent date.

The regions in which slate is found do not, in all cases, coincide exactly with States, nor, in the case of what is known as the Lehigh regions, with counties, but in a number of instances they overlap the geographical boundaries of State and county. Thus, the Peach bottom region lies both in Maryland and Pennsylvania, and the Lehigh region in Lehigh, Carbon, Berks and a small portion of Northampton counties. The Bangor region, which is entirely within Northampton County, Pa., is the most important. This region includes quarries at Bangor, East Bangor and Mount Bethel, Pa., the character of the slate produced at Mount Bethel being similar to that of the Northampton hard vein region. Included in the Lehigh region, besides Lehigh County, Pa., are a few quarries in Berks and Carbon counties, and a small number in Northampton County, on the opposite side of the Lehigh River. The Pen Argyl region embraces quarries at Pen Argyl and Wind Gap. The Northampton hard vein region is specially distinguished on account of the extreme hardness of the slate as compared with that produced in other regions of the State. This region includes the following localities: Chapman's Quarries, Belfast, Edelman, Seemsville and Treichlers, all in Northampton County. Five of the nine quarries included in the Peach Bottom region are in Harford County, Md., the remaining four being in York County, Pa. The Vermont and New York region includes an extensive slate formation, occupying a part of the old Champlain Valley, lying between the western base of the Green Mountains of Vermont and the southern trend of the Adirondacks, in New York. The area in which slate is actually produced at present is confined to a narrow strip in Washington County, N. Y., and a somewhat wider one lying next to it in Rutland County, Vt. It extends from Castleton, Vt., on the north, to Salem, N. Y., on the south, a distance of 35 or 40 miles, and has a maximum width of 6 miles, but the average is not more than 1½ miles. With the exception of red slate, the production of which is at present limited to Washington County, N. Y., the general character of the slate in Vermont and New York is the same. It happens, however, that red slate is produced only in Washington County, N. Y., this being the only locality in the country producing this variety of slate.

The slate quarrymen of the country, and to a considerable extent the firms operating the quarries, are either Welsh or of Welsh descent, many of them having learned the methods of quarrying slate in the celebrated quarries of Wales. The quarries are operated on an average of about 220 days in the year. The idle days are the result of rainy weather and holidays. The first day of every month is regarded as a holiday by the Welsh quarrymen, and no work is ever done by them on Saturday afternoons. The average wages for the entire country paid to foremen or overseers is $2.48 per day; for quarrymen and millmen, $1.56; for mechanics, $1.64; for laborers, $1.27, and for boys, 76 cents. The highest wages are paid in California, while those paid in the most important regions naturally approximate more closely the figures above given as the averages. The following figures represent the average daily wages paid in Pennsylvania: Foremen, $2.25; quarrymen, $1.88; mechanics, $1.54; laborers, $1.40, and boys, 73 cents. In the Vermont and New York region foremen receive an average of $2.65; quarrymen and millmen, $1.77; mechanics, $1.97; laborers, $1.51, and boys, 89 cents.

The following table gives a comprehensive view of the condition of the slate industry during the last year. It shows the number of quarries in each State, the total value of the slate produced and the total wages paid for the entire product:

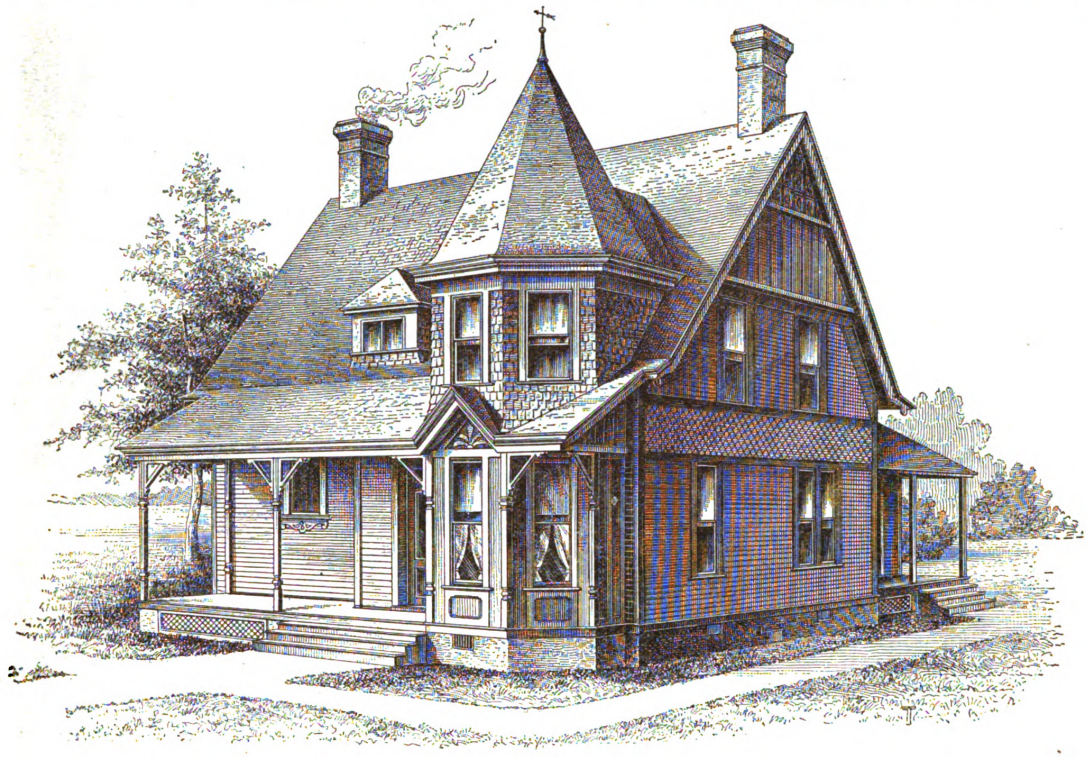
State.	Number of quarries.	Total value of all slate produced.	Total wages paid for product.
Arkansas	1	$240	$1,055
California	2	13,889	19,927
Georgia	4	15,330	11,371
Maine	4	214,000	160,300
Maryland	5	110,008	65,267
Michigan	1	15,000	12,000
New Jersey	5	10,925	7,367
New York	16	130,603	85,797
Pennsylvania	104	2,011,776	1,283,530
Utah	1	.....	170
Vermont	60	838,013	494,110
Virginia	3	85,079	66,920
Totals	206	$3,444,863	$2,209,344

Inasmuch as in slate quarrying the initial operations are those of stripping and excavating, preliminary to actual output, some time must necessarily elapse before any returns for labor can be realized. This explains why the expenses incurred in Arkansas, California and Utah exceed the value of the output.

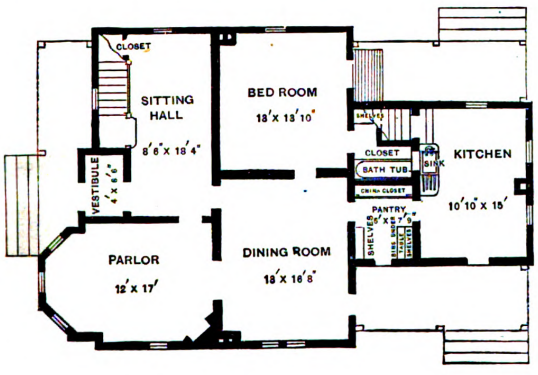
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DESIGN FOR A COTTAGE.

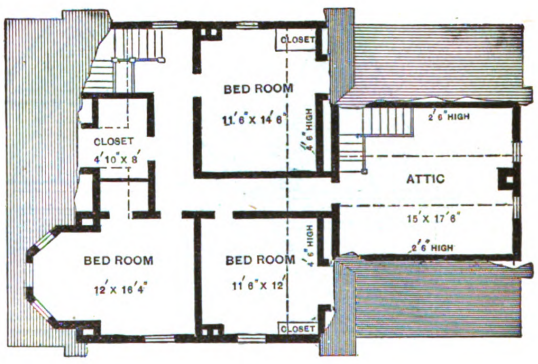
BY MEANS of the illustrations presented upon this and the two following pages, we show a design for a cheap cottage, the author of which is George W. Payne, of Carthage, Ill. The house was designed for a gentleman in a neighboring village, who desired a cheap dwelling, with a compact and convenient arrangement of rooms. From an inspection of the floor plans it will be seen that the house provides eight rooms and a sitting hall, beside vestibule, pantry, numerous closets and a large room in the attic, directly over the kitchen. The latter room occupies an extension at the rear of the house, in which is located the pantry and bathroom. This latter apartment is located upon the first floor, for the reason that one of the rooms is used as a sleeping apartment. From the porch the visitor passes through a vestibule, 4 x 6½ feet in size, into the reception hall, from which rise the main stairs. From this hall the parlor and dining room may be readily reached, the latter rooms being connected by doors of ample width. A fire place in the parlor is designed for a Jackson grate, with an inlet for fresh air and an ash pit. Ascending to the second floor there is found three sleeping rooms, together with a closet, measuring 4 feet 10 inches by 8 feet in size. Each sleeping room is also furnished with a closet. The vestibule and hall, including the stairway, are finished in yellow pine. The parlor, dining room and sleeping room on the first floor are finished in selected white pine, all of which is filled with white shellac and covered with two coats of best white hard oil, rubbed with pumice stone and water to a smooth, dead surface. All other rooms are painted. The kitchen is wainscoted 3 feet high, and provided with a small galvanized steel sink, with a drain table at one end. A 2½-inch brass cylinder pitcher pump, connected with the cistern, supplies the water to the sink and also to the bath. The pump is connected with the bathtub by a small tin tube run through the wall over the sink. Another tube of proper length fits loosely into this at one end, while the opposite end terminates in a funnel to fit under the spout of the pump. When not



Perspective View.



First Floor.



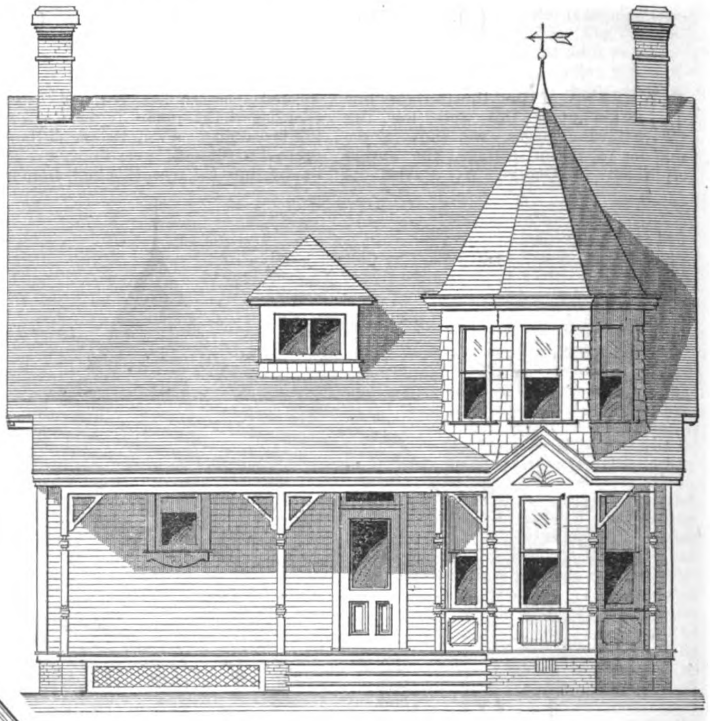
Second Floor.

Scale, 1-16 Inch to the Foot.

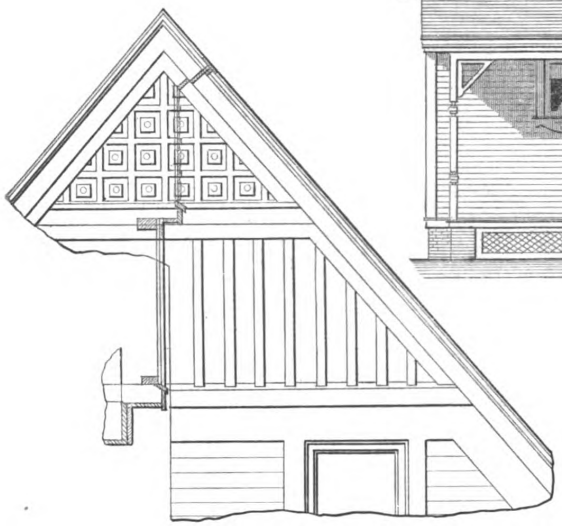
Design for a Cottage.—George W. Payne, Architect, Carthage, Ill.

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in use it is detached and hung up close at hand. Hot water from the kitchen range is poured through this tube when desired for bathing purposes. Some of our readers may perhaps smile at this very economical arrangement, but the author begs them to remember that it is a cheap house in a Western village which is under consideration. He expresses the opinion that it is certainly a much better arrangement than none at all. The china closet extends to the ceiling, and is inclosed with three pairs of doors, the lower pair having panels of screen wire, the middle pair being glazed, while the top pair is provided with wood panels. The pastry table in the pantry is fitted up with three portable tilting bins beneath, while the pastry board is made to slide under the top of the table. The floors of the kitchen and pantry are of narrow yellow southern pine, while all others are of selected fence

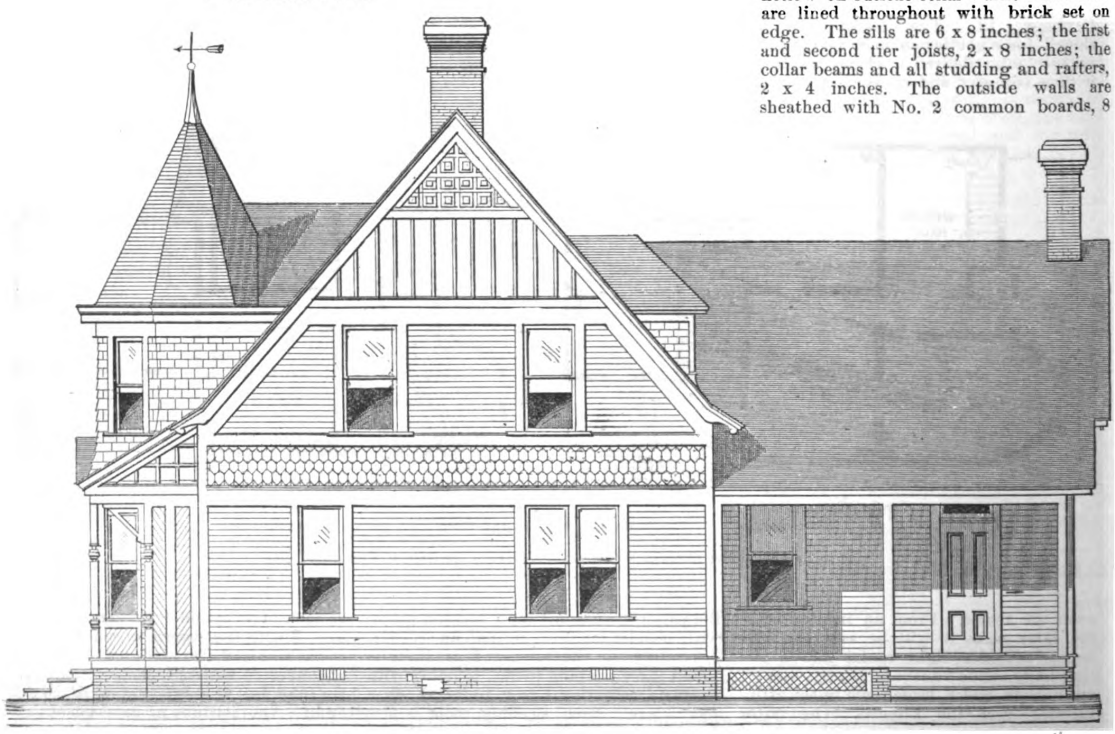


Front Elevation.



Detail of Main Gable.

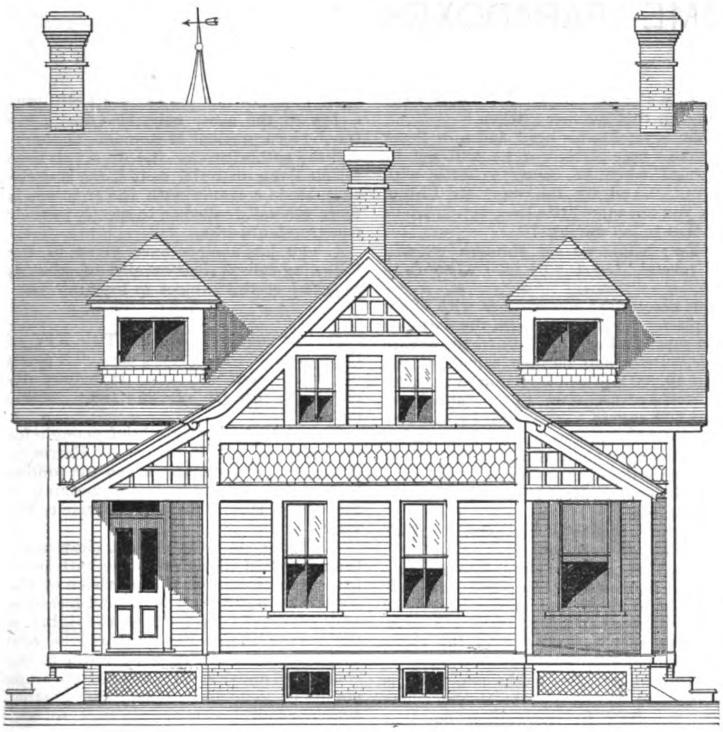
flooring. The outside doors and the inside vestibule doors are fitted with glazed upper panels. The porch floors are of narrow clear white pine. The foundation of the dwelling is of stone to the grade line, with an under pinning of hard burned brick. The stone work of the cellar is 18 inches thick, that of the foundation 12 inches thick, while the under pinning all around is 8 thick laid hollow on outside cellar walls. The flues are lined throughout with brick set on edge. The sills are 6 x 8 inches; the first and second tier joists, 2 x 8 inches; the collar beams and all studding and rafters, 2 x 4 inches. The outside walls are sheathed with No. 2 common boards, 8



Side (Right) Elevation.

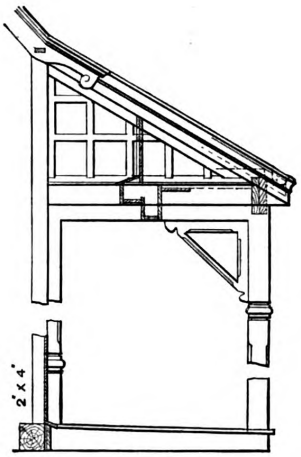
Design for a Cottage.—Elevations.—Scale, ⅛ Inch to the Foot. Details.—Scale, ¼ Inch to the Foot.

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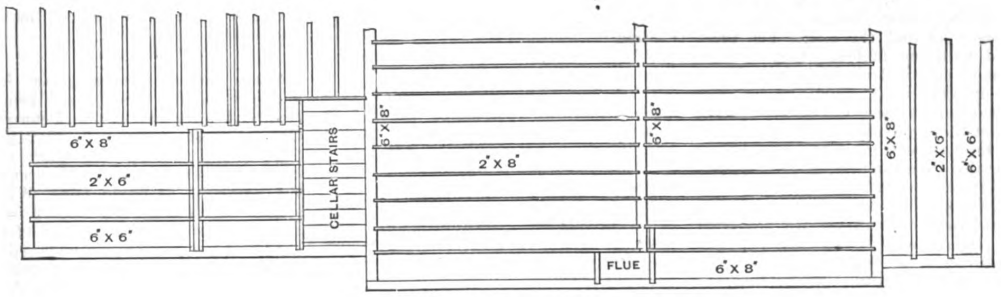
Rear Elevation.

inches wide, surfaced on one side, nailed on diagonally, covered with rosin building paper and finished with clear ½-inch siding, with cut shingles in the belt course. The roof is covered with best 16-inch sawed

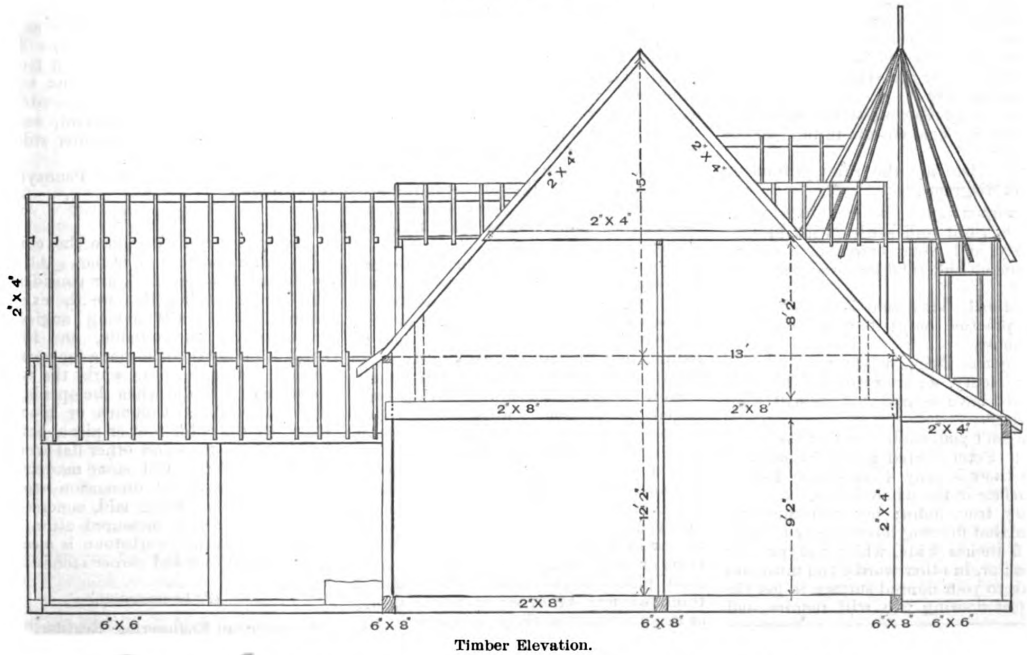


Detail of Front Porch.—Scale, ¼ Inch to Foot.

spruce shingles, 5 inches wide and laid 5 inches to the weather. The porch roofs have tin lined gutters. All the exterior finish is of ⅞-inch B selected white pine. The estimated cost of the structure is $1500 for the locality mentioned.



Portion of Timber Plan.



Timber Elevation.

Design for a Cottage.—Elevations and Timber Plan.—Scale, ⅛ Inch to the Foot.

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SOME PARADOXES.*

NEXT, JOHN THINKS he will stop at the quarry on his way home and pay for the stone before the bill has time to swell, as it surely will if Chipp's figures get out.

"Well, Mr. Flint, how much money do you want for the stone I got of you? We are done hauling and I thought I would settle while I had money."

"A good idea, Mr. Henry. Let's see, you owe me for 158 perches, which at $1.25 a perch, makes $197.50. Shall I give you a receipt?"

"Yes, but I want to know how you figure it."

"You took your stone off the end of that long pile, didn't you?"

"Yes."

"Well, we reckon 28 cubic feet for a perch when piled in that way, and that is the way we measured yours. How much do you think you ought to pay for?"

"Peter measured the wall and he made 160 perches, and Rubble had me charged with 174."

"Well, I presume that Rubble is right; quarrymen charge for the actual measure and masons measure extras."

The next paradox John finds is when Trowel, the bricklayer, announces the completion of his part of the work and presents a bill for laying 41,418 brick. John remembers his experience with Rubble, so he does not like to dispute the bill, but shows it to Peter, who says he knows it can't be right as his figures make but 31,700 brick hauled, so John and Peter drive over to the kiln and are pleased to find the maker has them charged with but 32,000, which amount John pays for, and on his return home counts up 1240 brick which he has left over, and asks to see Trowel's measurements, at the same time intimating that he knows he has used no more brick than were hauled from the kiln, and shows him the receipted bill from the brickmaker.

"Well," says Trowel, "if that is what you base your opinion on we are both right. It is true we have actually put into your house but 30,760 brick, but by measurement according to bricklayer's rules, we have laid 41,418. The corners of a building we measure double, hollow walls count solid unless the hollow is four inches or more in width, chimneys and piers we measure three sides and count solid, and no allowance is made for windows or openings unless their area amounts to 100 square feet."

"Can you prove your statement of this rule being the legal custom in this part of the country?"

"Yes. Here are the rules printed in full with diagrams."

Whereupon John is convinced that Trowel is right and settles with him accordingly, and Peter enters in his arithmetic under the rule for brickwork, the sentence:

"Caution! This rule is intended for school practice only: it won't work on Dad's house."

Next comes Chipp, who says:

"Mr. Henry, we are ready for the flooring, and I have figured that we will want 6200 feet."

"Haven't you made some mistake, Mr. Chipp? Peter figured all the rooms, and he says there is only 4900 square feet of floor surface in the whole house."

"Very true, John; but you must remember that flooring boards only average about 5 inches wide, while you pay for 6 inches; or, in other words, you must add one-fifth to your figured surface to get the amount of flooring you will require, and you may also do the same thing for the siding for that summer kitchen."

John scratches his head and tells Peter to make a note of that, so he will not be surprised when he comes to settle with Chipp. "And, by the way, Mr. Chipp, have you any more little back action tricks like that to get me into?"

"Yes; before we get through we will find several, but I will let you know in time."

Our hero's next adventure is with Mort, the plasterer, who also does the lathing. Mort says it takes 1700 lath to 100 square yards. Peter and he then calculate that about 10,200 lath will be required to cover the surface necessary to be lathed, or about 600 square yards, and in the end their estimate proves to be about right. Mort, however, charges up on his book at the completion of the work:

John Henry to Mort Dr., to lathing 658 square yards.

"How is that?" Peter asks. "Ain't you a little off to-day?"

"No, Peter, we are allowed to measure from the floor to the ceiling and to count in all the windows and doors, because it is as much work to cut the lath and work round the openings, as to cover the space they take out."

"How about the washroom, that is wainscoated 3½ feet high? Do you count from the floor to the ceiling on that room?"

"No, only from the top of the wainscoating. We let the carpenter work in his one-fifth extra material on that wainscoating."

"Well, how do you measure the plastering 9 square feet to the yard?"

"Yes, but we measure from floor to ceiling and count in all openings unless they measure 150 feet in area. All attic and irregular rooms are counted square."

"How much plastering will there be in the house by your rule?"

"1468 yards."

"Well, that beats the Jews again," and Peter makes a note in his arithmetic under the title plasterer's work, "This rule is no good in Iowa."

The last paradox John finds is when his painter brings in a bill for 1395 square yards, whereas Peter's figures only made 670 yards, so he asks Sable for an explanation.

"We used six colors on your house, Mr. Henry, and it is true that some of the trimmings were only 1 inch wide, yet we are permitted by the painters' rule to call them one foot wide. That ginger bread moulding of yours counts up fast. You have two colors on it, each of which counts a foot wide, though actually measuring only 2 inches, and besides, we measure all them quirks that Chipp put on your frieze brackets."

As the specifications do not state how the work shall be measured, there appears to be no way out of the dilemma but to settle, so John pays the bill under protest, and wisely resolves that the next time he builds, he will have his specifications so drawn that they will say what they mean.

Now, brother Surveyors, having completed my allegory and detailed in part the perplexities of our perhaps not wholly mythical John Henry, is there one of us who has ever been called to measure artisans' work who has not experienced to some extent the same trouble and uncertainty as to the proper manner of doing it; for in the absence of express specifications or terms in the contract, custom in most places is the guiding rule, and I think we may safely say there are nearly as many customs as there are cities in the United States

In proof of this proposition I will give a few of the many rules that are in use for the measurement of common masonry, and the authorities for the same. I have selected this material as it is one that the engineer in common with the architect is more generally called on to specify in their construction works.

1. Our law-makers have given us the following rule as their opinion of what is required on this subject in Iowa:

RULE 1.

Section 2050 of Chapter 1 Title XIV of the Revised Code of Iowa, says, "A perch of mason work or stone, is hereby declared to consist of 25 feet; cubic measure."

This rule is certainly brief enough for the purpose, and in the case of Harris *vs.* Rutledge, 19 Iowa, 388, I find the following construction put upon the meaning of the above statute by our supreme court, viz.:

"Where contracts do not show upon their face that they were made with reference to some custom, the provision of the statute in regard to weights and measures will govern in determining the rights of the parties thereunder." It will be seen that neither the statute nor the rule of the court cited above specify whether openings are to be deducted or not, and whether corners count double or only once, so, notwithstanding the plain English of the code, the manner of measurement is still much a matter of custom, and subject to the rules of the locality where the work is situated.

RULE 2.

There are two rules given in Carnegies' Pocket Book, as being the custom in general use in Pennsylvania. One is by the net perch of 24¾ cubic feet where all openings are counted out. The other is gross measurement by the perch of 25 cubic feet. With this system all openings less than 3 feet wide are counted solid, all more than 3 feet wide are taken out, but 18 inches is added to the running measurement for every jamb built. Arches are counted solid from the spring of the arch and nothing allowed for arching; the corners of the buildings are measured twice; pillars less than 3 feet square are counted on three sides as lineal measurement multiplied by the fourth side and depth. If more than 3 feet, the two opposite sides are taken, and to each side 18 inches for each jamb is added to the lineal measurement thereof, and the whole multiplied by the smaller side and multiplied by the depth.

Professor Haupt of the Pennsylvania University says:*

RULE 3.

Masons generally compute the contents of a wall in perches of 22 feet. All walls less than 16 inches thick are considered of that thickness, but if more the excess is charged for; walls having angles are measured on the outside, and for the material, allowance is made for openings, but in computing the work the wall is measured as if solid when the openings are less than 4 feet. Columns or blocks of stone, by the cubic foot or piece, chimney pieces, slabs, flags and other flat work by the square foot. Cut stone masonry and coping composed of dimension stone is measured before being laid, concrete and rubble are usually measured after being placed in position, curbstone is measured by the lineal foot and corner stones by the piece.

(To be continued.)

* Continued from page 232.

* "American Engineering Register," 1885, page XXXVIII.

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A SYSTEM OF FRAMING ROOFS.*

BY DAVID H. MELOY.

BEFORE BEGINNING to lay out the frame work of a roof it is necessary to know its size and form and what pitch the roof will have and dimensions of the timber to be used. All this is given in the plan, Fig. 1, which shows one-half of the roof. This building is 16 feet wide and 22 feet long. The roof will rise 6 inches to each foot, making it 4 feet high in the center. The timber to be used is of the following dimensions: Two wall plates 4 x 8 inches, 22 feet long, and two wall platas 16 feet long, 4 x 8 inches; four hip rafters 4 x 8 inches, 15 feet long; one ridge pole 2 x 9 inches, 6 feet long; ten common rafters 2 x 6 inches, 11 feet long; eight jack rafters 2 x 6 inches, 8 feet 10 inches long; eight jack rafters 2 x 6 inches, 6 feet 8 inches long; eight jack rafters 2 x 6 inches, 4 feet 6 inches long; eight jack rafters 2 x 6 inches, 2 feet 4 inches long. All the timber should be assorted and piled separately, so that you may know that it is full and what each stick is intended to make before any of it is laid out. Select straight sticks and of uniform size for making the pattern. No other plans or drawings of any kind are required to be made when this system of framing is once learned, and not a mark need be made more than what is marked on the timber to work to.

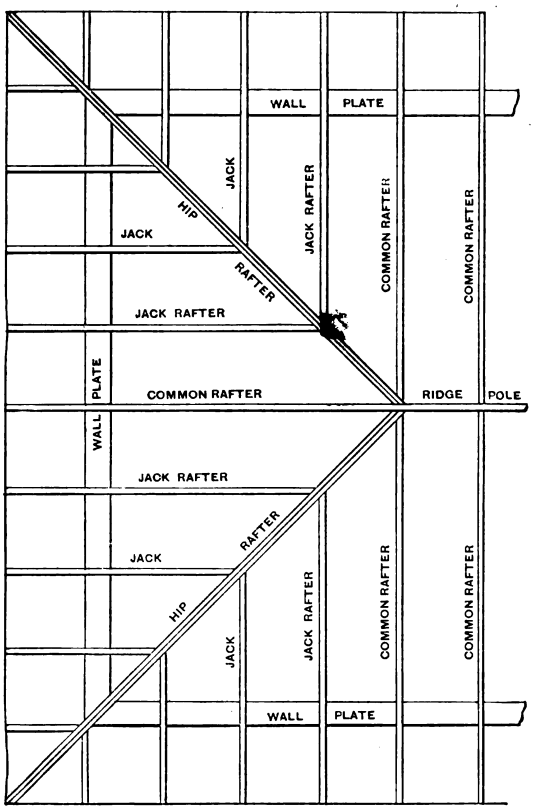


Fig. 1.—Plan of One-half of Roof.

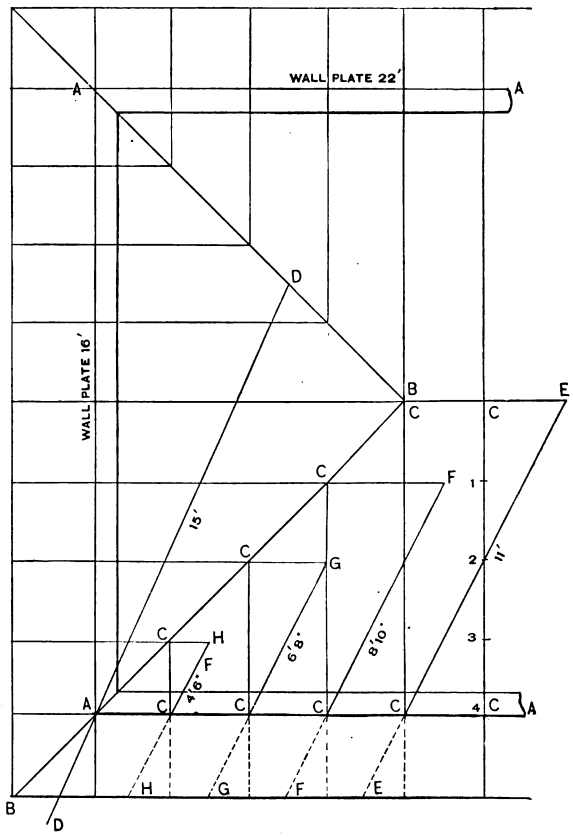


Fig. 2.—Showing Method of Obtaining Lengths of Timber in a Hip Roof.

A System of Framing Roofs.

LENGTHS OF TIMBER IN HIP ROOFS.

Fig. 2 is another plan of the same roof as No. 1, and shows the method of obtaining the lengths of all the timber in a hip roof. The lines AA represent the outer face of the wall plates. The lines BB represent the plan or run of the hip rafters. The lines CCCC represent the plan or run of the common and jack rafters. The line DD represents the pitch and length of the hip rafters and is 15 feet long. The line EE represents the pitch and length of the common rafters. The lines FF, GG, HH represent the pitch and length of the various jack rafters. The line BE represents the ridge pole. BD is the rise of the hip rafters and BE is the rise of the common rafters, which is the same as the hips and is 4 feet high or rise in this roof. CF and CG and CH are the rise of the various jack rafters. All of these rafters can be measured by the scale 4 feet to 1 inch near enough for making a bill of the timber. D to D is the length of the hip rafter and is about 15 feet long. E to E is the length of the common rafter and is about 11 feet 3 inches long. F to F is the length of the first jack rafter and is about 8 feet 10 inches long. G to G is the length of the second jack rafter and is about 6 feet 8 inches long. H to H is the length of the third jack rafter and is about 4 feet 6 inches long. There will be short jacks at all the corners, which will be 2 feet 4 inches long.

TO LAY OUT THE COMMON RAFTER.

Lay the square on the side of the stick to be fitted near the top end at figures 6 and 12 inches, the pitch of the roof, as shown in Fig. 3. Mark the down bevel A B. Square across the back of the rafter from A to C. Cut to marks C A B.

To find the length of the common rafter with a common pocket rule take the distance on the square diagonal from 6 to 12 inches, or from A to E, as shown in Fig. 3, and set it off along the top corner of the rafter as many times as there are feet in half the width of the roof, as shown by A E F. In a roof of this pitch the distance will be 13$\frac{1}{16}$ inches and must be set off eight times. Should there be a fractional part of a foot in the width of the roof, say 3 inches, place the square again on the stick same as before and at last point, and as for another run, and set off the distance required on the blade, as shown at G. Move the square along and mark the down bevel H I through the point G. Always remember to take out half the thickness of the ridge pole when laying out the rafters. Should there be a deck in the roof, the deck plates should be in line with the ridge pole, both on the face and on the top, so that the top end of all the rafters will fit alike on both the deck plates and the ridge poles.

TO LAY OUT SEAT OF COMMON RAFTERS.

Having found the length of the rafter according to and as shown in Fig. 3, and which point of length is at A, Fig. 4, lay the square on the side of the stick with the pitch of the roof 6 x 12 inches as before and as shown in Fig. 4, and mark the down bevel A B. Set off from the top of the stick on the down bevel line the hight you wish the rafter to stand above the plate, say 3 inches, as shown from A to C. Move the square along on the side of the stick toward the top end, until the edge of the blade comes to the point C, as shown

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by the square in dotted lines. Mark along the blade of the square the seat of the rafter C D. Extend the seat line full across the stick, whatever it may be, to D. Square across the underside or bottom of the rafter from B to E, and from D to F, and the lay out of the common rafter is completed. Cut to marks E B C, which is the plumb cut to fit against the outside face of the plate. Cut also to the marks F D C, which is the level cut to fit on the top of the plate. The bottom end of the rafter projecting outside of the plate may be cut to suit the detail of the cornice, and should be fitted before being set up, if any fitting is required. If the end is only to be cut to length it can be done best after they are set up.

TO LAY OUT THE JACK RAFTERS

First determine how many jack rafters there will be on one side of the hip, which in this case is three rafters and four spaces, as shown in the plans, Figs. 1 and 2. Divide the common rafter into that number of equal parts, which will give the different length of all the jack rafters, as shown at A and C, Fig. 5, which is one part, and shown also in the plans of the roof, Figs. 1 and 2, and marked 1, 2, 3, 4. The bottom end of the jack rafters are laid out the same as the bottom end of the common rafter, and is shown in Fig. 4. The down bevel for the top of the jack rafters is also the same as the down bevel for the top of the common rafter and is shown at A B, Fig. 5. To mark the side bevel, find the exact thickness of the stick at this end and set off the distance at right angles from the down bevel to the top corner of the stick at E. Square across the back of the stick to F, and mark the diagonal A F, which will give the bevel required to fit against the side of the hips. Cut to marks F A B. Select a straight rafter for the pattern. When the patterns are accurately made according to the above rule, set bevels for laying out the other jacks, one for the plumb bevel and another for the side bevel. Fit jack rafters in pairs.

TO LAY OUT HIP RAFTERS.

Hip rafters are laid out the same as common rafters, except that 17 inches is used for the run instead of 12 inches as for the common rafter, because it requires 17 inches run for the hip rafter to equal 12 inches run for the common rafter, or because 17 inches is the hypothenuse of 12 inches square. Lay the square on the side of the stick at the top end, as shown in Fig. 6, with 6 inches and 17 inches the pitch of the hip rafter, and mark the down bevel A B. Find the exact thickness of the stick at this end, and set it off at right angles to the down bevel A B, and mark the top corner of the stick at C. Square across the back of the stick from C to the opposite side, E. Mark the diagonal A E. Cut to marks, E A B, which will give the side and down bevels against the ridge pole. If the hip rafter is to fit against the corner of a deck plate then square across the back from A to D, and lay out the opposite side the same as above, and mark diagonel, D C. Cut to marks, A B, to the center F and D B on opposite side to center F. If the hip is to fit against the straight ridge pole, cut through one way only, either right or left, as may be required, or as first laid out. This will complete the layout of the top end of the hip rafter.

(To be continued.)

WHAT ARE TERMED hollow cast iron bricks form the subject of a recent German patent described in the technical journals, the article being the invention of an Erfurt mechanic. As the name indicates, they are made of regular brick form and size, the walls being 0.12 inches thick, but no mortar or other binding material is intended to enter into their use, the method of fastening adopted being as follows: The upper and lower sides of the bricks are provided with grooves and projecting ribs, which fit into one another easily and perfectly, so as to make a uniform and complete union or combination. There are in addition two large circular openings in the upper side of each brick, arranged to receive suitably formed projections on the lower side of the brick above, one of these projections being also hooked shape, thus securing a more secure hold; and, in order that the joints be made and remain air and water tight, a fluid is applied to the surface of the bricks with a brush. The non-conducting air spaces in the bricks, and the ease with which they may be put together and taken apart without injuring them, are cited as some of the special advantages in their favor as a substitute for ordinary bricks and brick construction.

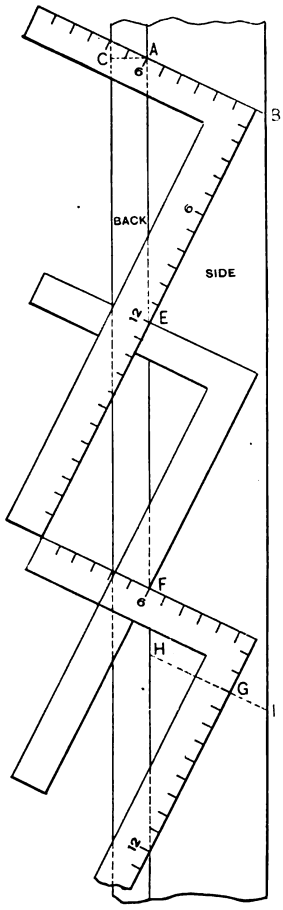


Fig. 3.—Method of Laying Out a Common Rafter.

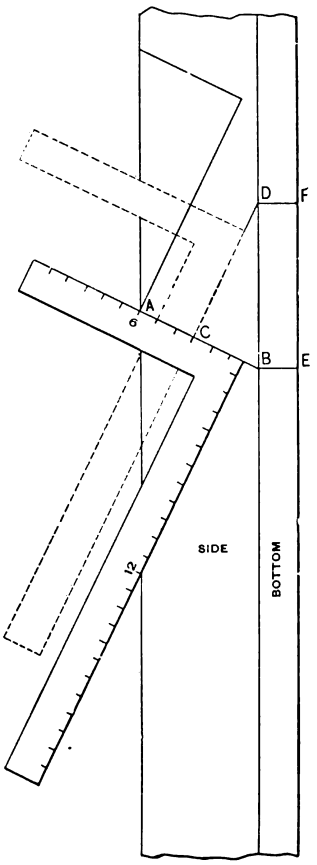


Fig. 4.—Diagram Illustrating Method of Laying Out Seat of Common Rafters.

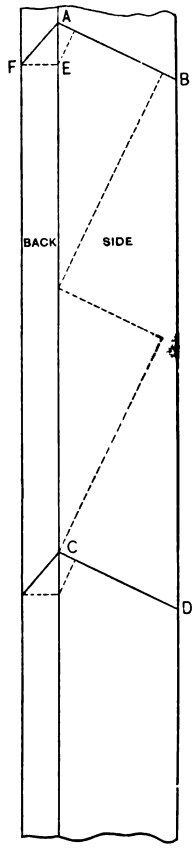


Fig. 5.—Method of Laying Out Jack Rafters.

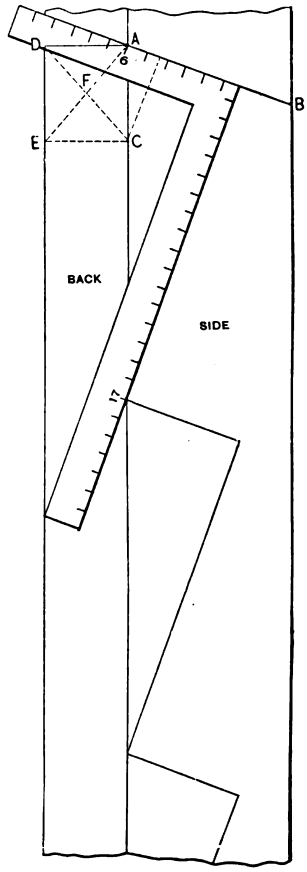


Fig. 6.—Method of Laying Out Hip Rafters.

A System of Framing Roofs.

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MASONRY AND STONE CUTTING.*

WE NOW COME to consider a groin formed by the intersection of a spherical dome with a barrel vault, the center line of which does not meet the center of the dome. In a previous article we have studied a similar intersection of vaults, but then the cupola was supposed to be constructed in concrete, whereas here it is constructed in stone, and, therefore, the stones which form the groin belong to both vaults, the barrel vault and the dome.

In Fig. 104 we have the square section of the barrel vault. Below it, in Fig. 106, we show the plan of the dome and the barrel vault which penetrates it. To find the plan of the groin formed by the intersection of the two surfaces, exactly the same methods are used as in the fifth article, where they are fully explained. But to determine a proper division of voussoirs in each vault we make a section of the dome, Fig. 105, placed by the side of the section of the barrel vault. We begin by drawing the jointing of the dome, and then divide the barrel vault in divisions small enough so that the first joint of the vault be lower than the first joint of the cupola. Here it is no more a question of taste, but if this precaution be omitted we shall be landed in inextricable difficulties; for the conical bed joints of the dome will intersect the cylindrical soffit of the vault and give us joint curves of a most complicated nature.

The reader no doubt remembers that the groin is obtained by cutting both soffits by horizontal planes, and that the intersections of the bed joints with the soffit of the dome are arcs of circles, which are projected on plan as portions of ellipses such as n N, m M.

After reaching the point N on the bed joint of the dome the plane of the bed joint of the vault intersects the cone of the bed joint of the dome. Points of this intersection are found by cutting both the plane of the vault joint and the cone of the dome joint by a series of horizontal planes. The intersection is, of course, a conic section; in the case of the joint n the intersection is an hyperbola projected on the plan in πN P. To find the point π we have drawn, Fig. 104, the line O′ π' parallel to O″ P″, Fig. 105. To find tangents to these intersections of the bed joints the plane tangent to the conical bed should be combined with the plane of the bed joint of the vault. The points where these tangents cut the axis of the barrel vault will serve as usual for finding the tangents to the real curves of intersection when drawing the bed molds.

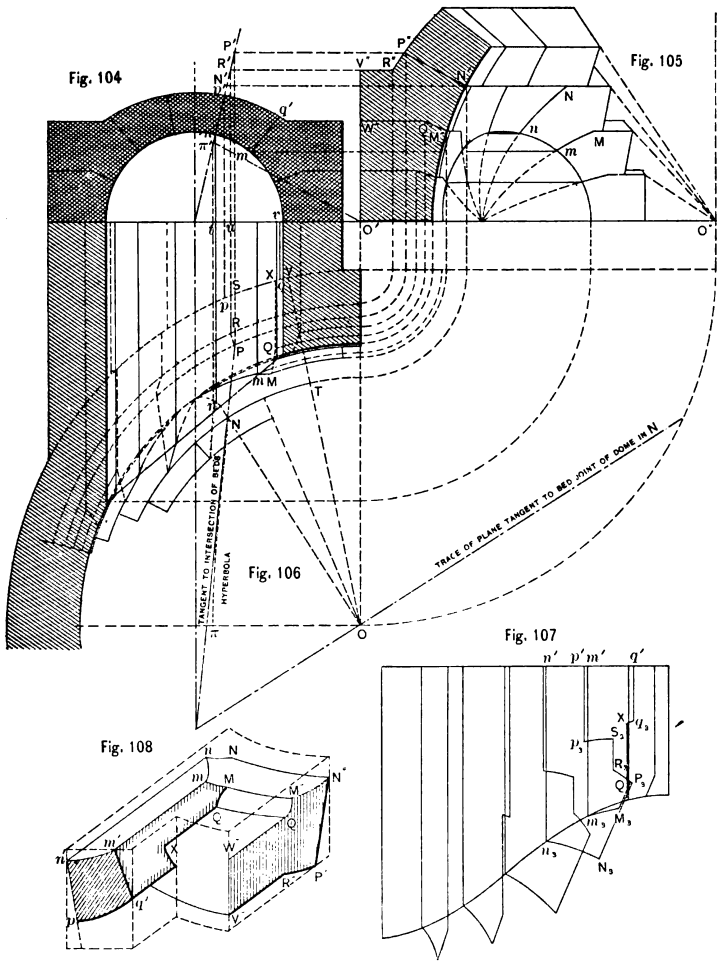
From the point P the plane of the bed joints cuts the extrados of the dome along the line P R, which is in reality an arc of a circle projected on plan as a portion of an ellipse. Then from R to S the bed joint cuts the horizontal plane V″ R″ of the dome voussoirs, Fig. 105, and from S to p the cylinder which forms the outside face of the lower rings of the dome, after which from p to u the bed joint cuts the extrados of its own vault along a straight line. Such are the series of intersections which have to be found to produce the voussoirs of this groin.

To give a clearer idea of the arrangement of the joint lines of this structure, in Fig. 105 an elevation of the arch and some of the voussoirs of the dome is given; but this drawing is not required for working the stones.

In Fig. 107 we give the development of the soffit of the barrel vault and the molds of the several bed joints, all of which are found by the usual methods. Some of these molds are somewhat complicated, such as the one marked n_1 n_2 N_2 P_2 R_2 S_2 p_2 p_1.

In Fig. 108 the voussoir is shown turned upside down. To work it a prism is formed which has a base equal to the plan of the stone t n N T V q v t, Fig. 106, and the hight of which is equal to the difference of level of the points m' and P′ (Fig. 104). On this prism the head molds m' n' p' q' and M″ N″ P″ R″ V″ W″, taken from Figs. 104 and 105, will be delineated. Then it will be easy to work the cylindrical soffit of the stone, and the planes of the bed joints starting from n' p' and m' q'. The plane of the bed joint n' p' can be worked right through the stone, and the mold of that joint, n_1 n_2 N_2 P_2 R_2 S_2 p_2 p_1, Fig. 107, will be placed thereon to delineate its outline. On the other hand, the plane of the joint m' q' must be worked progressively, until its bed mold can be exactly fitted thereon. The horizontal joint X Q Q″ W″ is easily worked, and its outline is given on plan, Fig. 106, by which we are able to delineate the curve Q Q″ The conical joint belonging to the dome can then be worked from the curve Q Q″ with the aid of a bevel set to the angle W″ Q″ M″, Fig. 105. On that conical surface the upper edge M M″ can be trammelled. The edge N N″ of the upper bed is also easily delineated on the concave cylinder forming part of the operation prism. We have now delineated all the lines M M″, M m, m n, n N, N N″, which surround the spherical soffit of the stone, and guided by these lines it is easy to work the surface with the help of a templet cut to the section of the dome. The upper conical bed joint is easily worked, as it presents no peculiarities beyond the joints of ordinary domes. The extrados P″ R″ would be worked with a concave templet, and the remainder of the stone offers no practical difficulties whatever.

Before leaving this subject, let us ask ourselves what would be the consequence of determining beforehand that the groin shall be a straight line on plan? This means that the intersection of both surfaces is contained in a plane; but the only line of that kind which can be drawn on a sphere is a circle. It follows, therefore, that the shape of the groin will be a circle, and as this groin is also a section of the cylinder of the barrel vault, it follows also that the square section of the barrel vault will be an ellipse, the vertical axis of which will be larger than its horizontal axis.



Masonry and Stone Cutting.—Figs. 104 to 108 Inclusive.

* Continued from page 230.

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Thus, it would be feasible to construct a perfectly regular cupola on pendentives over two parallel barrel vaults, or over the crossing of four barrel vaults, two running side by side parallel in one direction, the two others running side by side at right angles with the former. We see thereby, also, that it would be possible to start from the eight arches which support the cupola of St. Paul's, a nave and two aisles in one direction, and a cross vault at right angles with them, without its presenting the slightest appearance of trickery. The only irregularity would be that, if the nave were semicircular, the aisles would have to be of semi-elliptical section.

To Prevent Sagging Floors.

In the early part of the current year a very interesting discussion took place in the columns of the *Building Register* between a contractor and builder and an architect, both of Washington, D. C., relative to a method of strengthening floors, and thereby preventing a tendency to sag. The discussion was provoked through a communication written by the contractor and builder in reply to a request on the part of the journal above referred to for a formula approximating additional strength to floors by the addition of layers. As the matter is one in which many of our readers are more or less interested, we present in full the plan advocated by the contractor and builder for preventing floors sagging. The correspondent says:

In answer to the request in the *Building Register* for a formula approximating additional strength to floors by the addition of layers, would say, I have made a practical test by building a platform on joist supported on ends. 1. laying a floor of ⅞ tongued and grooved boards in the usual way upon which I applied a weight sufficient to spring the joist 2¼ inches.

Taking an accurate measurement of their deflection, I removed the weight and laid a second floor diagonally to the first, after which I applied the weight and found that it required a weight of 15 pounds to the square foot additional to spring the joist as much as under the first weight. I removed the second weight and laid a third floor of ⅞ boards at right angles to the second and found that it required additional weight of 25 pounds to the square foot to spring the joist equal to the first weight applied.

This test shows that the strength of floors can be very materially increased by the laying of additional courses. But in strengthening floors in this manner the shrinkage of the lumber must be taken into consideration, as any considerable amount of shrinkage would detract very much from its additional strength, as the increase of strength is an addition to the resistance of compression strains on the joist. Therefore it is necessary that the joints should be close to maintain their resistance. The shrinkage is counteracted to a considerable extent by the crossing of the grain of the wood.

I think from my test that two-thirds of 15 pounds to the square foot for the first additional course, and two-thirds of 25 pounds to the square foot for the second course, may be safely relied on as the increased strength. But ordinarily, to obtain any considerable amount of strength by the addition of extra courses of flooring would be rather expensive.

There is a very great advantage, even in dwelling houses, of first laying on the joist diagonally, a floor of cheap boards dressed to a thickness, but not tongued and grooved, upon which can be laid the tongued and grooved flooring after the plastering is completed. By this means the tongued and grooved flooring is left clean and dry, and an additional strength of 10 to 15 pounds to the square foot is secured.

This communication brought out a letter from a Washington architect, in which exception was taken to some of the statements made in the letter published above. The architect was of the opinion that while the deductions of the contractor and builder might, perhaps, be correct for all floors of the size used by him in making the experiment, the formula could not be applied with correctness to floors of varying sizes. In the opinion of the architect the bearing strength of floors, beams, joists, &c., could not be determined by any mere rule of pounds to the square foot without reference to the clear space between supports. "It is evident," he says, "that the greater the span the less will be the bearing strength per foot. In preparing a formula to be used generally it is necessary to consider the span between walls or supports, the space between joists, the degree of flexibility of the flooring, as well as the various strains exerted when the weight is applied." In the opinion of the architect an approximate formula could be prepared by making practical tests of floors of different spans and spaces and noting the relative proportion existing between the several spans, spaces and weights for each floor.

In answer to this criticism the contractor and builder replied as follows:

In answer to the criticisms on my formula for strengthening floors by adding layers, would say:

1. It is thoroughly understood that a long span requires stronger joists than a short span to carry an equal load.

2. The joists being the principal element of strength in the floor, it makes no difference whether the span is 10 or 20 feet. The same strength will be obtained on the 20-foot span as on the 10-foot span (that is, to the square foot), by adding the three thicknesses of flooring.

If the joist are strong enough on a 10-foot span to carry a load of 400 pounds to the square foot, by laying three thicknesses of flooring they will carry a load of 425 pounds to the square foot.

If the joists are strong enough to carry a load of 400 pounds to the square foot on a 20-foot span, by laying three thicknesses of flooring they will carry a load of 425 pounds to the square foot.

Therefore, the difference in span has nothing to do with the additional strength obtained by adding courses of flooring, but applies only to the joist.

In the next issue of the *Building Register* the architect presented the following views upon the floor question:

In Mr. Parsons' defense of his formula he advances a very startling theory, to wit: That although the span affects the strength of joists it does not affect the strength of flooring boards. According to his theory a floor 10 x 10 feet, the joists in which are capable of sustaining a weight of 400 pounds per square foot or 40,000 pounds, will be increased in capacity to 42,500 pounds by the three layers of flooring, and a floor 20 x 20 feet, under the same conditions, will be increased from 160,000 pounds to 170,000 pounds, an increase in the one case of 2500 pounds and in the other 10,000 pounds. If this is correct we can remove the joists, and by supporting each floor on four posts, one under each corner, secure two platforms of equal thickness, one capable of sustaining a weight of 2500 pounds and the other 10,000 pounds, the capacity of each being limited only by the number of square feet it contains without reference to the distance between supports.

This remarkable discovery will revolutionize our methods of construction when fully understood. We need no longer use joists in our dwellings, or if joists are essential to make the formula good we need use only the lightest kind. For a room 14 x 20 feet we can use say 2 x 3 inch joists, which, if spaced 16 inches on centers will have a bearing strength of say 1500 pounds. The three layers of flooring will add a strength of 7000 pounds, making the capacity 8500 pounds, certainly enough for ordinary use.

Having formulated this most remarkable rule, perhaps Mr. Parsons can give us a reason for the peculiar properties belonging to this kind of floor dealing out its strength as it does impartially 25 pounds per square foot, alike to all kind of joists, thick and thin, wide and narrow, long and short, adding nothing of its own weight, be its volume great or small, paying no attention whatever to spans, spaces or supports, and in fact being governed by none of the laws with which we have heretofore been familiar.

In order to make clear to the architect that the strength of floors could be computed by the square foot the contractor and builder replied as follows:

A joist 2 x 10 10 feet long will carry a load of 2700 pounds. Seven joists 2 x 10 required for a floor 10 feet square will carry a load of 18,900 pounds. Increase the depth of these joists 3 inches and they will carry a load of 31,900 pounds. Lay three thicknesses of flooring on the seven joists 2 x 10 and they will carry a load of 21,500 pounds, calculating the strength of the flooring at 25 pounds to the square foot.

One joist 3 x 12 20 feet long will carry a load of 2850 pounds. Sixteen joists 3 x 12 20 feet long required for a floor 20 feet square will carry a load of 45,600 pounds. Add 3 inches to the depth of these joists and they will carry a load of 75,232 pounds. Lay three thicknesses of flooring on these 3 x 12 joists and they will carry 53,600 pounds.

These calculations show that by taking the increased strength of the joist, by adding to its depth and calculating its strength, respective of its span, and calculating the flooring by the square foot, that they agree. Therefore, the formula of calculating by the square foot must be correct, and it is no "startling theory" or "remarkable discovery" nor difficult to understand.

The calculations of the strength of joist are the safe loads that they will carry, and not their breaking weights. The formula I gave of the strength obtained from laying three thicknesses of flooring was from a practical test. The calculation of the strength of joist is also from practical test, long since made. It is clearly seen that to obtain strength from laying numbers of thicknesses of flooring is inexpensive and in most cases impracticable.

Floor Space.

As land gets more and more valuable, or, at any rate, dearer and dearer, it is desirable that more attention should be paid to economizing floor space. This is particularly the case in "flats," and in houses on narrow lots. Taking the average flat, or small city house, there is scarcely a room in which the builder could not make more floor room without increasing the floor area.

To start with the kitchen, it may be mentioned that the boiler is usually an upright fixture, supported near the floor on an iron stand placed close to the range. Turn the boiler on its side and perch it above the range, and floor space will be gained. The manner of setting may be such as to give greater heating capacity than with the upright arrangement.

The dresser generally is so arranged as to give the least holding capacity for a given floor space. It could be run up further toward the ceiling and made deeper at the top—in fact, given an overhang—and thus made to hold just as many pots, pans and dishes as before in but two-thirds the length and with but two-thirds the floor space. The sink, when boxed in, offers a premium on carelessness. With the casing removed, it gives more floor room, and with the usual curved iron legs replaced by light brackets, the arrangement is better yet. Stout shelves over the range, the door and the windows will make a kitchen practically larger.

In the dining room there is often experienced difficulty in finding room for a buffet or an old fashioned sideboard. The skilled designer can put over the mantel piece a buffet which will be at once an ornament and a convenience and thus increase the floor space.

In bedrooms, closets which run clear up to the ceiling may be made narrower than when they stop short at the 7-foot line. An extra wide window sill often does away with the necessity for a small table and thus increases floor room.

Where standing bedsteads are used there should be made under them a pair of large, deep drawers for holding extra pillows, bed clothing, &c., and that relieves the pressure on the other closets in the house. Over stationary washstands cupboards should be built.

In the parlor appropriate cabinet finish over the mantel piece provides suitable place for the display of bric-a-brac without taking up floor space with chiffoniers.

In the library overhead shelving for seldom consulted books would be as economical of space as the present "low-down cases" are wasteful thereof.

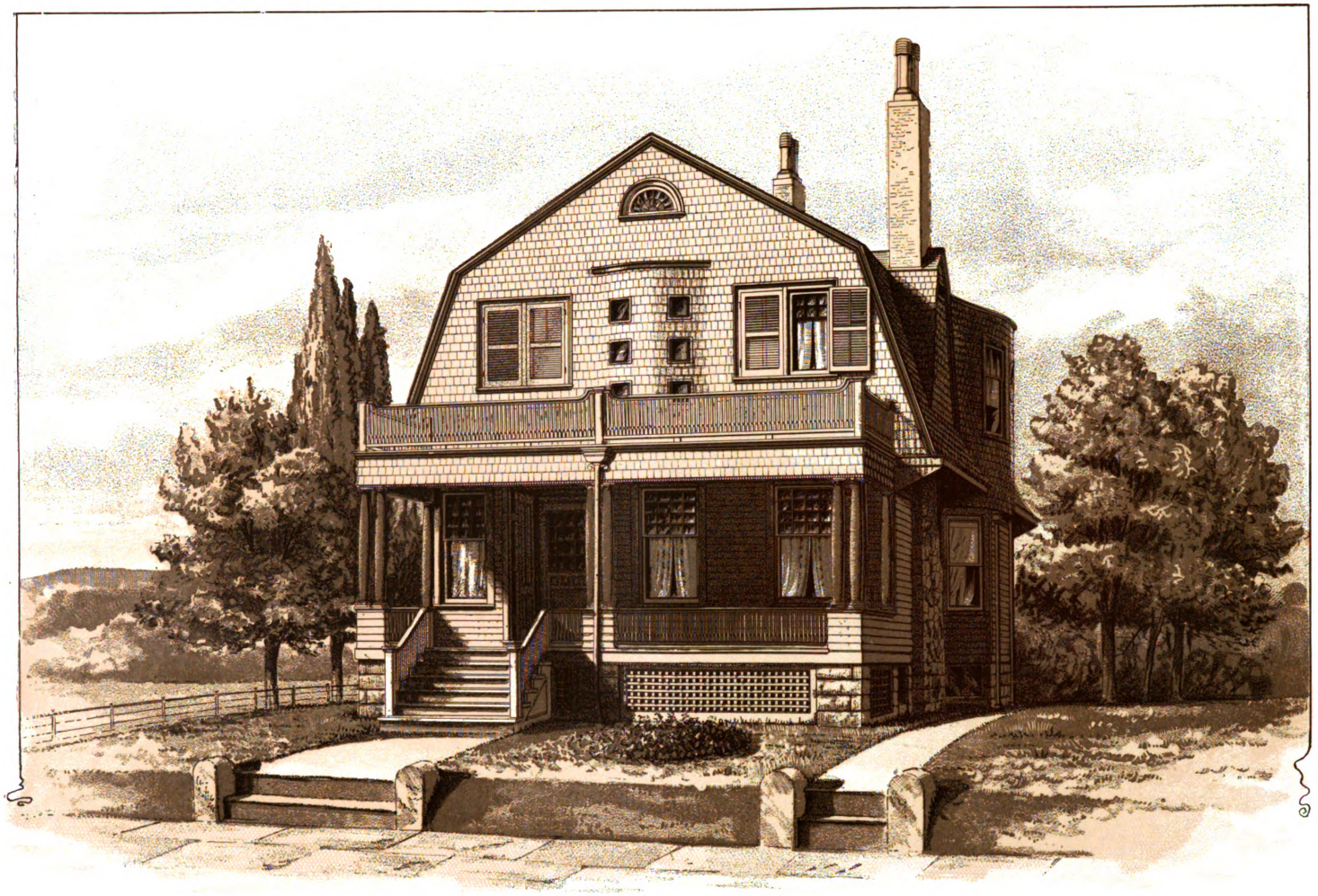
All through the house sliding doors save floor space where hinged ones would waste it.

A bay window adds materially to the area of the room, particularly a chamber or a dining room.

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A HOUSE IN CLEVELAND.

HARDWAY & WILLIAMS, ARCHITECTS, CLEVELAND, OHIO.

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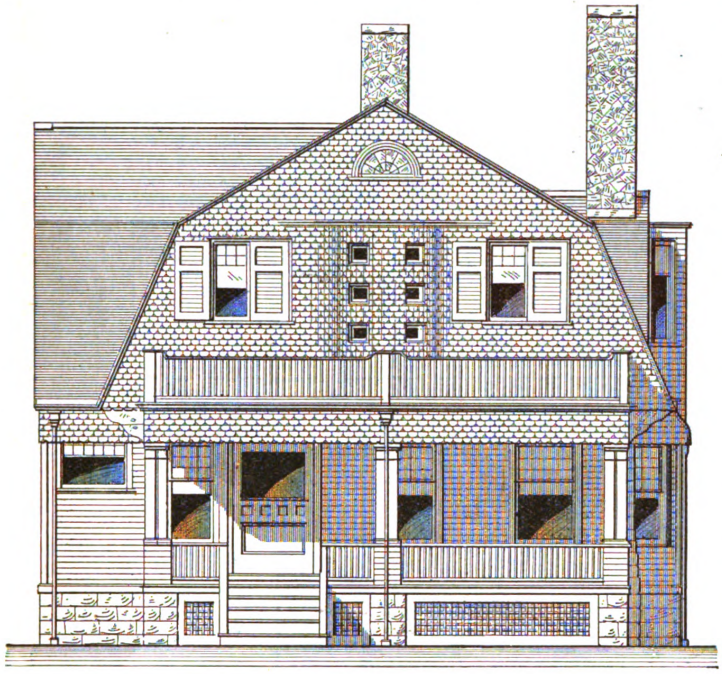
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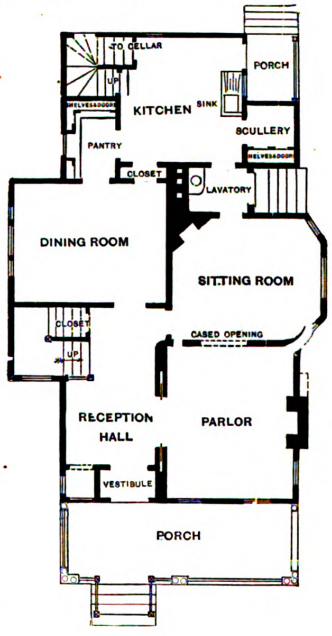
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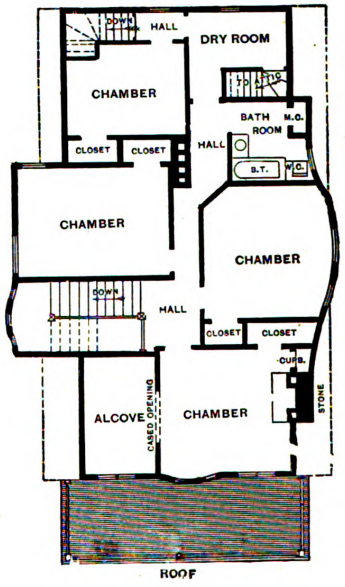
WHAT WILL be regarded by numerous readers of this journal as a happy illustration of the quaintness which modern architects affect in many of their designs at the present time, is shown by means of our supplement sheet this month and by the elevations presented upon this and the following pages. The house has been erected in Cleveland, Ohio, for Ezra S. Adams, from plans prepared by Hardway & Williams, architects of that city. In general style it takes one back to the old colonial days when chimneys of ample proportions and quaint shingled exteriors were predominating features of dwellings. When one comes to consider the interior arrangement, however, all idea of the ancient vanishes from the mind. The disposition of the various rooms, the ample reception hall, winding stairway, the modern means of communication between the different rooms, large panes of glass, good plumbing, and first-class kitchen facilities, place the house far ahead of the most elaborate dwelling of the time back to which the style of architecture carries one. The house illustrated in this issue is, by no means, a pretentious structure, but is typical of much of the good work of moderate cost that is being done at the present time in and about the city of Cleveland. It may be said to be a very happy illustration of what a man of average means has at his command at the present day, both in point of good taste and excellent accommodations. An inspection of the floor plans will show that, in addition to a commodious vestibule and ample reception hall, there are four rooms of good proportions upon the first floor, while upon the second floor are four sleeping rooms, one of which has an alcove. The details of which engravings are not presented at this time are in excellent taste and quite as simple as the general design would suggest, and so far as the exterior finish is concerned, can be readily gained from the elevations.



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



First Floor.



Second Floor.

Scale, 1-16 Inch to the Foot.

A House in Cleveland, Ohio.—Hardway & Williams, Architects, Cleveland.

THE QUARRYMENS' NATIONAL UNION held their first convention during the early part of August, at Quincy, Mass. The union was in session three days, and the attending delegates from Maine, New Hampshire, Vermont, Massachusetts, Rhode Island, Connecticut, Maryland, Virginia, Georgia, Missouri, Wisconsin and Montana represented 7000 organized quarrymen. The States of Colorado, Dakota, California and Pennsylvania were not represented at the convention, although organized under the American Federation of Labor. At this meeting a national constitution was adopted, and it was decided to hold biennial conventions, the next one to be at Concord, N. H., on the first Wednesday in August, 1892. It is stated that there are about 40,000 quarrymen in the United States, all of whom it is intended to embrace in the national union before the convention of 1892. The deliberations of the convention were presided over by Samuel Gompers, president of the American Federation of Labor. The national officers elected were as follows: President, Edward Flood, of Barre, Vt.; secretary, John, J. Byron, of Quincy, Mass. The Executive Committee is made up of the president and secretary, together with John Wilson, of Vinal Haven, Maine; Moses Lewis, of Richmond, Va., and Joseph Coleman, of Stony Creek, Conn.

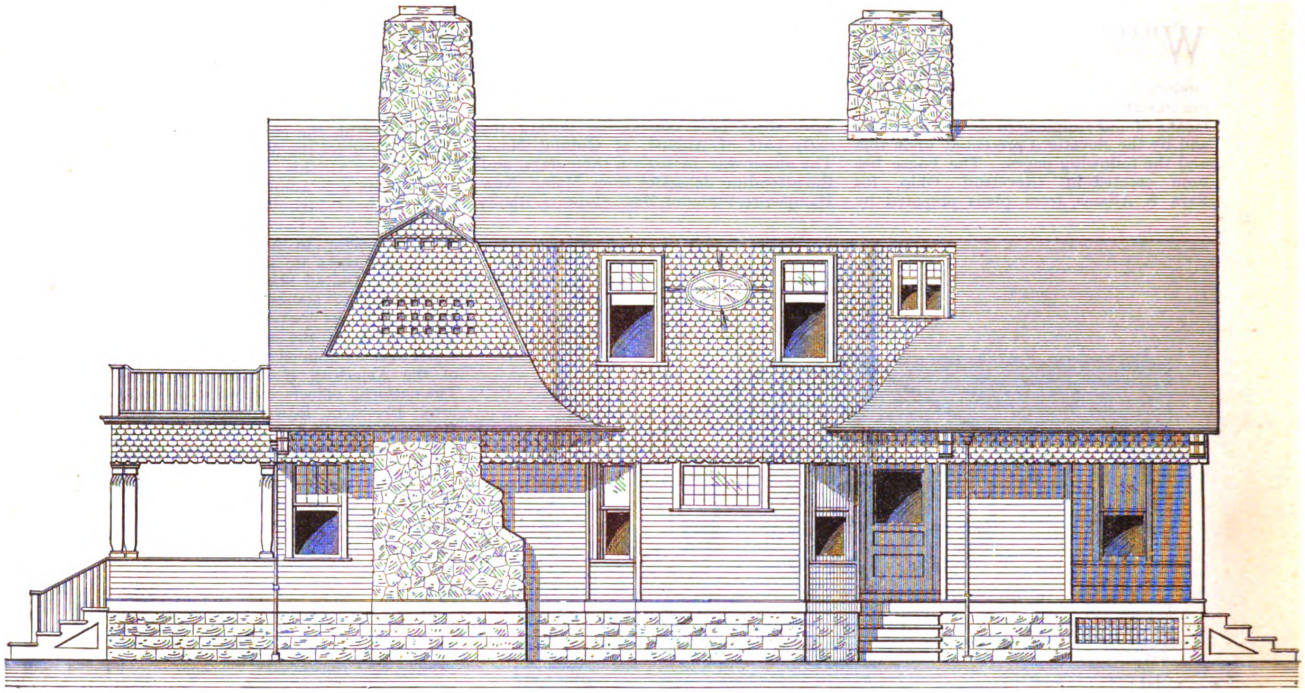
NEW PUBLICATIONS.

BRICKMAKING AND BURNING. By J. W. Crary, Sr. Illustrated; 122 pages; bound in stiff board covers. Published by T. A. Randall & Co. Price, $2.50.

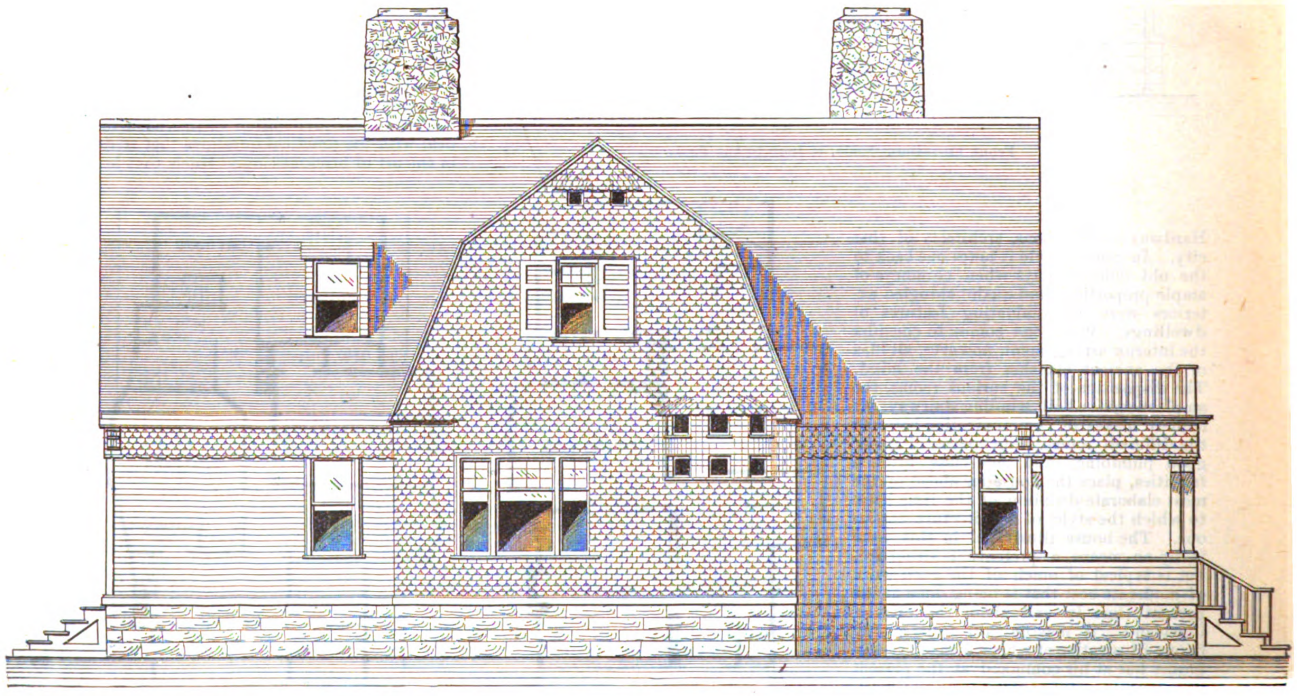
This is a practical treatise on brickmaking and burning, as well as on the management and use of different kinds of clays and kilns for burning brick. The author is a gentleman who has given a great deal of attention to the subject of bricks and brickmaking, and in the year 1867 began to compile material upon the subject. It has been the purpose of the author in the preparation of this book to deal with the practical questions that arise in the art of brickmaking. Much that he

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has learned has been the result of studying closely the action of matter and the laws relating thereto in his every day experience, covering 58 years of brickmaking in 11 States. A great deal of useful information is given relative to the management of clays, the drying, setting and burning of brick, and in the construction of kilns. In a supplement the author has given directions to beginners in the art of brickmaking and hints to bricklayers and builders. The main body of the work is composed of 11 chapters, while in the supplement there are three. An appendix to the supplement gives attention to "whitewash" in burning, the cause and the cure; and a paper on "The Theory and Practice of Brickmaking," read by Mr. Crary before the fourth annual convention of the National Association of Brick Manufacturers.



Side (Right) Elevation.



Side (Left) Elevation.

A House in Cleveland, Ohio.—Elevations.—Scale, ⅛ Inch to the Foot.

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MEASUREMENT OF ROOFS.*

BY TRIANGLE.

IN ORDER TO MAKE a tracing of an architect's drawing, it is convenient to place the drawing on the drawing board, place the tracing paper over it, and after placing the two sides so the lines in the drawing will be parallel with the T-square, fasten the two to the board by means of thumb tacks. By this means it is easy to make the necessary parallel and other lines, as the tracing paper is firmly held over the drawing. To determine if all of the required lines have been made, a piece of white paper can be slipped between the two, when any omissions can be detected. If these conveniences are not at hand, the tracing paper should be secured to the drawing in some manner, so as to be retained in one position until the copy has been made, the pocket rule being used in place of the T-square. Tracings thus made are very plain when placed on white paper. In Figs. 89 and 90 are shown the tracings made from the front and side elevations of a house illustrated in the issue of *Carpentry and Building* for December 1883, which will be used in connection with the plans shown in Figs. 87 and 88 for drawing the roof plan. Similar tracings could have been made of the plans, but as the intention is to show the reader how to draw the roof plan from the elevations and plans, it has not been considered necessary, so the plans will be referred to as required. When making tracings from plans or elevations, the reader is at liberty to make them as elaborate as desired, including such features as the circumstances require.

Before commencing to draw the roof plan it might be well to inspect the tracings of front and side and the plans, so as to obtain a general knowledge of the structure. From an inspection of the front, in Fig. 89, we can see that there are two gables, N M L and M J R. For an explanation of R K we look at the tracing of side, Fig. 90, and see by the dotted line O1 N1 that it is a hip. The side, Fig. 90, also shows that H A B is a gable, and in the absence of an elevation of the other side we are to suppose that C D E is also a gable. In the tracing of the front, in Fig. 89, we see that V U W shows the gable of porch, and in the side tracing, Fig. 90, T1 U1 shows the projection of porch gable from the vertical line of house. The second floor plan, Fig. 88, shews that part of the kitchen, the pantry and stairway are covered with a hip roof, which is shown in side tracing by *c o b*. When transferring distances from the elevations to the roof plan, it may be found convenient to employ the dividers; yet a scale or rule can be used, if desired. For convenience in drawing the roof plan shown in Fig. 91, we will commence with the side, although any other part would do as well. We will first draw N3 N4 of roof plan, in length equal to the distance in side tracing between H4 N1, as shown by the dotted line dropped from the point H1 to H4. At right angles to N3 N4 of plan draw N4 H1, in length equal to H G of front, and extend it to the right, equal to G *g* of front, as shown on plan by N4 G2. Thus H1 G2 of roof plan represent the eaves of the gable, as shown in front tracing by H *g*, and N3 N4 of roof plan also represent the eaves, as shown by N1 H4 of side tracing, which continue under the gable to N2, where they stop against the bracket shown in the perspective. The length of roof at eaves is shown on plan by N3 N2. When referring to Figs. 89, 90 and 91, it will be convenient to refer to them as front, side, and plan. At right angles to H1 G2 of plan, draw H1 H3, in length equal to the width of gable, as shown by H2 H1 of side, and also draw H3 G4 similar to H1 G2. For the ridge line on plan, bisect H1 H3 and draw A1 B2 as shown, in length equal to A B of front, which shows the length of ridge. By connecting G2 B2 and B2 G4 we have the valley lines, as shown on plan, but not

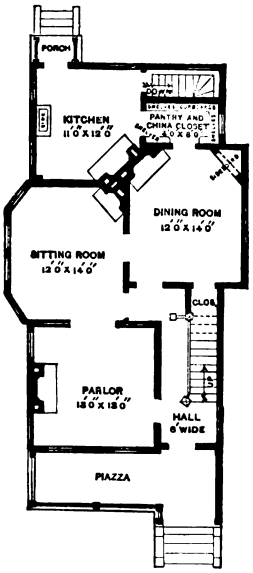


Fig. 87.—First Floor Plan.—Scale, 1-16 Inch to the Foot.

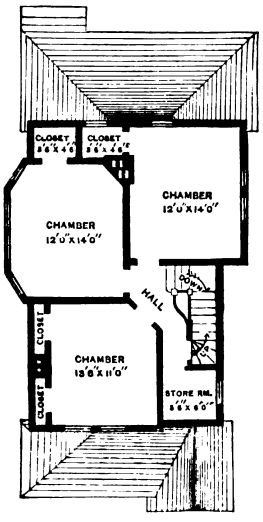


Fig. 88.—Second Floor Plan.—Scale, 1-16 Inch to the Foot.

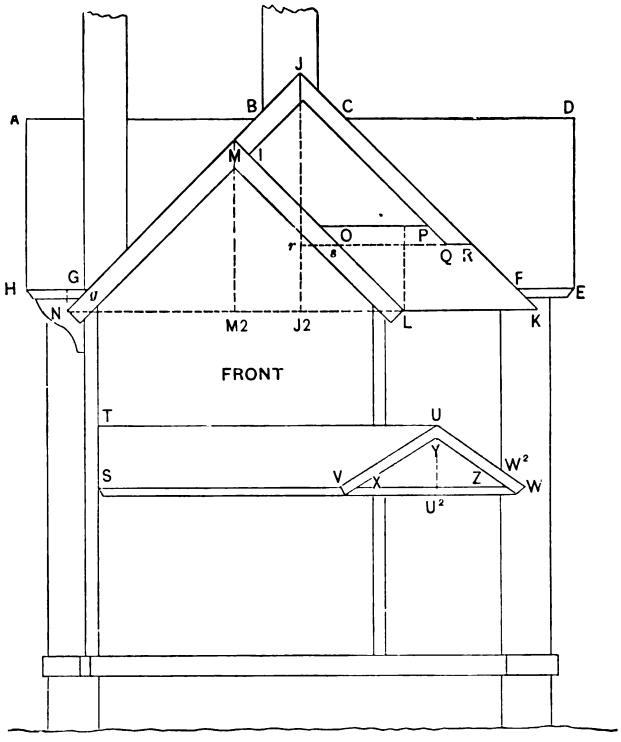


Fig. 89.—Tracing Derived From Front Elevation.—Scale, ⅛ Inch to the Foot.

Measurement of Roofs.

* Continued from page 225.

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the length of the valleys, as will be subsequeetly explained. Then H1 G2 B2 G4 H3 is the plan of gable shown in front by H A B *g*, and inside by H2 A1 H1. The reader who is not accustomed to architects' drawings will now understand what is meant on the plan by the line H1 G2 crossing N3 N4, that the eaves of gable extend on to main roof as far as the point G2. To complete the side of roof in plan, with the blade of the T-square even with N3 N4, draw N5 N6, equal in length to N4 H3 of side.

As the rear of house is not shown in either of the elevations, we must derive our information regarding its shape from the second story plan, Fig. 88. There we see that the rear line is unbroken, as is also indicated by the end of gable N4 J2 of side, which is a continuation, if it might be so called, of the gable N J K of front. To show the rear line of roof in plan: At right angles to N5 N6 draw N6 E4, in length equal to *g* E of front. An inspection of the front shows us that the two gables G H A B and C D E F are, or at least appear to be, alike. We can refer to the first story plan, and there measure the outer sides of the sitting room and dining room, or measure in a similar manner the outer sides of the two chambers in the second story plan. In either case they will be found to be alike. We accordingly draw E4 E2 at right angles to N6 E4, and in length equal to the front of the other gable in plan, and also draw the other lines in a similar manner. Then F3 E4 E2 F1 C1 shows the gable on plan that is represented by C D E F in front, being a duplicate of the gable G2 H1 H3 G4 of plan. If a rear elevation was to be shown, F3 E4 of plan would appear in the elevation as does H *g* N of front. As there is no elevation of this side of the house to refer to to complete our plan, we will finish the plan of front, of which there is an elevation, leaving the plan of side finished as far as F1 E2 of gable.

We commenced the plan by drawing N3 N4, and we will now draw N3 L3 of plan at right angles to N4 N3, in length equal to N L of front, which shows the width of gable at the line of eaves. To obtain the line of ridge on plan, we can connect N L of front by a broken line, and drop a similar line from M, intersecting the line just drawn, as shown, at M2, and transfer the distance N M2 of front to N3 M3 of plan, as shown. The length of ridge is shown by M1 M2 of side; consequently by drawing in plan M3 M4 at right angles to N3 L3, and in length equal to M1 M2 of side, we have the ridge line M1 M2 of side shown by M3 M4 of plan. To show the line of main ridge on plan: At right angles to M3 M4 set off M4 R1 indefinitely. Drop the perpendicular J J2 in front, and set off the distance M2 J2 in front from M4 in plan, as shown by M4 J3. Then J3 is the point of gable on plan corresponding to J in front. With the T-square parallel with the side line of plan, draw J3 J4 as shown, which gives the line of main ridge on plan. By referring to the second floor plan it will be seen that the front of store room sets back from the front of chamber, and as this plan is $\frac{1}{8}$ inch to a foot, which is half in size of the scale to which the roof plan is drawn, we will take twice the distance shown on second floor plan and set it off at right angles to N3 L3, as shown by L3 L4 of plan. Then draw L4 K1, in length equal to L K of front, and connect K1 with K2, which completes the outer line of plan. In the front we have drawn the broken line *r* R, parallel with N K and cutting J J2. By taking the distances *r s* and *r* R and setting them off from J3 of plan, as shown by O1 R1, we have the points necessary for drawing O1 L4, and R1 K1, showing the lines of valley and hip on plan. The outside wall line, which should be a duplicate of the second story plan, is shown by dotted lines. The distance from the outside wall line to the line of eaves should be equal to the projection of cornice. The plan of roof over the kitchen is shown in the second floor plan, Fig. 88, and to draw the plan of this roof in connection with that of the main roof we would take the projection from rear of building, as shown by *c p* of side, and use this distance for setting off the line of eaves in plan, shown by *f g*. The remaining parts of the plan of this roof are derived from the second floor plan, consequently it is not considered necessary to explain how each line is drawn.

When estimating from a set of plans, the reader should bear in mind that discrepancies are liable to occur between the different drawings in the set. Various causes may require certain changes to be made, and for the architect to go back and alter each drawing to conform to the change would require an expenditure of much time and trouble. If a roof plan is furnished, it may not represent each part of the roof as it will appear on the finished building. While the perspective view and roof plan are of great assistance in enabling one to form an idea regarding the construction of a building when estimating on a set of plans, it will be well to refer frequently to the elevations or plans to correct any errors that may be made. In the perspective and two elevations published in the issue for December, 1883, the end of roof is shown as a shed roof and does not pass beyond the front of house, yet in the second floor plan the roof is shown to have a hip, projects past the front and is returned against the side. In a case of this kind we will suppose the elevations are correct and will base our calculations accordingly. In the plan of porch roof, T1 S2 is the same distance as from S1 to wall line in side. S2 V2 of porch plan is derived from S V of front. The projection V2 V3 in porch plan is the same as S1 V1 of side, and the width of porch gable, as shown on plan by V3 W3, is similar to V W of front. By

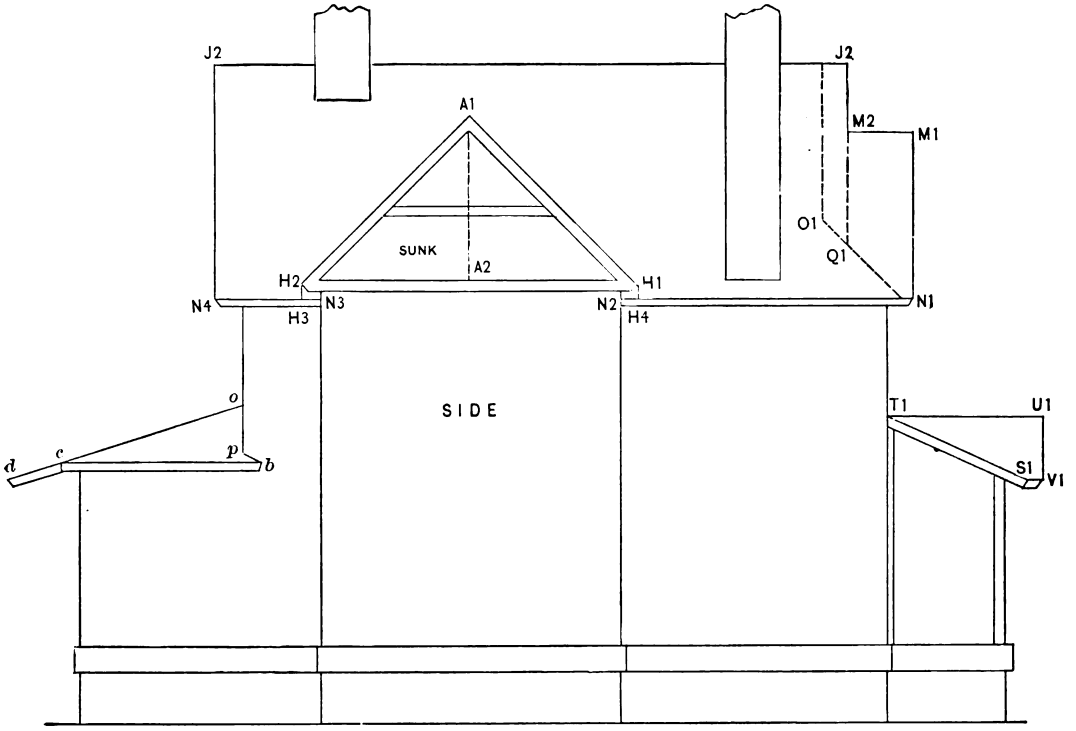


Fig. 90.—Tracing Derived from Side Elevation.—Scale, ⅛ Inch to the Foot.

Measurement of Roofs.

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dropping a line from U in front to U2, and taking the distance V U2 and setting it off from V3 in plan, as shown by U3, we have the point from which to draw the line U3 U2, showing the ridge of porch gable. By drawing V2 U2 of plan we show the valley line. An inspection of the second floor plan, or the front, will show that the part of porch roof at W in front extends past the side of house, and so we draw W3 W2 of plan of sufficient length to allow of a return against the side at W2. If the porch roof was to be covered with shingles, and the tinner was required to furnish the trough, conductor and valley, nice over bay window to be covered with tin. As there is no bay window under the gable on the right side of house, it is presumed that this gable is to be finished similar to the one in front.

A NOVEL ARCH, says a recent issue of *Engineering News*, was tested at Matzlendorf, Austria, May 16 and 17. The arch had a span of 32.8 feet, a rise of 3.3 feet, is 6 inches thick at the crown and 8 inches at the springing line. The material is composed of 1 part Portland cement and 3 parts clean river sand. At a

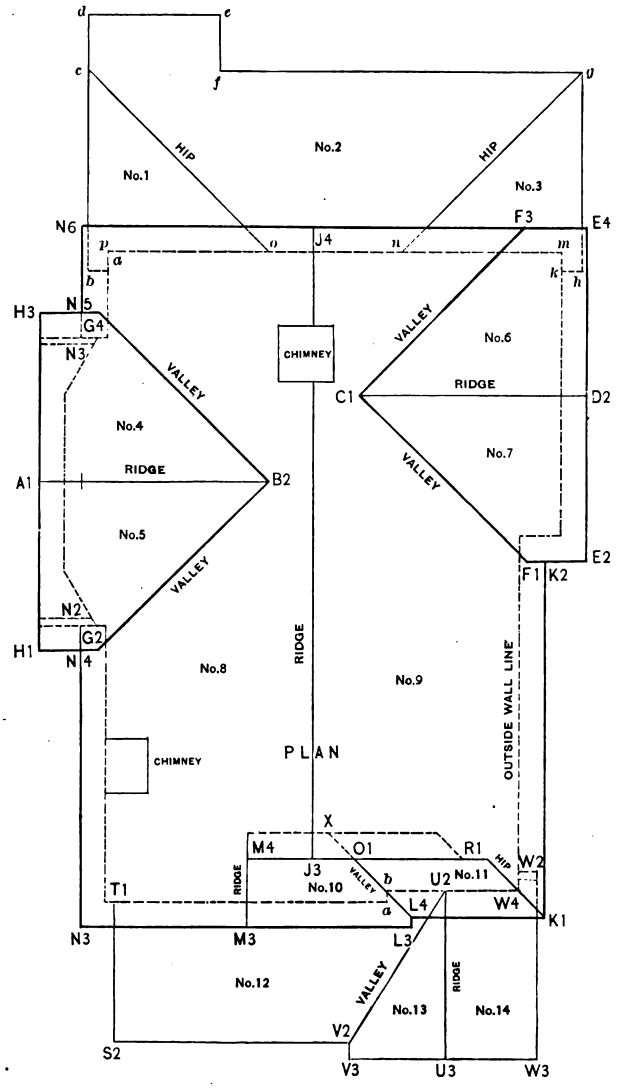


Fig. 91.—Roof Plan, as Obtained from Elevations and Plans.—Scale, ⅛ Inch to the Foot.

Measurement of Roofs.

S2 V2 V3 and W3 W2 of plan would give the length of trough, and it would be seen that a miter would be required at V2. It is probable the outlets for the two troughs would be at S2 and W2. From the front and side elevations could be obtained the shape and length of the two conductors The length of valley will be shown when the shape of roof is obtained. An inspection of the perspective view will show that the gable of porch slopes, and that part of the front of gable shown in side elevation is set back even with the wall line, which requires the part of cor-

A NOVEL ARCH, says a recent issue of *Engineering News*, was tested at Matzlendorf, Austria, May 16 and 17. The arch had a span of 32.8 feet, a rise of 3.3 feet, is 6 inches thick at the crown and 8 inches at the springing line. The material is composed of 1 part Portland cement and 3 parts clean river sand. At a distance of 0.8 inches from the soffit is a net of 0.39 and 0.27-inch wire, the thicker wires running transversely to the axis of the arch. The tests were begun by placing a locomotive weighing 40 tons over the crown, and after running this off placing a 53-ton locomotive over a half of the arch; the deflections were measured at 18 places on the soffit with each locomotive. Then a half of the span was loaded with 110 tons of rails, equivalent to a pressure of 1000 pounds per square foot, which resulted in a deflection of the crown of 0.12 inch. On the following day it was found that the crown had very nearly returned to its original position. A load of 188 tons, equivalent to 1741 pounds per square foot, of rails was next placed upon a half of the span. This weight caused the abutments to give way, and on increasing the load to 2000 pounds per square foot the arch sank without entirely breaking.

Law in the Building Trades.*

BREACH OF BUILDING CONTRACT.

In an action for breach of a building contract, it is proper, in order to aid in arriving at a correct measure of damage, for the complainant to show the cost of removal of defective material and of replacing the same in accordance with the contract.—Healy *vs.* Bulkley, City Court of Brooklyn, 10 N. Y. Sup., 702.

ENFORCEMENT OF MECHANIC'S LIEN.

Under the Nebraska statute unless an account of materials furnished be made under oath and filed with the register of deeds within 60 days after furnishing the materials a sub-contractor cannot enforce his lien.—McPhee *vs.* Kay, Supreme Court of Nebraska, 46 N. W. Rep., 223.

MEASURE OF DAMAGES FOR TERMINATING UNPERFORMED CONTRACT WITHOUT CAUSE.

A contract was entered into by which the plaintiff was to erect in the building of defendant a complete heating apparatus. Before work in the building was commenced, but after plaintiff had got the furnace and fixtures ready to put in place, the defendant, without cause, terminated the contract. Either party to a contract which has not been performed may terminate it without cause, thereby becoming liable to the other party in damages. In the case of a contract for a specific article or work, which, as in this case, is partly performed when the contract is rescinded, the contractor may recover compensation for what he has done and the profits he would have earned had he been allowed to complete the contract, terminated without fault on his part.—Hale *vs* Hess, Supreme Court of Nebraska, 46 N. W. Rep., 260.

Petrified Pulp.

A new artificial building material has recently been examined in the Mechanico-Technical Testing Establishment, at Charlottenburg, and it has excited general attention in interested circles. Although the method of producing the article has been known for a number of years, it was only about 12 months since that its manufacture was commenced on a large scale. According to the *Paper Makers' Circular*, the process is chiefly as follows: A high pressure (1,500,000 kg. on the square meter) is exerted on a combination of sawdust and different mineral stuffs; this combination, as has been proved by experiments, being indissoluble. The substance thus produced is not a fire conductor. On a plate of the material being exposed to the action of a Bunsen burner, it was only charred in the immediate locality of the flame, and the fire was not carried over the other parts. A block of 7 cm. held perfectly together after having been on a coal fire for five hours. The application of this petrified wood will probably be extensive and varied, as it has also a very great resistive capacity against the action of the weather. Boring with a gimlet cannot be accomplished in this material, and nailing is impossible. It can, however, be worked with saw, planes, chisels, files, wimbles and center bits.

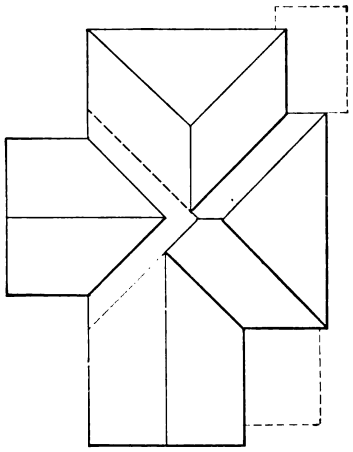
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CORRESPONDENCE.

Problem in Roofing.

From S. B., *Mount Vernon, N. Y.*—I notice in the June number of *Carpentry and Building* an inquiry from "F. D. R.," Decatur, Ill., relative to framing the roof of a house, the plan of which was pre-

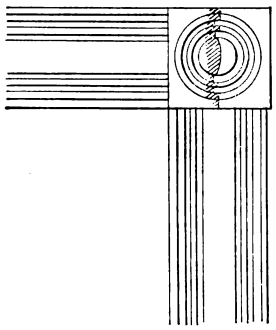


"S. B's." Answer to "F. D. R."

sented in his communication. In reply I submit the inclosed sketch, which, I think, answers all the requirements of the problem given.

Setting Corner Blocks.

From R. R. S., *Pittsburgh, Pa.*—Will some of the practical readers of *Carpentry and Building* kindly tell me, through the columns of the paper, which is the best or



Drawing Accompanying Letter from "R. R. S."

proper way of placing corner blocks? Should they be put on in such a way that the grain of the wood runs horizontally or perpendicularly, when used on inside finish?

Water Closet Construction.

From R. L. S., *Denver, Col.*—Will some of the readers of *Carpentry and Building* present drawings showing the best manner of putting together water closet seats, and give the proper dimensions and shapes? I should also be glad to have a method of drawing the curves, &c.

Preventing Tools from Rusting.

From G. W. F., *Fisherman's Bay, Cal.*—In the May number of *Carpentry and Building* I notice an inquiry from a correspondent who desires information as to what is best to keep rust from tools. I always use rosin and lard melted together. The rule I follow is to take 1 pound of fresh lard and add a lump of rosin about half the size of a hen's egg. More rosin than this does no harm, but I prefer about the amount named, as too much rosin makes the tools feel gummy. Pure sperm oil is also good for the purpose.

From H. M. N., *Sandwich, Ill.*—In the May issue of *Carpentry and Building* "J. C. W.," of Pine Hill, Pa., asks for a means of preventing tools from becoming rusty. Some time since an old carpenter showed me his kit of tools, which were very free from rust, and upon inquiry as to how he managed to keep them so clean, he said he used anguintim, or mercurial ointment, an article to be obtained at any drug store. I have also seen vaseline oil used with favorable results.

From S. E. D., *Pittsburgh, Pa.*—In the May number of *Carpentry and Building* "J. C. W.," of Pine Hill, Pa., desires to know what is best to keep rust from tools. In reply to this inquiry I take the liberty of sending the following, which is taken from Gould's Carpenters' and Builders' Assistant: "Take any quantity of good lard, and to every pound or so add of common rosin an amount about equal to half the size of an egg or less—a little more or less is of no consequence. Melt them slowly together, stirring as they cool. Apply this with a cloth just enough to give a thin coating to the metal surface to be protected. The rosin prevents rancidity and the mixture obviates the ready access of air and moisture." Whether it will do for saws remains to be tried, but for other tools and metals exposed to the weather it is indispensable.

Crown Mold Intersecting Gable.

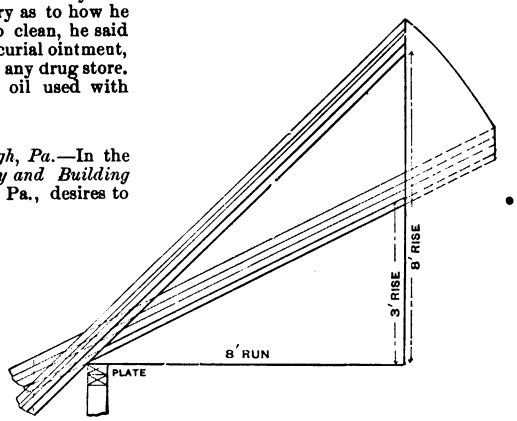
From O. A. H., *Chariton, Iowa.*—In the June issue of *Carpentry and Building* "M. B. C.," of Moreland, Ill., seems to forget the point of solution under discussion and goes on to explain what every carpenter in the country knows—that is, how to cut a miter, for that is what he has done in his illustration. Now, I cannot see the object in putting on a standing facia, if the crown mold is put on in the way he has shown. I would like to ask "M. B. C." how he would connect a crown mold where it intersects a gable on the side of a building where a standing facia is necessary in order to do a good job?

Designs for a Summer Cottage.

From SUBSCRIBER, *Waveland, Ind.*—Will some contributor to *Carpentry and Building* kindly furnish for publication details of a cottage 12 x 24 feet in plan, containing two rooms? It is to be unfinished inside, but will have ornamental cornice and gables. What I desire are plans for a cottage suitable for erection near a lake and for use by a camping party.

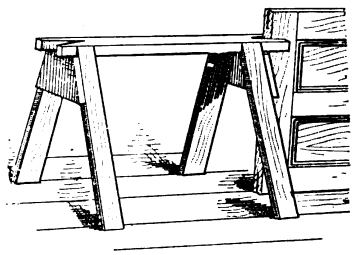
Convenient Door Holder.

From W. K. H., *Chase City, Va.*—I desire to ask of "J. L. H.," Grand Rapids, Mich., whose communication about a door holder appeared in *Carpentry and Building* for February, 1889, what is to hold the device while the door is being planed? His criticism of "N. P. W's." door holder is a just one, in my opinion, for it will not work in doors of different sizes. It also deface the jambs. Trestles are neces-



Crown Mold Intersecting Gable.— Diagram Submitted by "O. A. H."

sary while hanging doors, as some sawing is usually done. They are also convenient to stand on while putting the top hinge in the frame. My men have a flat top trestle, with a V cut in the ends. This holds the door while planing the edges, or



Door Holder Suggested by "W. K. H."

putting on the butts. The sketch which I send shows the trestle and door in working position. I would suggest to those who are interested to try putting on the lock with the door flat on the bench, instead of attempting to do it after the door is hung.

Mixing Paint for Roofs.

From D. C. K., *Kingsville, Ohio.*—How much venetian red is required to be mixed with 1 gallon of boiled oil for painting a new tin roof the first coat?

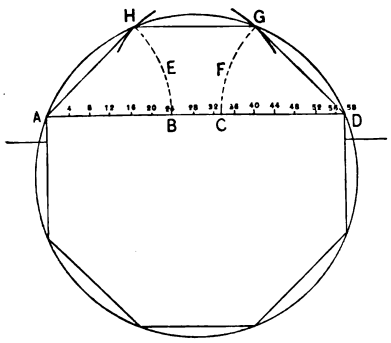
Answer.—It is the usual custom with painters to mix their paint according to the work to be done, and on this account it would be difficult to give precise directions. A paint that would spread well in warm weather might appear to be too thick in cold weather. We would infer from our correspondent's question that the

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roof was to receive more than one coat of paint, and as it is the oil that affords the real protection to the roof, we would recommend that the first coat be quite thin, using about 4 pounds of venetian red to 1 gallon of oil, care being taken that the paint is well mixed before using. If the paint is too thick when applied to a roof it is liable to crack and peel off.

Laying Off an Octagon.

From C. D., *Denver, Col.*—I notice in the August issue of *Carpentry and Building* that the subject of laying off an octagon is discussed at great length, and some plans suggested which seem to be rather complicated for the average carpenter's comprehension. Kindly allow me space to explain my rule for laying off an octagon, which I consider quick and practical. Referring to the sketch which I inclose, we will suppose that the line A D is the extreme width of the octagon to be laid off. Divide this line into 58 equal parts, then take a pair of compasses and open them to B, which is $\frac{24}{58}$. Draw the arc E. Set the compasses at D and draw the arc F; then set them at B, and draw the little arc G; then set them at C, and draw the arc H. Connect A H G and D, and the octagon is completed. In order to prove my work I have drawn a circle through A H and D, and spaced off eight spaces of the same length as A H, H G and G D, which proves to be a true octagon. In laying off an octagon bay window, the carpenter is principally guided by plans which indicate the width desired. The pattern by which the foundation is to be built can be laid off full size on a floor with the aid of a straight edge and a pair of compasses. It is not necessary that the radius of the octagon should be known, provided one side is given, to suit window frame and brick work, &c. Take the length given, which would be $\frac{24}{58}$ and add $\frac{34}{58}$ which gives the entire width A D of the octagon. If my plan of drawing an octagon is not satisfactory to "L. W. T." and "W. S. W.," who appear to know more about geometry than I do, then I should like to hear from them. I do not claim to know it all, and if any of the readers of *Carpentry and Building* know a simpler rule, I shall only be too glad to learn it.



Method of Laying Off an Octagon, Described by "C. D."

Carpenters' Pencils.

From C. & W., *San Francisco, Cal.*—Can any reader of *Carpentry and Building* tell us who manufactures a red mottled carpenters' pencil branded "Frederick Taylor?" We desire to learn the address of the manufacturers of this pencil, or of one who makes a similar pencil.

Border Light Sash for Gable Ends.

From W. H. W.,, *Woodlawn, Ala.*—Will some of the readers of *Carpentry and Building* please tell me the proper way of fitting a border light sash for gable ends, or for any ornamental fronts or border light transoms? What I desire to know is whether the putty side should be turned in or out. I have seen some of the best mechanics in Birmingham turn the putty side out, while others turn the opposite side out.

Problem in Roof Framing.

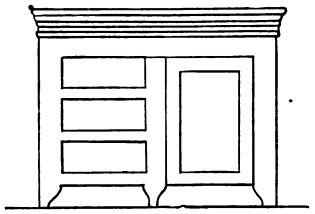
From H. L. W., *Macon, Ga.*—I have frequently noticed in the columns of *Carpentry and Building* interesting problems relating to construction, particularly in regard to roofs. I note in most cases, however, that reference is made to those which are of regular form with rafters of equal length. I take the liberty of sending an outline tracing of an irregular form of roof covering which has arisen in my practice, and solicit from the ingenious and skilful carpenters among the readers of *Carpentry and Building* suggestions as to the best method of constructing the roof. It must be self-supporting, the steeper part covered with slate, while the remainder is covered with tin. The truss nearest the front end of the building must be sufficiently strong to carry one corner of a tower 12 feet square at the base and 50 feet in hight, constructed with a wood frame and covered with galvanized iron. The problem is to fill in and properly arrange within the lines given the necessary timber, braces, rods, &c., to make a safe structure. The ceiling under tie beam is to be lathed and plastered.



Problem in Roof Framing, Submitted by "H. L. W."

Design for Flour Bin.

From J. McA., *Crown, Pa.*—For the benefit of "R. G. M." I send a sketch of flour box, dough board and drawer case combined, which may possibly be of interest to other readers of the paper as well. The drawings show the construction of the device so clearly that if "R. G. M." is a mechanic there is no necessity of my going into a detailed description. Fig. 1 shows a front view, Fig. 2 end elevation, while Fig. 3 is a sectional view.



Design for Flour Bin.—Fig. 1.—Front Elevation.

If there is anything, however, which the correspondent does not understand and he will make it known through the columns of *Carpentry and Building*, I will endeavor to help him out.

Mitering a Plank at the Valley.

From J. L. F., *Marysville, Mo.*—In a recent issue of *Carpentry and Building* I noticed a communication from "H. L. S.," Colorado Springs, Col., answering the inquiry of "S. J. W.," of Centerville, S. D., in regard to mitering a plank at the valley. Permit me to say that I think his answer is wrong, or at least, misleading, and if "S J. W." attempts to miter and join sheeting boards or plancier boards for a box cornice at the valley according to this rule, he will find the joint of planciers gaping widely open at B in the plan. I believe "H. L. S." means all right, but he has taken hold of the wrong lines in giving his rule. It would, I think, work all right in joining boards on a horizontal plane, but not on planes inclined to the pitch of roofs.

My rule for finding the cut or bevel for sheeting boards or planciers to run up a right valley—that is, where the pitches are the same—is to take the length of the common rafter on the blade and its run, one-half the width of the building, on the tongue of the square. The tongue will give the cut. In valleys where the roofs are of unequal pitches, it will be necessary to refer to the plan in order to demonstrate the rule. I will submit the same plan given by "H. L. S." in order to show where his error occurs. We will suppose G to represent the roof of a house 16 feet wide, the roof being half pitch. We will suppose T to represent the roof of an addition 14 feet wide, with the comb level with the other roof, which would obviously make this roof steeper than half pitch. It is now required to find the cut E B for the planciers, or for sheeting boards to run up this valley A E. Now, to find the cut on the board D, we must take the length of the rafter of the roof G on the blade of the square and the run of the rafter for the roof T on the tongue of the square. The tongue then gives the cut. To find the cut on the board F, we must take the length of the rafter for the roof T on the blade, and the run of the rafter for the roof G on the tongue of the square, when the tongue will give the cut. The error made by "H. L. T." consists in only taking the runs of the rafters on the blade of the square when

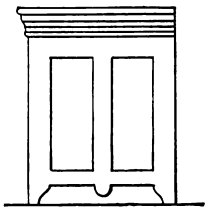


Fig. 2.—End View.

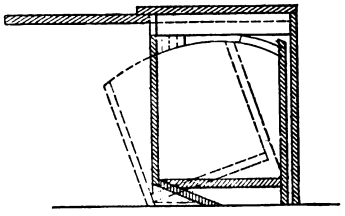
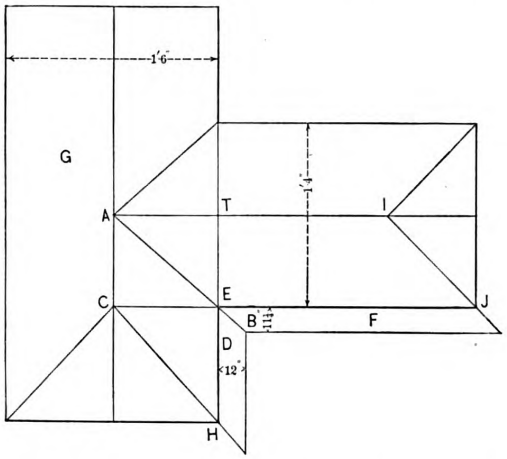


Fig. 3.—Sectional End View Showing Dough Board Extended.

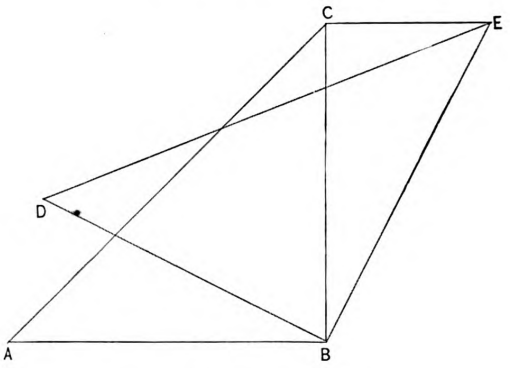
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he should have taken their lengths. For instance, he says to find the cut for D, take A C on the tongue of the square, which is correct, and C E on the blade. Now, the distance C E is only the run of the rafter for the roof G, and were the boards D and F required to lie in a horizontal plane he would have the miter cut correct, but as the board D must lie in the plane of the roof G, and the cut in the valley at E B must correspond to the plane of the roof T, he would have his board cut, if it were 12 inches wide, exactly 3 inches too short at B. As a consequence, it would take a good many rags to fill the joint. The same criticism applies to his cut on the board F.

I would say that this is a rule not commonly known among carpenters. In fact, I believe I have never met a carpenter who knew the rule for cutting on uneven pitches or right valleys. To "H. L. S." I would say that my criticism is meant in all kindness, and, while he came very near having the rule correct, if he will try it in actual work he will discover that I am right. I would also say that the method employed by "H. L. S." of applying the square to the board is correct; also his rule for finding the plumb cut for planciers.



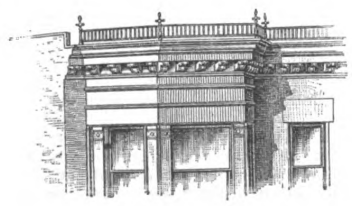
Method of Mitering a Plank at the Valley, as Suggested by "J. L. F."



Sketch Submitted by "C. E. W."

An Artistic Cornice.

From CORNICE MAKER, *Chicago, Ill.*—The other day, when looking out of a window at a building opposite, I was surprised to see the profile of a human face shown in shadow on the brick of the building. This shadow came from a bay window, and it was somewhat curious that an ordinary cornice could become artistic enough to make a picture. The reader of *Carpentry and Building* interested in the subject of perspective drawing is at liberty to determine how the profile is produced from the projecting bay window. The photograph from which the engraving is made was taken at about 1 p.m. The location of the sun can be estimated from the position of the shadow. The reader may infer from the title of this article that reference has been made to a cornice that is of artistic design, but that such is not the case is evident. A cornice that can produce a shadow that will resemble a human face should be called "An artistic cornice" if any kind of a cornice is entitled to the term.



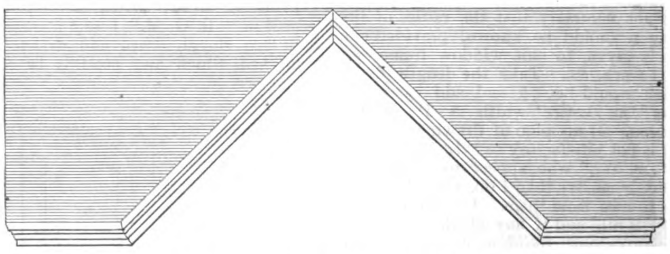
An Artistic Cornice.

Putting on Butts.

From A. J. McC., *Cleveland, Ohio.*—I am a constant reader of *Carpentry and Building*, and have obtained a great deal of valuable information from it. If you will permit me the space I would like to ask a question of the practical readers of the journal. I had a lid to hinge on a box where the butts had to be kept down, so that the ball of the butt would not show on the top or face. I thought I knew how to do the work, but when I sunk the butts I found the lid would not open. Now, what I would like to have is a diagram and explanation of the manner in which the job can be executed in a practical manner.

Rake Molding Intersecting a Level Molding.

From O. A. H., *Chariton, Iowa.*—In answer to "J. M. B.," of Du Pont, Ga., who draws me over the coals this hot weather, I would say, the discussion is on the level molding standing plumb, for when it is put on square with the rafters a miter will cut it. Now, I can explain better by illustration what the length of the rafter has to do with the cut across the miter box, for it is on the same principle as cutting the jack rafter on a hip or valley rafter. Take, for example, a half and a fourth pitch roof. We know that a rafter on a half pitch roof is longer than one on a fourth pitch roof, and that is the reason why the length is taken. As I said before, I know of no way whereby a machine made molding can be cut to member under these conditions.



Sketch Accompanying Letter from "O. A. H."

Cuts of Jack Rafters.

From A. D. F., *New London, Conn.*—Please inform me through the columns of *Carpentry and Building* the correct method, by means of a diagram, of obtaining the different cuts of jack rafters when there are three or more gables of varying pitches in one roof. This is a question I have never seen published, and it may prove of interest to other readers of the paper as well as myself.

Hip Roof Framing.

From C. E. W., *Quincy, Mich.*—In reply to "C. E. S.," who wants to know why certain figures on the square will give the bevels for jack rafters, I present a diagram which I think will afford the necessary explanation. Referring to the sketch, A C is the seat of the hip rafter; B C is the seat of the longest jack rafter; C E is the rise of the roof; B E is the longest jack rafter; D E is the hip rafter. Now, as B D E is the shape of the roof which covers the triangle A B C, it is evident that any figures on the square which are to each other as B D is to B E will give the bevel for the jack rafters. When the hip runs at an angle of 45° the length of the rafter on the blade and the run on the tongue will give the bevel. The bevel can also be found by taking the length of the hypotenuse of a triangle, the base of which is 12 inches and the perpendicular is the rise per foot of the roof on the blade and 12 inches on the tongue. Ergo, the roof is third pitch, or has a rise of 8 inches to 12 inches run. The hypotenuse of a triangle of that size is 14.42 inches. The figures 14.42 and 12 will give the bevel for the jack rafters and also for the roof boards when the hip runs at an angle of 45°. The same bevel can also be used on the hip rafter if the hip is first backed.

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The Builders' Exchange

CONDUCTED BY WM. H. SAYWARD, SECRETARY OF THE NATIONAL ASSOCIATION.

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The next convention will be held in New York City, on the second Tuesday of February, 1891.

MID-YEAR MEETING

Of Officers, Directors and Members of Standing Committees of the National Association of Builders.

The mid-year meeting, a partial report of which was presented in the issue for last month, was called to order in the rooms of The Building Trades Club, New York City, at 11 o'clock a. m., on Monday, September 22, 1890, with President John J. Tucker in the chair.

There were in attendance throughout the meeting 31 delegates from various parts of the country, including the members of standing committees called upon for reports.

The first morning was spent in preparatory work, appointing proxies for absent directors and laying out the plan of the work for the entire meeting.

The President, Mr. Tucker, opened the first mid-year meeting of the National Association with appropriate words of welcome to the visitors, and spoke briefly of the purpose for which they had been called together and the importance of the subjects to be considered.

The first thing for consideration was whether or not the deliberations of the meeting should be open to the press and public, it having been suggested that certain arguments and the handling of certain subjects were likely to be of a private nature. It was decided to give the secretary the authority to make public such action by the directors as he deemed advisable.

The Secretary, Mr. Sayward, in a short address, impressed upon the committees the necessity of the most careful and thorough consideration of the subjects upon which they were to report, and the importance of having their reports as perfectly prepared as possible before being submitted for discussion.

In the absence of the treasurer, the financial report of the condition of the National Association was read by the secretary, together with the names of delinquent associations.

He then proceeded to give a short *resumé* of the replies that had been received in answer to the various letters issued from the secretary's office pertaining to the objects of the meeting. Many valuable suggestions were contained in these replies and the same were prepared in succinct form for the use of the committees.

The final business of the morning was the fixing of the periods in the meeting when committee reports should be submitted and the conditions under which they should be made. It was decided that reports should be made without previous discussion upon their subject matter, and that all delegates should be present at the time when reports were submitted.

Secretary Stephen M. Wright, of the Mechanics' and Traders' Exchange, and also general secretary of convention committees, in the absence of Mr. Marc Eidlitz, president of the Building Trades Club, extended a most cordial welcome to all to the rooms of the club, requesting that they be used at all times by the delegates as their own. Mr. Arthur McAllister replied on behalf of the delegates, and the morning session adjourned.

Afternoon Session.

The first business was the discussion of the subject of expenses of the annual conventions, and it was voted that hereafter the National Association bear all the legitimate expenses thus incurred, such as rent of convention hall and other similar necessities, thus assuming the expense that has heretofore been borne by the local bodies.

In view of the fact that at St Paul three days were found to be hardly sufficient time in which to transact the busi-

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ness of the convention, the directors decided to add another day to the time appointed for the next convention, and it was therefore decided to give the Executive Committee power to open the convention on the second Monday of February instead of the second Tuesday, as has been previously announced, and the convention to continue through Tuesday, Wednesday and Thursday.

The question of a distinctive badge or button to be worn by members of the National Association was presented by the secretary, and, after some discussion and several suggestions, the following committee was appointed to select a badge: William Harkness, Jr., Philadelphia; Thomas J. King, Washington; George Mann, Baltimore.

Mr. William Harkness, Jr., in response to a suggestion by the secretary, gave a very full statement of the method of procedure adopted by the Philadelphia Exchange in establishing their trade schools. [As this subject has been lately touched upon in these columns, and as this report will occupy considerable space, Mr. Harkness' remarks will be given in a future issue.]

The speaker stated that in establishing these schools the Exchange had been guided by the recommendations of the National Association, and have not departed therefrom in the least degree.

A motion was made and carried that the secretary be instructed to secure from the Philadelphia Exchange such publications and information relating to the trade school as is available, and distribute the same among the filial bodies.

The subject of Exchanges owning their own building was next brought up by the Secretary, and a very full description was given of methods used to secure money for this purpose by Mr. King, of Washington, Mr. Harkness, of Philadelphia, and by Mr. Jacobs, of Boston. These various methods, with others, will be given in full in future issues of this journal.

Mr. Snead, of Louisville, presented a revision of the Kentucky building law as suggested by the Builders' and Traders' Exchange, of Louisville, and explained some of the defects that exist in the present law. The copy of the revision was referred to the Legislative Committee.

Tuesday, September 23, 1890.

Tuesday morning, the committees not being prepared to report, the time was devoted to individual expression by the directors upon affairs relating to their various Exchanges.

Mr. McAllister, of Cleveland, stated that steps were being taken to reorganize the local Exchange in that city. That the uniform contract was but little used, and that the methods of conducting the building business would bear a general overhauling.

Mr. Harkness, of Philadelphia, said that nothing had occurred in his Exchange recently that would be of importance to the filial bodies, save perhaps the establishment of the permanent exhibit upon so much more elaborate a scale than has previously been accomplished by other associations. The exhibition space is all taken up, and much more could be utilized if it were available. The exhibit is a constant source of information to all members and to visitors and architects, and has proved a much greater benefit, financially and otherwise, than was anticipated by the most hopeful.

Mr. Woelpper, of Philadelphia, touched upon the importance of every Exchange owning a building, that would be not only a home for the Exchange, but the recognized center of all building interests of the community in which it might be located. The uniform contract is not in general use in Philadelphia, although every architect had been supplied with copies.

Mr. Makinson, St. Paul: The Builders' Exchange is in sound condition, and efforts are being made to secure better attendance at the 'change hour. The uniform contract is used to a limited extent.

Mr. Cook, of Buffalo: The Builders' Exchange of Buffalo advocates the establishment of a working day to be of uniform length all over the country, whether it be eight, nine or ten hours. A uniform day would greatly facilitate the securing of more harmonious relations between employers and workmen, as it would tend to make wages the one vital question, which, of course, would be adjusted according to the conditions existing in various localities. Also advocates the establishment of some plan or the altering of conditions, that will create a more harmonious relationship between the builder and the architect. Mr. Cook thought that the collection and credit system, such as is in use in Louisville, or by the Master Plumbers' Association of Buffalo, for instance, would be a good thing to establish in connection with each exchange. The unreliable men could be very soon brought into a better manner of conducting their business, or no one would deal with them. The uniform contract is but little used in Buffalo.

Mr. J. S. Hudson, Providence: Conditions between builders and architects are much the same as those that exist in other localities. The uniform contract is not used to any extent.

Mr. Richard Smith, Omaha, said that the necessity for more harmonious relations between the builder and architect were apparent in Omaha, and thought that the National Association should take up the subject of convict labor—at least secure some arrangement whereby the product of convict labor should not be placed in the market at a less price than the material with which it competed.

Mr. Wisehoon, Syracuse, N. Y.: The uniform contract is not in general use, although the architects have been furnished with blanks.

Clifford Chase, Milwaukee: Our Exchange is in fairly good condition, and has accomplished some specific good this season. We have succeeded in getting the city to let municipal contracts under eight different heads. The custom heretofore has been to let such contracts under one head, to one man, and a very unsatisfactory system of trading has been the result. The Exchange took up the question, and finally succeeded in getting the city, by force of an injunction, to adopt our plan. Many of the contractors refused to figure for municipal work under the previous conditions.

A. S. Reed, Wilmington: The only labor trouble that has disturbed Wilmington builders for the past three or four years was the shorter day agitation during the past season, which was universally settled in favor of nine hours. Builders are using every effort to secure the establishment of trade schools under some form or other, fully recognizing the value of such education.

Thos. J. King, Washington: The best architects work hand in hand with the Builders' Exchange, and the utmost harmony prevails. The uniform contract is used to a limited extent. In view of the fact of the approaching convention of the American Institute of Architects, to be held during the month of October in Washington, it would be a desirable thing for the Board of Directors of the National Association to request the American Institute to instruct their members to use the uniform contract. By this means the form would be brought at once directly to the attention of the architects connected with the local chapters. The general contract system prevails in Washington, and is very satisfactory in its working. The general contractor makes the bid on his own responsibility and receives sub-bids for portions of the contract afterward. Our Exchange is in a very flattering condition and is prospering nicely. Our members are a unit upon almost all questions that come up, there being no dissensions.

Mr. J. Arthur Jacobs, Boston, indorsed what had been said by the gentlemen from Philadelphia regarding the importance of an exchange owning its own building. The uniform contract is not in general use in Boston, but is used by nearly all members of the Master Builders' Association.

Lawrence Grace, Cincinnati: I can say for the Cincinnati Exchange that we are at present in need of the services of our very able national secretary. During the past year our Exchange was reorganized very successfully on a capital stock basis, but we have not made the progress we should have made. We seem to get along very well with the architects, and everything is harmonious in our relations with each other. I think that the National Association should recommend to filial bodies that they permit no unjust dictation from labor organizations as regards the settlement of questions that are beyond their jurisdiction. While the National Association has recommended many good things, the affiliated bodies have not done their duty toward the national body.

H. W. Eddy, Worcester: Our Exchange is very harmonious in all its action, and we have been taking some preliminary steps toward securing a building of our own. The uniform contract is but little used, although architects seem to favor it. We have invited architects to our Exchange and to honorary membership.

Mr. Daniel M. Mannix, Portland, Maine: One of the greatest difficulties in the way of the success of our Exchange is the inappreciation of the members of the value to themselves and the building business generally of attendance daily at the Exchange rooms during the 'change hour. The uniform contract is rarely used in Portland.

Mr. T. J. Kelly, St. Louis: The Mechanics' Exchange is in a flourishing condition, and we have recently raised both the initiation fee and the annual dues. The same conditions obtain in St. Louis as in Washington, so far as the method of submitting bids is concerned.

Nearly every architect uses the uniform contract. We have a rule among the contractors that we will sign no other form, and also that we will submit no bids to an architect, unless bids are opened publicly and announced within 24 hours of the time of opening.

Mr. S. P. Snead, Louisville: The uniform contract is not generally used in Louisville. We have inaugurated a collection and credit system in the Exchange with very satisfactory result. Oftentimes a man who would not otherwise pay will settle rather than have his name put upon the delinquent list. One half of the commission charged for collections goes to the Exchange, the other half to the secretary.

Mr. D. J. Hamilton, of Pittsburgh, Pa.: The uniform contract is in vogue in our town altogether. The city government has a very obnoxious rule with regard to bids on public buildings requiring contractors to furnish a bond for

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double the amount of the cost of the work with not less than two sureties, and each one of the sureties has to swear to the Comptroller that he is worth so much over and above his obligations on the bond. Consequently, the principal contractors will not bid and the city has a great deal of trouble in securing bids from reputable contractors. With regard to architects and builders, the first man who is usually consulted by a person who intends building in our city is not the architect but the builder. Consequently, our architects are more cordial toward the contractors than they formerly were. I think the National Association ought to take some cognizance of the abuse of the apprentice system. Though my firm employ never below 50 men, and sometimes as high as 250, we are only allowed two boys. This is almost universal, and some contractors pretend to do work with only their two apprentice boys. The consequence is that they are not making good mechanics out of the boys.

Mr. King: I desire to offer a few suggestions. Some of these exchanges have requested information as to how to purchase a building. To bring that matter before the directors, I suggest that the Board of Directors recommend to the National Association at their next convention that they take measures by which exchanges will be induced to organize within themselves builders' investment associations, which can be done on a monthly scale. The money can be invested in anything you please until you have sufficient funds in hand to guarantee you the purchase of a building or lot. My second suggestion is that the Board of Directors recommend to the National Association the passage of a resolution at the next convention petitioning Congress to make an appropriation sufficient to establish a national school for the advancement of civil engineering and mechanical arts.

The meeting adjourned until 2 p.m.

Afternoon Session.

The first thing in order was the reading of the report of the Committee on Sub-Contracting. The report was read by Mr. James A. Miller, chairman, and was received and the different sections taken up successively for discussion. After considerable controversy the directors made the suggestions which appear in conjunction with various sections of the report as printed herewith:

Report of Committee on Reforms in Sub-Contracting, as submitted to the Mid-Year Meeting of the Directors and Standing Committees of the National Association of Builders.

NEW YORK, September 23, 1890.

To the President and Directors of the National Association of Builders: GENTLEMEN.—Your committee, appointed at the annual convention at St. Paul under the following resolutions:

Whereas, Many evils and wrong practices have become prevalent through the present methods of sub-bidding and sub-contracting; and,

Whereas, It is for the best interests of both direct contractor and sub-contractor to have a more complete understanding of the rights and practices which should prevail to constitute and comprehend honorable dealing; therefore, be it

Resolved, That a standing committee of five be appointed by the chair to take this subject into consideration, make thorough investigation, and report at the next convention,

desire to report,

That the first thing they did was to prepare and send to each delegate to the St. Paul convention a letter giving a copy of above resolution, asking for a statement of the methods of business that prevailed in their respective cities, what evils, &c., they had to complain of, and what remedies they had to suggest; to which circular your committee have received in all 21 replies representing 17 different cities. A slight majority of these replies report that the system of letting work to one contractor does fairly well. Almost all of these favorable replies are, however, from general contractors. On the other hand, those who complain of this system are sub-contractors, some of whom complain bitterly—one going so far as to say that the adoption of a resolution similar to that offered by Mr. Sullivan, of St. Paul, is necessary to prevent the exchange in his city from disruption. Only one sub-contractor (Mr. Snead, of Louisville) thought the general contractors' system was perfectly satisfactory; he thought that as conducted in his city under the rules governing the same adopted by the Louisville Exchange, no complaint was to be made—a copy of which rules was forwarded to us—and upon those rules is largely based the code submitted by your committee. The Louisville rules in turn were largely based upon those adopted by your convention held in Cincinnati in 1888.

Your committee further wish to say that they do not present this code as being a perfect one; as being one which will prevent all of the evils and wrong practices complained of. The majority of your committee very frankly admit that they doubt if sub-contracting and sub-bidding can be carried on, under any code that can be devised, in a way that will be satisfactory to all concerned. The majority of your committee have tried, in preparing this code, to eliminate their individual preferences for direct contracting, which the majority of your committee frankly admit they believe is the proper way the building business should be carried on; and these remarks are only made because they are very unwilling to be understood as being in favor of the idea that the best way to carry on the building business is that of sub contracting; they simply present this code as the best they have been able to devise up to the present time where the building business is conducted on the sub contracting plan.

REPORT.

1. A principal contractor having been awarded a contract involving sub-contracts, his estimate having been based upon sub estimates, should award the said sub-contracts to the lowest solicited bidders whose bids were received by him prior to his having made out his own bid, and should notify the sub-bidders that their estimates have been accepted or rejected as soon as the contract has been awarded to him, promptness upon the part of the contractor in notifying the sub-contractors of his acceptance of their proposals being essential to the proper compliance of this rule. And should a principal contractor receive a sub-estimate unsolicited, he should not be considered under obligation to use the said bid, even if it be the lowest, but he must not reveal the bid, nor use it in any way to influence any other party.

2. Sub-contractors should avoid leaving their estimates in architects' offices, when they are received there simply as an accommodation to and for the information of principal contractors. By such action there is danger that bids may become known to competing sub-contractors before estimates are closed, and that they may be disclosed to the general contractor without the knowledge or consent of the sub-contractor.

3. Payments should be made by the contractor to the sub-contractors on account as the work progresses, final payment to be made when the sub-contractor's work is completed and accepted by the owner or his authorized representative, and should not be delayed until the entire building is completed.

4. Any one detected in trading on any of the sub-bids, whether they be solicited or unsolicited, or however knowledge of them may have come into his possession, should be liable to forfeiture of membership, censure or suspension, or fine of not less that $10, or more than $50, as the Board of Directors or General Exchange of which he is a member may direct.

5. A contractor having obtained work upon bids received from sub-contractors, has received from those sub-contractors valuable considerations, for which proper remuneration should be given; the proper remuneration being the awarding to said sub-contractors of their respective sub-contracts; and the damage to the sub-contractors for failure of the contractor to make such awards should be estimated at the liquidated damages of not less than 10 per cent. of the amount of their respective bids; the payment of these damages by the contractor not necessarily to relieve him from being disciplined by his exchange for dishonorable conduct.

6. To bring this code at once to the attention of those interested, and to prevent it from being forgotten, or its rules from being overlooked, each exchange should prepare and furnish to its sub-contractor members envelopes which should have on their faces the name of the person using them, to whom given, the nature of the work bid on, and building upon which said work is to be done, and also the following: "This bid is made with the understanding that if this is the lowest solicited bid received by you before you put in your bid for the work to which this pertains, and you get said work, you are to make a contract with us for our part of this work at price named therein, immediately you receive your contract. Liquidated damages for failure of this agreement by you to be estimated at ten (10) per cent. of amount of inclosed bid; if this is not agreed to by you, this envelope to be returned to us unopened." The use of this envelope not to be obligatory upon the sub-contractor, and his failure to use it not to debar him from the benefits of these rules; but it is advised that these envelopes be used often enough to prevent the essential parts of this code from being forgotten.

7. No contractor should assume the risk of taking an entire contract, embracing work to be done by sub-contractors, without adding sufficient percentage to the various sub-contractor's bids to pay him for the risk he assumes and the trouble he will necessarily be put to.

8. The declining by a sub-contractor to go upon a general contractor's bond shall not be a proper reason for the general contractor to decline or refuse to award to said sub-contractor a contract that by this code properly belonged to him.

9. This association recommend to all affiliated bodies that they pass proper rules to enable them to discipline their members for violation of this code in their dealings with members of affiliated bodies, as well as with members of their own exchange.

10. Any member having work to let should, as far as consistent with business principle, deal only with members of his own or an affiliated exchange, and should do all in his power to forward their interests.

11. When it is necessary to cut or change the work of one mechanic in the placing of the work of another, then the said cutting shall be done by the mechanic whose work is so changed or cut, he being paid therefor by the mechanic whose work made the said cutting necessary.

12. To properly enforce this code, each exchange should have a rule about as follows:

Any member of this exchange who shall be guilty of unfair, dishonest, or unbusiness like conduct in the transaction of any business, either in competition for work or material, or refusal to comply with a contract, according to the terms thereof, or by declining to enter into a contract after the same has been awarded to him, shall be deemed guilty of a violation of the rules of this exchange, and if after a fair trial he shall be so adjudged, he shall be liable to suspension or expulsion.

SUGGESTIONS MADE BY THE DIRECTORS AT THE MID-YEAR MEETING.

Suggested Amendment to Article 1.—When the contract shall have been executed by the general contractor with the owner, he should, without unnecessary delay, execute a contract with the sub-contractor; and the sub-contractor should require the same, and should not consider that his bid is fully accepted until such contract be executed.

Suggested Substitute for Article 2.—The practice of leaving estimates for portions of building work in architects' offices, to be used as sub-estimates, is a dangerous practice, and should be severely condemned. The practice, by general contractors, of soliciting estimates from sub-contractors, who, at the same time, leave estimates for the same work in the architects' offices, should also be severely condemned. When bids are submitted in architects' offices, or to the owner, for portions of building work, they should be considered as direct estimates only.

No amendments suggested to articles 3, 4 and 5.

Suggested Substitute for Article 6.—To bring this code at once to the attention of those interested, and to prevent it from being forgotten, or its rules overlooked, each exchange should prepare copies of said code of practice, printed in large type, and posted conspicu-

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ously upon the walls of the Exchange, where they can be readily referred to by all members. Copies of the code should be freely furnished to all contractors and architects.

No amendments suggested to articles 7, 8, 9, 10, 11 and 12.

Owing to the length of the discussion on the report of the Committee on Sub-Contracting, the report of the Committee on Builders' Surety Company was received and discussion thereupon was postponed until after the report of the Committee on Arbitration, which was set for the first thing Wednesday morning. The meeting adjourned.

Wednesday, September 24, 1890.

The first business of the morning was the reading of the report of the Committee on Arbitration. At the close of the reading of the report and before a motion to receive the paper could be put to the meeting, a lengthy and somewhat warm discussion took place as to the exact province of the committee in respect to arbitration. The discussion continued upon what constituted matters of mutual concern that were subject to arbitration, until afternoon. The report was finally received as a whole as substantially the report to be offered at the next convention, and is as follows:

Report of Committee on Arbitration, as submitted to the Mid-Year Meeting of the Directors and Standing Committees of the National Association of Builders.

The committee appointed at the last convention of the National Association of Builders to prepare a form of arbitration, offer to the directors of the National Association assembled in mid-year meeting the result of their deliberations thus far, which is substantially the form in which their report will be presented at the next convention.

The committee call attention to the fact that one of the fundamental points of the Declaration of Principles of the National Association recites that "employers in the building trades should recognize that there are great opportunities for good in associations of workmen, and while opposing and condemning improper methods and action upon the part of such associations, they should still be ready to aid and assist them in all just and honorable purposes."

It is therefore the manifest duty of the National Association to recommend to its filial bodies a definite method of arbitration in place of the objectionable methods, or lack of method, heretofore existing, and which shall fully recognize the rights of both employers and workmen.

It is possible and desirable for employers and their workmen to unite in establishing a method by which the interests of workmen and the interests of employers may each receive just consideration, and through which the relations of each to the other may be harmoniously adjusted.

To secure the establishment of such a method it is absolutely necessary that there be associations of employers and associations of workmen, to act as authoritative bodies in the premises, in order that the action taken may represent as fairly as possible the collective interests of both parties, and in order that the practices recommended may, through them, be more generally adopted.

No association desiring recognition as an authoritative body should, either in its form or organization or through its by-laws, rules or practices, attempt to independently or arbitrarily control or influence the action of others; but, recognizing the rights of others, should adopt measures that will lead to joint consideration and joint action in all methods of mutual concern.

Associations established on the principles above expressed should be heartily encouraged, all persons eligible thereto should be urged to join, and every legitimate effort made to convince them that it is their duty to unite with their fellows in all honorable methods for the establishment and maintenance of just and proper practices among themselves and in their relations to others.

In harmony with these views, your committee offers the following draft of a form of organization of a joint committee, which they believe to be applicable for the use of any and all of the various branches of the building trades, and offer it as an honorable plan, which filial bodies may safely recommend to employers and workmen in the building trades for the peaceful settlement of all matters of mutual concern.

Your committee recommend that all filial bodies be urged to present this simple plan to the various trades represented in their bodies, requesting their various special trades to organize, if not already organized, and then offer this plan to the organizations of workmen in their trades as the basis for a mutual agreement and understanding which shall prevent all further disputes.

AGREEMENT.

For the purpose of establishing a method of peacefully settling all questions of mutual concern,.....(Name of organization of employers) and..... (Name of organization of employees) agree that no such question shall be conclusively acted upon by either body independently, but shall be referred for settlement to a joint committee, which committee shall consist of an equal number of representatives from each association: *and also agree that all such questions shall be settled by our own trade, without intervention of any other trade whatsoever.*

The parties hereto agree to abide by the findings of this committee on all matters of mutual concern referred to it by either party. It is understood and agreed by both parties that in no event shall strikes and lockouts be permitted, but all differences shall be submitted to the joint committee, and work shall proceed without stoppage or embarrassment. The joint committee above referred to is hereby created and established, and the following rules adopted for its guidance:

ORGANIZATION OF JOINT COMMITTEE

1. This committee shall consist of not less than ..... members, equally divided between the associations represented, and no action shall be taken by the committee unless the full number of each delegation be present.

2. The members of this committee shall be appointed by their respective associations, not later than the .... day of December of each year. Vacancies occurring in either delegation to be filled by remaining members of such delegation.

3. The duty of this committee shall be to consider such matters of mutual interest to the employers and the workmen as may be regularly referred to it by either of the parties to this agreement, transmitting its conclusions thereon to each association for its government.

4. A regular meeting of the committee shall be held not later than the.....day of December of each year, at which meeting the special business shall be the fixing of the hours of labor and the rate of wages for the ensuing year. At this meeting, also, a code of practice to be observed by workmen and employers shall be adopted, covering all points upon which the interests of the two parties come in contact.

5. Special meetings shall be held when either of the parties hereto desire to submit any question to the committee for settlement.

6. For the proper conduct of business, a chairman shall be chosen at each meeting, but he shall preside only for the meeting at which he is so chosen The duty of the chairman shall be that usually incumbent on a presiding officer.

7. A clerk shall be chosen at the annual meeting to serve during the year. His duty shall be to keep true and accurate record of the meetings, transmit all findings to the associations interested, and attend to the usual duties of the office.

8. In voting, a majority of the committee shall rule. In case of a tie vote, an umpire, selected according to rule 9, shall cast the deciding vote.

9. To provide for possible cases of failure to agree, the committee, immediately after organizing, shall choose an umpire, to be called upon to serve in cases of tie vote.

This umpire shall be, preferably, a judge of some one of the higher courts, if the matter in consideration be important enough to demand such a selection; but in any event some disinterested person, in no way connected with the building trades, and his vote shall be considered final and binding.

10. No amendment shall be made to this rule except by concurrent vote of both parties.

Afternoon Session.

The first business was the consideration of the report of the Committee on Builders' Surety Company. There was considerable discussion, and the result of the same appears in the report as printed herewith.

The original report on the Builders' Surety Company, as considered by the Committee, appears first in the following; next succeeding are the amendments and changes deemed desirable by the committee, and last in the report are the suggestions offered by the directors:

Report of Committee on Builders' Surety Company, as submitted to the Mid-Year Meeting of the Directors and Standing Committees of the National Association of Builders.

The committee appointed at the last convention to establish a surety company beg leave to report to the mid-year meeting the following, as substantially the report they will feel obliged to offer to the next convention. The plan as originally proposed presents certain serious defects, and a revision seems, to the committee, absolutely necessary before the company can be established.

The committee were instructed to apply for a charter, but in view of the very substantial changes which seem necessary have deemed it inadvisable to take that step until the changes proposed have been authorized by the National Association.

The committee have prosecuted their investigations with the assistance of an expert in such matters, and from the best approximations possible believe that a company of this kind, successfully established, would be a great advantage to the general building fraternity.

ORIGINAL REPORT SUBMITTED TO THE ANNUAL CONVENTION, JANUARY, 1890.

1. The title of the company to substantially cover the fact that it is a Builders' National Insurance, Security and Guarantee Company, and that it is under the patronage and direction of the National Association of Builders.

2. Its stock to be limited to say 250,000 shares, at a par value of say $4 per share.

3. These shares of stock to be issued only to members (either active or honorary) of bodies affiliated with the National Association, and if found practicable to the said filial bodies themselves, thus insuring a holding composed of contractors in the various building trades or persons engaged in similar pursuits.

4. At least 100,000 shares to be held in trust, to allow for apportionment as follows: Each filial body of the National Association, which maintains its connection therewith by payment of the yearly dues required by that body, to be allowed and apportioned on the books of the company stock at the rate of five shares for each member of the said filial body, as shown by their payment of the annual *per capita* assessment to the National Association, the same to be adjusted annually. This apportionment to be without payment of the value of the stock by the said filial bodies, but the certificates of said stock to be held in trust for their benefit. Dividends accruing on the stock thus apportioned to filial bodies to be paid over to them through the national treasurer.

5. Filial bodies in good standing, which are so incorporated as to permit them to hold personal property, to be permitted to purchase and hold stock, if any be available, in addition to that apportioned as above mentioned, limited in extent to an equal number of shares to those so apportioned, upon condition that said shares be non-transferable, and that upon failure to

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maintain their standing in the National Association, they to relinquish the said shares to the company at a price not greater than paid for the same.

6. The Board of Directors of the company to always include the directors of the National Association named at each annual convention by the filial bodies as their representatives.

7. The officers of the company to always be members (present or past) of filial bodies of the National Association.

8. There to be a central department of the company for the general conduct of their business, under the direct management of their president, general secretary and treasurer; there to be also departments, with definite territory and jurisdiction, each managed under the general laws and rules of the company, through a vice-president as head of the department.

9. In the arrangement of rates of premium to parties applying for insurance or bonds an appreciable difference to be made in favor of those who may be members of filial bodies.

10. The books and affairs of the company to be open at any and all times to the inspection of a regular standing committee of the National Association appointed annually for that purpose.

AMENDMENTS SUGGESTED AS DESIRABLE BY THE COMMITTEE.

1. "The title of the company to be the Builders' National Security and Guaranty Company." The former title being impracticable, as it has been ascertained that certain States prohibit insurance companies from transacting two kinds of business.

2. "Its stock to be limited to 10,000 shares, at a par value of $100 per share."

3. "These shares of stock to be issued only to members (either active or honorary) of bodies affiliated with the National Association, or to the said filial bodies themselves."

4. The committee are of the opinion that this section is not feasible, and desire its elimination.

5. The committee desire to amend this section by omitting the words "in addition to that apportioned as above mentioned, limited in extent to an equal number of shares to those so apportioned."

6. The committee consider this impracticable, and desire it be stricken out.

7. No change desired.

8. "The business of the company shall be in charge of a Board of Directors, consisting of persons to be elected at the annual meeting of the stockholders, which board shall elect its executive officers. They may appoint such advisory boards in various sections of the country as they may deem advisable for the proper and efficient conduct of the business, preference in the selection of such boards to be given to persons nominated by filial bodies of the N. A. of B. located in said districts."

9. The committee consider this section inadvisable, and desire its elimination.

10. "The books and affairs of the company to be annually inspected by a regular standing committee of the National Association appointed for that purpose."

SUGGESTIONS BY THE DIRECTORS AT MID-YEAR MEETING.

1. No further change suggested.

2. That its stock be limited to 40,000 shares, at a par value of $25 per share.

3. That this section be amended to read, "These original shares," &c.

4. No further changesuggested.

5. That this section be amended to read, "Filial bodies in good standing, which are so incorporated as to permit them to hold personal property, to be permitted to purchase and hold stock."

6, 8 and 9. No further change suggested.

10. That this section be amended by adding the words, "by the stockholders of the said company."

The committee were requested to take the matter under further consideration, and be prepared to submit another report to the next convention.

The president then made a few complimentary and congratulatory remarks relative to the hospitality extended to the convention by the Building Trades Club, after which Mr. Grace offered the following resolution:

Resolved, By the Board of Directors of the National Association of Builders, that the secretary of the National Association be requested to send a circular letter to the president of the American Institute of Architects, which is about to hold a convention in a neighboring city, &c. (as suggested in the recommendation of the committee as reported this morning).

This resolution was, upon motion duly seconded, unanimously adopted.

Mr. Blair: Before our adjournment, I think it is meet and proper that we should make some recognition for the courtesies extended to us by the builders of New York, and for the use of these beautiful quarters. I, therefore, move you, sir, that the Board of Directors of the National Association of Builders extend their hearty thanks for the use of this room of the Building Trades Club, and the courtesies extended to us.

This motion, upon being duly seconded, was carried unanimously.

The convention then, upon motion duly seconded, adjourned *sine die*.

THE RECEPTION.

As had been previously announced to the delegates, they were tendered by the Building Trades Club on the evening of the 24th, after the conclusion of the business of the meeting, a most delightful and entertaining "informal reception." The rooms of the club, which are particularly convenient for their purpose, and are so arranged that they can be thrown into one long apartment, were profusely decorated with flowers, and about the rooms were a sufficient number of small tables to seat the guests.

After a very agreeable reception, which lasted until about 9 o'clock, the tables were spread and the reception transformed into an "informal banquet." Much credit is due the House Committee of the club for the exceedingly pleasant manner in which the evening passed off. To add, if possible, to the enjoyment of the occasion, the visitors had the pleasure of listening to some particularly good declamation, serious and comic, by two young members of the club, who were introduced by Mr. Stephen M. Wright, general secretary of the committees on the coming convention.

After the coffee had been passed, Mr. Marc Eidlitz, president of the club, made a few remarks alluding to the work of the meeting, and bidding all a hearty welcome to the club and New York at the time of the next convention in February.

Mr. Sayward gave a short *resumé* of the purpose and what had been accomplished by the first mid-year meeting, and the remainder of the evening and until a late hour was devoted to pertinent remarks by various members of the New York Exchange and directors upon the important topics of the time.

NOTES.

The following named gentlemen, 30 in all, were in attendance at the mid-year meeting: President John J. Tucker, of New York; First Vice-President Arthur McAllister, of Cleveland; Second Vice-President Anthony Ittner, of St. Louis; Secretary W. H. Sayward, of Boston; George Mann, Baltimore: J. Arthur Jacobs, Boston; Samuel Farquhar, Boston; E. F. Cook, Buffalo; James A. Miller, Chicago; Lawrence Grace, J. Milton Blair and R. H. Jenks, of Cincinnati; S. P. Snead, Louisville; Clifford Chase, Milwaukee; Marc Eidlitz, New York; Richard Smith, Omaha; Wm. Harkness, Jr., Stacy Reeves and David A. Woelpper, of Philadelphia; Daniel M. Mannix, Portland; J. S. Hudson, Providence; T. J. Hamilton and A. Rasner, Pittsburgh; W. H. Gorseline, Rochester; T. J. Kelly, St. Louis; E. E. Scribner and J. W. Makinson, of St. Paul; C. F. Wiseboon, Jr., Syracuse; Thomas J. King, Washington; A. S. Reed, Wilmington; H. W. Eddy, Worcester.

The motion made in the meeting requesting the secretary to procure and distribute any publications relating to the Philadelphia Trade Schools had already been anticipated by the presentation in these columns of all information relating to these schools as fast as available. Full and complete description of their workings, a copy of the prospectus and all that would be of benefit to other exchanges desirous of undertaking a similar project have been given in *The Builders' Exchange*.

The return of Mr. John S. Stevens, ex-president of the National Association, to his home in Philadelphia, after an extended trip in foreign lands, was appropriately celebrated by a reception and banquet tendered him at the Master Builders' Exchange by his fellow members of that association. During his absence Mr. Stevens very kindly kept his friends of the National Association informed upon many of the interesting incidents of his trip, through the medium of letters printed in *The Builders' Exchange*, and arrived safely home on the 5th inst.

On the occasion of the reception the rooms of the Master Builders' Association were beautifully decorated with flowers and green plants, and an excellent orchestra added music to the pleasure of the entertainment. The banquet, judging from the beauty and artistic appearance of the *menu*, and a knowledge of the ability of the Philadelphia builders to provide a thoroughly enjoyable entertainment, must have been a delightful affair. The toast "Our Guest" was responded to by Mr. Stevens, who expressed the utmost appreciation of the warmth of the greeting extended him, and congratulated the members upon the improvements in the Exchange Building which had taken place during his absence. He proceeded to give a short description of his trip, touching upon the principal points visited and the most interesting occurrences.

The Rev. H. B. Rominger, of East Portland, Ore., who was a fellow traveler with Mr. Stevens for part of the journey, related a number of incidents of the trip.

The toast "The Future Greatness of the Exchange and Trade School" was assigned to Mr. George Watson, and was done full justice at his hands. The large number of guests were all most delightfully entertained, and separated with the feeling that another bond of fellowship and fraternity had been established among them.

The members of the Master Builders' Exchange of Worcester recently enjoyed their annual outing. The day was spent at Lake View, and was one of the most enjoyable occasions in the history of the exchange. After the afternoon had passed and an amusing game of base ball had been played the members and guests sat down to an ample and excellent repast. There were a number of toasts proposed and replied to by various members of the exchange. "The Master Builders' Exchange" was responded to by Secretary J. H. Coggeshall, who gave a short history of the association, and laid particular stress upon the importance of full daily attendance by members at the rooms during the exchange hours. Many other toasts of local interest were given, and when the party broke up, about 9.30 o'clock, all were very well pleased with the result of the day's vacation.

THE INHABITANTS OF ULM are very proud of their cathedral, which is at last completed, after having remained for nearly 500 years in an unfinished condition. The cap stone, says *Invention*, has now been put on what is now the highest building in the world, the finial of the Ulm spire being 530 feet from the ground. The cathedral is a very beautiful one, in pure German Gothic of the fourteenth century, with a single spire, which stands in the center of the west front, and covers a projecting portal. This spire, with the tower supporting it, is a magnificent specimen of the unrivaled skill in stone-cutting of the German masons of the later Gothic period.

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TRADE NOTES.

W. S. RICHARDS & Co , of Philadelphia, Pa., have been appointed agents for the products of the Whittier Machine Company, of Boston and New York. Among the contracts on hand may be mentioned one calling for three hydraulic elevators for the apartment building at the corner of Eleventh and Pine streets, Philadelphia. The building is 11 stories in hight, and the elevator will run to the top story.

GEORGE W. GROVE, 937 F street, N. W., Washington, D. C., has devised a form of agreement for building with bond, which seems to meet a well defined demand. It is a very complete and clearly worded document, printed on Japanese linen bond paper, with neat red double margin lines, special seals, &c Dotted rules are left at the end for special agreement, alterations, for old materials, corrections, &c.

THE VAN DUZEN GAS AND GASOLINE ENGINE COMPANY, Cincinnati, Ohio, have for the past year been experimenting with gasoline engines, with the result that they now have ready for the market a little engine of great power, designed for using gasoline. It is a 6 x 7 inch engine, occupying but very little floor space and weighs 800 pounds. The manufacturers state that it will run 100 feet of shafting and machinery, while it consumes from 5 to 6 gallons of gasoline per day. Full information concerning this engine and prices can be obtained upon application to the company.

A NOTICE HAS BEEN ISSUED, under date of September 22, to the effect that the firm of F. A. Requarth & Co., composed of F. A. Requarth, H. W. Requarth and H. W Hueffelmann, was dissolved upon that date, by mutual consent H. W. Hueffelmann disposed of his interest in the firm to William H. Meyers, who, with the Messrs. Requarth, will continue the business under the style and title of F. A. Reuarth & Co.

THE STANLEY RULE AND LEVEL COMPANY, of New Britain, Conn., report that up to the present time they have sold fully 15,000 of their Tool known by the name Odd Jobs, and are confident that it is a device which is likely to find its way into the kit of every carpenter in the country. Elsewhere in this issue they announce that until Christmas they will send by mail, postpaid, a sample of this tool to any address on receipt of the retail price.

THE SIDNEY PLANING MILL COMPANY issue an announcement to the effect that there has just been completed at Lima, Ohio, a large and commodious factory for the manufacture of the Hill Sliding Blind. This building has been erected and equipped with a special view to meeting the requirements of the large and growing trade in the goods named, and the company state that the factory has a capacity sufficient to enable them to promptly fill all orders. It is stated that nothing more will be done at Sidney, and that all future communications should be addressed to the Monroe Mfg. and Lumber Company, Lima, Ohio.

THE GAGE TOOL COMPANY, of Vineland, N. J., are distributing circulars illustrating their Self Setting Bench Plane, which is claimed to combine the advantages of both iron and wood planes. It is stated that the device can be set for the finest work with the eyes closed, the adjustment being such that the cutting iron may be set square with the face of the plane, even though the cutter be not ground square with itself. The throat is protected from wearing by an adjustable iron bit holder, which extends through the plane. The company state that for 60 days they will send to any carpenter a sample of an excellent pencil and copies of their circulars if in applying the applicant will mention *Carpentry and Building*.

WE HAVE RECEIVED from William P. Walter's Sons, 1233 Market street, Philadelphia, Pa., an illustrated catalogue of woodworkers' tools and foot power machinery. It is a volume of over 250 pages, profusely illustrated and presenting ample descriptive letter-press. Directions are given how to order goods, as well as how to make remittances. Attention is given to Auger Bits, Chisels, Clamps, Drawing Knives, Gougers, Hatchets, Planes, Miter Boxes, Rules, Saws, Trammel Points, Vises, Saw Sets, Nail Punches, Drawing Instruments and Levels. This is the eighth edition of the company's catalogue and is gotten up in a manner which cannot fail to interest the trade. The company make a specialty of the latest and most approved tools for all branches of mechanical trades, and carry in stock a full line of machinists' and metal workers' tools, lathes, &c.

W. A. HEATH, of 23 and 24 Walter street, Binghamton, N. Y., has issued a poster of large size containing illustrations of some of the many woodworking machines manufactured by him. The poster is sent out to the trade with the request that it be hung up in a prominent place for reference. In addition to illustrations of machines of various kinds, a general view is shown of the works of Mr. Heath, in Binghamton, N. Y.

THE EGAN COMPANY, of Cincinnati, Ohio, have just been awarded the contract to furnish the woodworking machinery required in the navy yard at Norfolk, Va Among the machinery included in this contract is a complete outfit of planing, sash, door and blind machines. The statement is made that the contract was awarded on the strength of recent improvements incorporated in the machinery turned out by this company, resulting in rapid and satisfactory work.

JAMES B. SCOTT & Co., Pittsburgh, Pa., have just issued a very neat little circular relating to guaranteed tin plates. As they state in a prefatory note, their object in offering the pamphlet is a desire to present a few opinions of representative railroad engineers and architects, government experts and roofing contractors regarding the Scott Extra Coated brand of roofing tin plate. Several testimonial letters are printed in *fac-simile*, and at the close of the pamphlet description is given of the Triumph hand made and Braddock brands.

THE NILES IRON AND STEEL ROOFING COMPANY, of Niles, Ohio, are distributing an illustrated catalogue descriptive of the specialties which they are furnishing the trade. It is a little pamphlet of 12 pages, bound in colored paper covers, and presents a great deal of information which will be found useful to the builder. Reference is made to the quality of iron which is used in the roofing turned out by this company, the statement being offered that it is box annealed and free from scale and smoke. Attention is also invited to the special advantages of the company's Roll Cap Roofing, as well as to their Curved Iron for ceilings, fire proof doors, shutters, &c. An announcement which the company presents elsewhere in this issue will be found of general interest.

THE MONROE MFG. AND LUMBER COMPANY, who were recently incorporated with W. H. C. Monroe, formerly of the Sidney Planing Mill Company, Sidney, Ohio, as president, are now located in their new plant at Lima, Ohio. They occupy a structure so situated as to afford excellent shipping facilities, the main building being 94 x 146 feet, and three stories in hight. It is equipped throughout with new machinery designed especially for the production of the Hill Siding Blind and the Perfection Window Screen, as well as for general planing mill work. The power is obtained from a 110 horse-power Lane & Bodley Corliss engine steam being supplied by a 16 x 68 Brownell boiler. The heating and drying department is located in a separate building, two stories high, 18 x 82 feet in size, and supplied with a Sturtevant apparatus. The capacity of this department is 50,000 feet of lumber per day. The entire plant is heated by steam.

SAMUEL GOMPERS, president of the American Federation of Labor, has issued a notice to the trade and labor unions of America to the effect that the tenth annual convention will be held at Clausen's Hall, 96 Miami avenue, Detroit, Mich., on December 8 of the present year. All national and international unions, State federations, central labor unions, trades assemblies, local unions and federal labor unions which are affiliated to the American Federation of Labor and entitled to representation, are invited to send their delegates to this convention. The circular contains other information which is of general interest in this connection.

THE NORTON DOOR CHECK AND SPRING COMPANY, Boston, Mass., direct the attention of carpenters and builders to the Norton Door Check, which they are prepared to furnish on short notice. This device is claimed to permit the door to close without slamming or breaking the glass.

THE MILLER LOCK COMPANY, of Philadelphia, Pa., state that they have incorporated some improvements in their line of Champion Keyless Locks, and that the combinations are made so simple that any person can put them in place without the least difficulty. The dial has been enlarged and made as legible as possible. Each lock has four tumblers and is opened on a combination of three numbers, these combinations all differing in a large series, and may be changed by the owner without taking off the lock. Reference is made by the manufacturers to the extensive use of these locks by colleges, normal schools, armories, clubs and associations, where large numbers are required

JOHN T. TOWSLEY, 226 Main street, Cincinnati, Ohio, calls attention in another part of this issue to the line of specialties which he manufactures. Reference is made to Swing Saws, Wood Lathes, Steam Glue Heaters, Wood Frame Benches and Trucks of various kinds.

C. E. JENNINGS & Co., of 79 and 81 Reade and 97 Chambers streets, New York, state that, having purchased the entire plant of the Port Jervis Saw Works, including the real estate, machinery and tools, they are now prepared to execute orders on a full line of Hand, Panel, Compass, Keyhole, Kitchen and Butcher Saws. They also state that they carry in stock a full line of Buck Saws. An interesting assortment of saws will be found illustrated in their advertising space this month.

THE NEW YORK TRADE SCHOOLS, on First avenue, between Sixty-seventh and Sixty-eighth streets, New York, present an announcement elsewhere in this issue which will be found of especial interest to those desiring a course of instruction in the branches covered by this institution. The courses in plumbing, house and sign painting commence on December 3, and in bricklaying, stone cutting and carpentry on January 6, 1891. Evening instruction in plastering, bricklaying, plumbing, carpentry, house, sign and fresco painting and blacksmith work is given from October 22 to April 1.

WE HAVE RECEIVED from the Jackson Architectural Iron Works, 315 East Twenty-Eighth street, New York, some very interesting photo prints of work recently executed by this firm. These are in the form of plates, which they are in the habit of sending to their correspondents in the sense of illustrating such work as they undertake. One of these represent the iron construction of the Third Avenue Railroad Company's car house. Others show Wrought Iron Balconies Grills, Railings and odd specimens of artistic wrought iron work. A counter screen railing, executed for the Canadian Bank of Commerce, Toronto, an aluminum bronze rail furnished to the Public Buildings, Philadelphia; a view of the stairway in the Cambridge Hotel, Thirty-third street and Fifth avenue, New York; a wrought iron entrance gate to the Lincoln Building, New York, and other interesting subjects are found in the collection before us.

THE MURRAY & PORTER LEVEL COMPANY, Pittsburgh, Kan., are offering the trade a Plumb and Level to which attention is invited in another part of this issue. Reference is made to the fact that in the construction of this device there is nothing to break or get out of order, and that it is a thoroughly reliable Level.

IN ANOTHER PART of this issue the New England Artistic Carving Company, 621 Albany street, Boston, Mass., direct attention to the line of Architectural Turned Wood Work, which they carry in stock and can furnish to order. The announcement is of especial interest to cabinet makers and wood workers, to whom a copy of the company's catalogue will be sent on application to them.

A PORTABLE STRUCTURE, composed of a series of panels hinged together in such a way that they may be set up and attached to form a portable building, constitutes the basis of a patent recently granted to Charles H. Leonard, of Grand Rapids, Mich. This arrangement is said to be peculiarly adapted for use in the construction of storm houses, or houses which are attached to buildings for the purpose of protecting them from cold in winter. One of the objects of the invention is to construct a cheap, substantial and portable structure, which can be readily set up and attached to a building, and as readily removed and folded for the purpose of transportation or storage.

THE CHAMBERS SASH LOCK COMPANY, with factory at New Britain, Conn., and warehouse at 103 Chambers street, New York City, state that a company have been formed for the manufacture of Chambers' Gravity Sash Lock, and have fitted up a plant, in which operations were commenced on Monday, October 20. The company have equipped their buildings with the latest improved machinery necessary for the production of the Chambers Lock, and are in a position to handle orders promptly. They show elsewhere in this issue a general view of the lock referred to.

W. J. BURTON & Co., Detroit, Mich., are meeting with a steady and growing demand for their Eastlake Metallic Shingles, Conductors, Gutters and Roofing Specialties, which they manufacture. The demand for roofing seem to be of a general character, and orders are coming in from different sections of the country, while the city trade is keeping pace with its past record. Recent shipments which the company have made include points in Ohio, Indiana, Illinois, Missouri, Kentucky, Georgia, Texas, Washington and several places in Michigan.

THE AMERICAN INSTITUTE FAIR.

The American Institute Fair, which is now in progress in this city, and will continue until the last week of November, presents a number of exhibits which are of more or less interest to those engaged in the building trade. The Burlington Blind Company, of Burlington, Vt., and with New York office at 18 Cortlandt street, show the practical operation of their Inside Sliding Blinds and Screens by means of a small house which has been erected for the purpose. The Defiance Scuttle Lock Company, of 157 East Fifty-seventh street, New York, display a model of the Defiance Scuttle Lock, designed to facilitate egress in case of fire, and of such simple construction that it can be operated by a child.

The D. Frisbie Company, of 112 Liberty street, New York, show one of their Elevator Hoists with elevator in position, while George Hayes, 71 Eighth avenue, New York, has a small portable house, illustrating the practical application of Hayes' Metallic Lathing, which adds to the fireproof qualities of the building in connection with which it is employed. The Ducker Portable House Company, of 239 Broadway, New York, have also on exhibition a model of a portable house, clearly showing the manner of construction and its appearance after the sections are put together.

Another interesting exhibit is made by the Stewart Ceremic Company, of 821 Pearl street, New York. The space is floored with tile and wainscoted with marble slabs. The exhibit consists of a number of patent Solid White Crockery Stationary Wash Tubs, fitted with nickel plated faucets and highly polished supports. H. A. Berry, of 39 Dey street, New York city, makes an exhibit of the Prescott Door Hanger, in connection with which no tracks or railways are used. He also exhibits the Norton Door Check and Spring.

The Hercules Novelty Mfg. Company, Albany, N. Y., show the Hercules Folding Extension Horse; Frank W. Gates, 39 Dey street, New York City, exhibits the Emery-Gates Sectional Ladders; A. C. Manning & Co., 18 Vesey street, New York, make an exhibit of the Otto Gas Engine, and Charles E. Little 59 Fulton street, New York, shows the Detroit Sure Grip Steel Tackle Block, and some of the specialties made by W. F. & John Barnes Company, of Rockford, Ill.

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CARPENTRY AND BUILDING.

A MONTHLY JOURNAL FOR THE BUILDING TRADES.
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A. O. KITTREDGE, - - - - EDITOR.
JOHN S. KING, - - - BUSINESS MANAGER.
66 & 68 DUANE STREET, NEW YORK.

DECEMBER, 1890.

New York Architectural League Exhibition.

The Architectural League of New York will give their sixth annual exhibition at the Fifth Avenue Art Galleries, beginning Tuesday, December 23, and continuing for three weeks, closing January 10, 1891. The exhibition will consist of drawings, &c., not before publicly exhibited in New York, representing as far as possible the present style of architecture and the allied arts. It will include architectural designs embodied in plans, elevations and sections or shown in perspective; designs for decoration, furniture and the like; photographs of executed work, cartoons for stained glass, models of executed or proposed work, sketches, drawings and paintings of architectural or decorative subjects and completed work, such as carving in stone or wood, wrought iron, mosaic, glass, &c. In connection with the exhibition will be the fourth annual competition for the gold and silver medals of the Architectural League. The competitors must be residents of the United States, and the drawings made in conformity with the regular programme. Full particulars can be obtained of the secretary, Edward T. Hapgood, 47 West Forty-second street, New York City.

Opening of the Trade Schools.

The season is at hand when trade schools open. The number of these institutions which command attention by reason of the good work that they are doing is far in excess of any other period in the past. The opening exercises each year are attended by a larger number of interested citizens than ever before, and the classes average more in number and are more regular in attendance than formerly. The trade school from being an experiment has come to be an institution universally respected and very generally supported by both master mechanics and journeymen. The period of uncertainty immediately preceding the abandonment of the old apprentice system has happily come to a close, and now employers everywhere turn to the trade schools as being adequate for that education which the young men of the country must possess in order to fit them to be mechanics. The time would seem to be near at hand when the graduates of our trade schools will take correspondingly high positions to those occupied in the past by the graduates of our technical schools, of our engineering schools and of our universities. Whenever that time reaches us the condition of the American mechanic will be far better than it is now or has ever been in the past. We are somewhat slow in getting our institutions established and in running order, but when the mill once commences grinding the product will be of no uncertain quality, and the supply will be fully up to the demand.

Architectural Competitions.

Many architects throughout the country are opposed to the usual system in vogue of architectural competitions. They do not believe that as managed they result in the best designs nor in securing the best talent for managing a given building. They also feel that by this plan an immense amount of labor devoted to the preparation of designs and sketches goes absolutely without remuneration. The question of a remedy for the evil has been variously discussed in the different architectural papers, and its agitation has not been without its effect. Competitions at the present time are very frequently conducted in accordance with methods radically opposed to those which formerly obtained. It is not uncommon now that a number of architects are invited to submit plans for a certain building upon the understanding that each competitor, except the successful contestant, shall be paid a certain amount in cash. The one who submits the preferred design is to have the management of the work, and be paid for same at regular prices. While the amounts offered in cash upon this plan seldom equal a reasonable payment for the work done, it is yet satisfactory, because it emphasizes, the good intentions of those having the work in charge. A competition conducted as competitions are ordinarily managed is in effect a lottery, and one architect, talking upon this point a short time since, was so strong in his expressions as to say that under the lottery law passed by the last Congress he hoped architectural competitions could be suppressed. This is an extreme view, no doubt, but it shows in what repute architectural competitions are held at the present time.

Review of the Year's Building Operations.

The builders of the country are just finishing up what has been one of the most satisfactory building years, in some particulars, that they have experienced in a long time. The building operations of the country have been well distributed, involving new edifices of all kinds, and have been so managed as to keep the rank and file of builders and mechanics busy from the commencement of the season to its close. During the progress of the year there have been some disturbances in building lines on account of strikes and misunderstandings between employers and employees. But, after all, these have resulted in far less embarrassment to the industry than the general public has supposed. The prospect ahead is for the continuation of the present hopeful conditions during another year. So far as can be judged at this time, there will be a demand for new buildings for 1891 fully up to that which has prevailed during 1890. From surface indications, it is fair to assume that labor matters may be expected to exert a less injurious effect in the future than has been the case the past year. Many of the points in dispute have been settled, and employers and employees are working together upon a new basis far more satisfactory than that which preceded the present understanding. There is one condition to which the builders will have to adjust their business in the near future, and that is the changes in prices produced by the new tariff law. Certain building materials are likely to be higher in the near future than they have been in the past. On the other hand, certain other materials will likely be lower than heretofore. Perhaps, after all, the changes produced by the artificial conditions of recent legislation are no more radical in their effect than those which are frequently brought about by other causes. The larger part of the material entering into any building is of local supply, and therefore builders have less occasion to take a broad or national view of the situation than those in many other lines of trade.

The Late Flurry in the Financial World.

As we go to press with this issue of *Carpentry and Building*, the financial world is recovering from one of those rude shocks which occur at irregular intervals and which are very generally known as "panics." In this case the results have not been nearly so disastrous to business interests at large as those which have followed similar complications in the past, and yet enough has occurred to put every one to thinking about money matters and financiering. Various opinions are current as to the cause of the difficulty. The practical failure of one of the largest and most noted financial firms in the world, with headquarters in London, would seem to indicate that much of the trouble has grown out of the particular line of investments or securities with which this firm's business has long been prominently indentified. As storms in the natural world come from sudden changes in temperature, from the rarification of the air in one place causing heavier and colder air from another part to rush in, so in the financial world storms occur from sudden fluctuations in values, sudden withdrawal of deposits, and even from sudden changes of opinions as to the real worth of different things. Illustrations of all this are easily pointed out. The heavy load of South American securities which the Barings carried, on account of the peculiar financial methods characterizing the governments alluded to, in all probability lie close to the bottom of their difficulty, and yet this is only one of several causes which have co-operated to bring about the crisis. London is, in a peculiar sense, the financial center of the world, and what occurs there affects all the other money centers. But in New York we have our own difficulties to contend with as well, and what with the disarrangement of

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values growing out of the various changes which have recently occurred in this country, for which, to a certain extent at least, the recent tariff legislation is responsible, with liquidation in progress in various directions and refunding and reinvesting also going forward, the stringency in London has made things very bad for weak banks and overloaded brokers as well.

A Panic Averted by the Banks.

However, we did not set out to write a history of what has recently occurred, but we do want to point out one or two things which, in our estimation, are of the most encouraging character, and which, perhaps, have served to make the present panic of shorter duration than any other which has ever occurred. We refer particularly to the united action of the New York banks, through the Clearing House, in standing beside any solvent institution which needed help. We refer also to the arrangement which was made for taking care of the Barings in London, and to which even the great Bank of England became a party. This union of solvent financial institutions to resist the ravages of a panic is in every way commendable. Such methods have been tried to a limited extent in the past, and have always proved advantageous. Speaking on this point, one of the daily papers sums up the situation in the following suggestive sentences: "The ability and courage with which the banks on both sides of the water have come to the aid of the threatened money markets is proof that commercial systems and customs have greatly advanced in the course of the last quarter of a century. A panic has been averted by the banks, which have put their resources at the command of the business interests that were in danger. In other words, business men have stood together, recognizing that the cost of preventing a panic is less to all honest dealers than the cost of recovery from one. Wall street, with this aid, has shown marvelous strength. Twenty years ago a mere rumor of the embarrassment of the house of Barings would have ruined hundreds of brokers and bankers, and would have carried disaster into every business quarter of the country. The difference between now and 1873, when Jay Cooke's failure brought on a general panic, is wonderful."

Money for the World's Fair.

An important question for the people of Chicago, which was settled at the election on the 4th ult., was one wholly outside of partisan politics and strife for office. A constitutional amendment had been submitted for ratification to the people of the State of Illinois, empowering the city of Chicago to issue bonds for $5,000,000 to aid the world's Fair of 1893. This action was rendered necessary, as Chicago had already borrowed for other purposes up to the full limit of its municipal privileges under the State constitution. The vote on this question was overwhelmingly in favor of enabling Chicago to raise the $5,000,000 desired. There is no doubt whatever that the City Council will act promptly with this permission given them and that the World's Fair can therefore be said to have been put in possession of ample funds to make the exposition a grand success. The subscriptions from individuals and corporations were in excess of $5,000,000, so that that there will be more than $10,000,000 available. It is worthy of mention in this connection that the political managers of the several parties adopted a shrewd scheme to get a full vote on this question, and also to insure a favorable vote. All the tickets, so far as now known, were printed "for the constitutional amendment," instead of being printed, as is usually the case, "for" and "against," and leaving the voter to exercise his choice by crossing out one line. Many voters in such cases leave both stand, not comprehending their purpose, and thus rendering their vote nugatory. Few voters would take the trouble to write "against" instead of "for" unless they were bitterly hostile to the scheme, and that is not the case in Chicago and throughout Illinois, the sentiment being practically unanimous not only of having the World's Fair, but also of giving it the proper financial support.

Profit Sharing.

Profit sharing with employees appears to be growing steadily in favor among manufacturers. Another large Chicago establishment announced its adoption last week. Of course the milennium has not yet dawned, and a new dispensation cannot be predicted merely because some converts have been made, but it is certainly gratifying to note the increasing disposition of employers to cultivate pleasant relations with their workmen. And in no way can pleasant relations be cultivated with a surer prospect of getting a good crop than through the agency of a substantial pecuniary benefit. This does not imply mercenary motives on the part of a workingman any more than in the case of any other class of people. All are striving for the mighty dollar because of the advantages to be gained by its possession. Profit sharing must necessarily make a workman take a deeper interest in the operations of the concern employing him than if he merely received the market rate of wages, no higher and no lower than those paid in other works around him.

Ventilation in the Autumn.

More thought is given to the subject of ventilation during the fall and early winter than at any other time of year. We do not mean that professional sanitarians annually await this season to study the laws of ventilation and give no attention to it during the remainder of the twelvemonth, but rather that the public at large are now forced by considerations of health and bodily comfort to thoroughly consider the best means of obtaining fresh air. In the summer time windows and doors are wide open and the air circulates freely through stores, offices, street cars, boats and all other stationary and moving enclosures, but with the first coming of cold weather down with a bang go the windows, and slam go the doors, and the poor imprisoned people immediately begin to suffer from drowsiness, nausea, headache, faintness, and all the other ills that attend the breathing of foul air. This brief season between summer and winter is the most trying in the whole year, and is much worse than the corresponding period in spring, for by the latter time people have, in a measure, become accustomed to breathing obnoxious gases of all sorts, and furthermore, artificial heat is continued till summer's warmth arrives, and so makes it possible to open windows in the intermediate time of cool weather. But in the fall all this is different, for heat from furnaces, stoves and boilers is economized till the last moment, and in the meantime every cool air entrance is kept hermetically sealed lest some one suffer from a chilly draft. When winter really arrives the conditions become more wholesome. The furnaces and indirect radiators deliver large volumes of fresh air into the rooms and apartments, and even where direct heating systems are employed the plentiful supply of heat renders window and door ventilation possible without attendant discomfort.

Some Illy-Ventilated Places.

Amateur and professional sanitary engineers are continually improving the condition of buildings, so far as ventilation is concerned, and though there is much to be wished for in the way of further advance, there is also much to be thankful for in what has already been accomplished. But unfortunately the traveling public has no reason to be satisfied with what has been done to provide them with fresh air in cars and steamboats. We venture to say that George Washington, in all his stage riding, never suffered such discomforts in breathing as many a poor drummer suffers every winter in the lower berth of a sleeping car; while Thomas Jefferson, journeying on horseback, could not have imagined what his followers would for his sake endure in crowded horse cars going to and from political gatherings on rainy October nights. In the winter time a stuffy sleeping car, the cabin of a crowded ferryboat, and a horse car filled with steaming humanity are three places that do little credit to our boasted knowledge of hygiene and the progress in material comforts that this century is generally acknowledged to have brought about. There are, to be sure, several difficulties in the way of ventilating cars and cabins, but none of them appear to us insuperable and we look for the time when the traveler will be furnished with an abundance of sweet air to breathe and will not look forward to his journeys as a period of enforced discomfort. Perhaps the reason that so little has been done to ventilate vehicles and boats is that those who suffer from the bad smells and lack of air have borne their miseries in silence. A city resident is, as a rule, only in a horse car a few minutes each day, and so does not think it worth his while to grumble, but were he to regularly spend half the day riding about town he would be more apt to protest against the horse car company's indifference to the laws of health. So it is with this as with many other abuses that are permitted to survive; the large aggregate amount of discomfort is distributed over so many that no one feels called upon to work for reform; everybody's business being nobody's business.

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A ROW OF HOUSES IN ELIZABETH, N. J.

D. B. PROVOOST, ARCHITECT.

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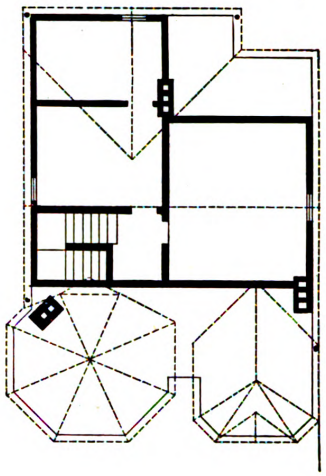
HOUSE IN ELIZABETH.

IN THESE COLUMNS some months since we referred to the pleasing effects produced by the erection upon a street of houses which, in their external features, possessed in a greater or less degree architectural variations. Attention was also called to a row of moderate cost houses located in a Western city, and showed, by means of a supplemental sheet, some of the designs which were employed. In the present issue we have pleasure in showing upon our supplemental plate a row of dwellings in Elizabeth, N. J., the designs for which were prepared by D. B. Provoost, architect, of that place. The elevations, floor plans and details, which are given upon this and the following pages, apply to the first of the row of houses shown on the plate, while those of the second house in the row will be given in our next number.

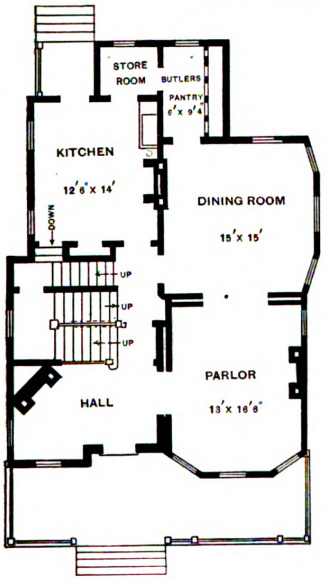
Referring to the house now shown, it will be seen that provision is made for three large rooms upon the first floor besides a hall, which is fitted with an open grate, adapting the apartment for use as a reception room, if desired. The parlor and dining room are connected by means of folding doors, while access to the kitchen from the dining room is secured by means of a butler's pantry and storeroom. The arrangement upon the first floor is such that a person can pass directly from the kitchen to the front hall without the necessity of entering the dining room or parlor. The main stairs rise from the reception hall, and are so arranged as to occupy as little space as possible. The



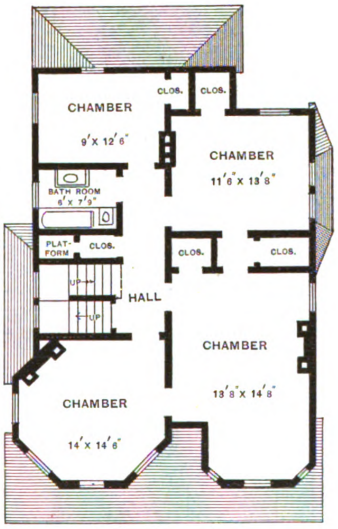
Front Elevation.—Scale. ⅛ Inch to the Foot.



Attic Plan.

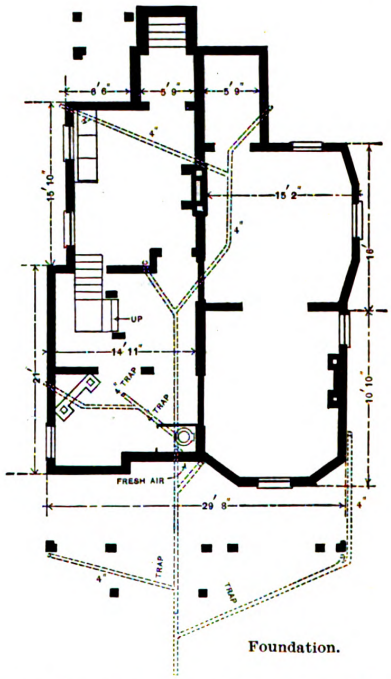


First Floor.



Second Floor.

Scale of Plans, 1-16 Inch to the Foot.



Foundation.

A House in Elizabeth, N. J. (For Perspective View See First House in Supplement Plate.) D. B. Provoost, Architect.

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Side (Right) Elevation.



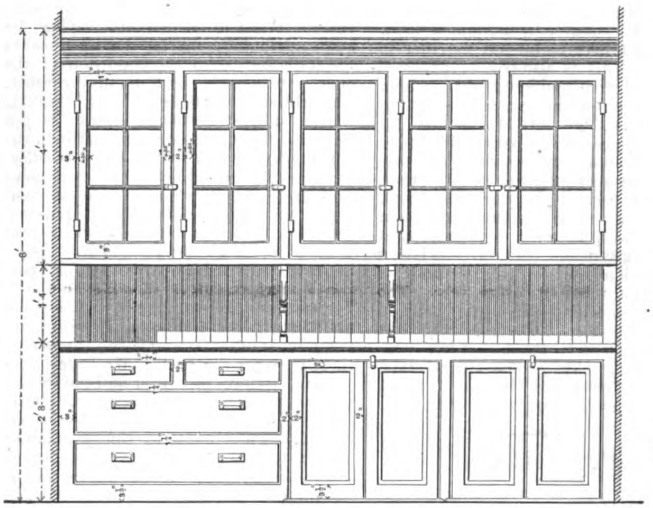
Side (Left) Elevation.

A House in Elizabeth, N. J.—Elevations.—Scale, ⅛ Inch to the Foot.

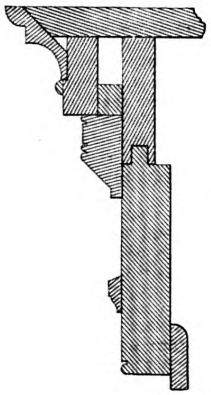
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back stairs, readily accessible from the kitchen, extend upward only half a flight, terminating on the landing of the main stairs. The second floor is fitted with four sleeping rooms, bathroom and ample closets.

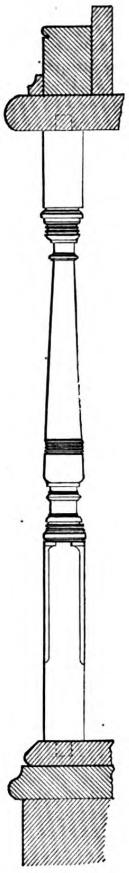
In designing this house the architect had in view the provision of two good rooms upon the second floor, one of which might, if desired, be used as a sewing or sitting room. Each room is furnished with an open grate, as will be seen from an inspection of the floor plan. It will also be noticed that the stairway is so placed that a very small space is required for hall purposes. The house is finished on the inside with natural pine, varnished and polished, and with two finished rooms in the attic. All the modern improvements are provided. The water for the house is drawn from a tank in the attic, he tank being supplied by means of force and lift pumps. This arrangement would not be necessary in case the house was erected in a city supplied with waterworks. The foundation plan shows the drainage system and indicates the manner in which the cellar is divided. From an inspection of the front and side elevation it will be seen that the roof of the house extends down in such a way as to cover the front piazza, the roof line being continuous. This is so arranged, however, as to give the rooms on the second floor their full hight.



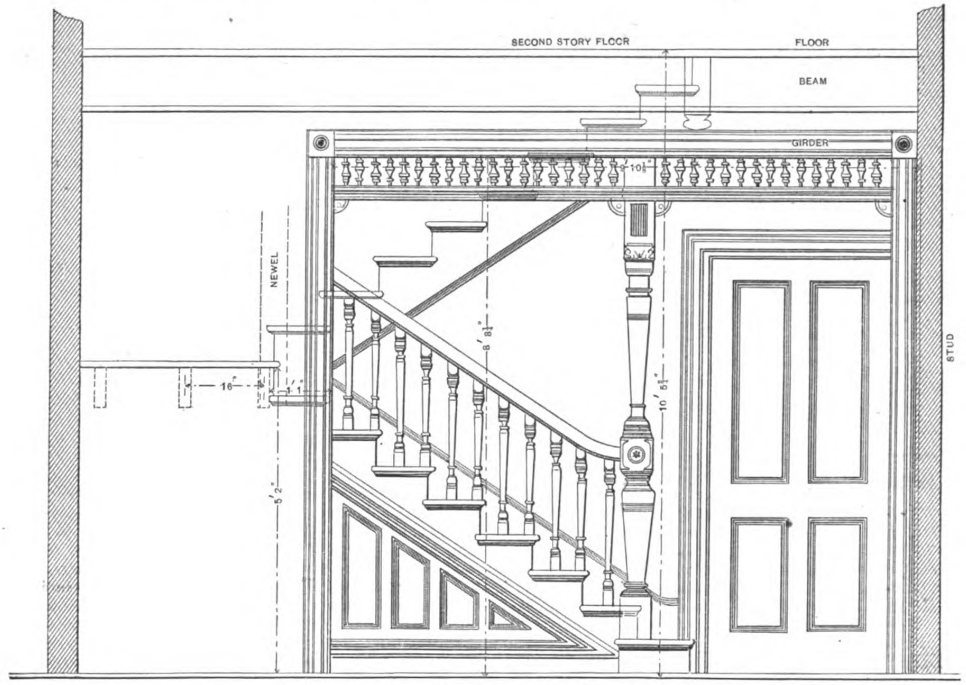
Cases in Butler's Pantry.—Scale, ⅜ Inch to the Foot.



Detail of Cornice and Column.—Scale, 3 Inches to the Foot.



Column in Cases in Butler's Pantry.—Scale, 3 Inches to the Foot.



Main Stairway.—Scale, ⅜ Inch to the Foot.

Details of a House in Elizabeth, N. J.

Precautions Against Freezing.

The Boston Manufacturers' Mutual Fire Insurance Company have issued a special circular which deals with the methods of avoiding damage by freezing. Not only is a large amount of damage done to fire apparatus by freezing, but there have been numerous instances in which cold weather has interfered with proper action of some portions of the apparatus, and these difficulties would have been to a large extent avoidable.

It is not that the damage caused by frost may be limited to the portion of the apparatus injured, but in many instances breakages of this nature affect the whole fire protective system, and in some instances sufficiently to prevent its efficient use.

In the course of this precautionary work for the winter, all hydrants and valves should be carefully examined and oiled, preferably with a heavy mineral oil which will not corrode the brass. All hydrants on standpipes and all Y or branch hydrants should be opened after the pipes are emptied, to let out any entrapped water which may have leaked past the

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valve when the pipes were full, care being taken that the drip valves of the post hydrants are in good condition. The rotary pumps should be oiled, and, if exposed to freezing, turned backward to empty them of water. The pipes exposed to freezing should be emptied, care being taken that the water should be let out from above the check valves, and that all persons who are in charge of such apparatus should know that the gate and drip valves are in order. The drip valves should be marked by an arrow showing the proper direction to open them.

At the last inspection trial of the fire apparatus, the hydrant houses should be looked into and arranged for the winter, attention being given to any lanterns kept hanging there ready for use, and, if necessary, make any changes so that the doors of such hydrant houses cannot be readily obstructed by ice.

If there are any automatic sprinklers in places liable to freezing, and which cannot be kept warm, the petcocks should be opened after the main valve is closed, and the water drawn off at the drip pipe very slowly, in order that the sprinklers should not be rendered liable to leakage by a sudden change of pressure upon them; this may happen if the water is drawn off rapidly.

When it is necessary to close any sprinkler valves in this manner, it is important that every member of the fire department of the mill should be made aware of the fact that these valves are closed and that it is necessary to open them to provide for the operation of the automatic sprinklers in time of fire.

The valves to automatic sprinkler systems are frequently reported by the inspectors as shut when they should be open, and were believed to be open. Every valve to automatic sprinklers which is to be kept open should be secured in such a position by a leather strap—not a chain—passing around the pipe and one of the spokes of the hand wheel of the valve, the ends of the strap held together by rivets or padlock. It is preferable that this strap should be loose enough to permit the hand wheel to be moved half a turn, in order that the valve may be turned fully open at any time. It is recommended that such valves be kept a quarter to a half turn from being full open, so as to render inspection possible without removing the strap.

On new sprinkler installations it is recommended that all valves should be provided with an indicator showing whether they are open or shut.

The Trades in New York.

Quite recently a careful inquiry has been made into the condition of the various trades in New York City, and the conclusion is that the laboring man is now better paid, housed and fed than at any former date. Workmen are more thoroughly organized than ever, and the work of perfecting their organization is constantly going on. The tendency is to the decrease of the Knights of Labor, the local organizations of which were largely made up of men of different trades in one body. In place of the Knights has grown up a powerful body, the American Federation of Labor, organized each trade by itself. At the last report there were 62 national and international separate trades, comprising 586,000 members, belonging to the Federation, of which Samuel Gompers is president. In the last six months about 300 local organizations have been added to the Federation. The plan of keeping the affairs of each trade as much as possible in the hands of men belonging to that trade, which is the peculiar feature of the Federation, works well. New organizations are constantly springing up. In many trades it is almost impossible to get anything done without paying union wages and conforming to union rules. One tendency which workmen can hardly view with satisfaction is to drive a great deal of work out of the city to points where there is more freedom of action. This is noticed in the printing business and in the building trades. Doors, sashes, window blinds, moldings and even trimmings are made in great factories in various parts of the country by non-union labor and brought here to be put together in buildings. This is also true of immense quantities of iron and stone work, which is got ready elsewhere and merely put together here. The city contractors for large buildings find it very difficult to compete with out of town contractors, who underbid them by means of facilities to do the greater part of the work elsewhere. There is a growing tendency to lessen strikes and keep the men more steadily at work by agreements between the bosses and the union men for a certain scale of wages to be renewed every year. The men fix the scale and the bosses agree to it, and really do not care much what the scale is so long as all the bosses are compelled to pay alike. The stonecutters, masons, plasterers and tin roofers have adopted the plan, with good results.

NEW PUBLICATIONS.

SELECTED DETAILS OF INTERIOR AND EXTERIOR FINISH FOR ARCHITECTS, CARPENTERS AND BUILDERS. 32 plates, 14 x 18¼ inches in size. Published by William T. Comstock. Price $5.

This work has been brought out to meet the demand for good details upon a large scale, and most of the drawings presented are produced directly from large sized originals. This collection of details represents the work of many well known architects in different sections of the country, while the subjects treated cover a sufficiently wide scope to render the volume of more than ordinary interest and value to the architect and builder. The plates present, among other things, suggestions for a bank or counting room with hard wood finish, details and fittings for a drug store, designs of mantels, interior details of residences in the East and West, porches, gables, dormers, interior and exterior doors, wainscoting and wood ceilings, with details.

WANT AND WEALTH. A Discussion of Some Economic Dangers of the Day. By Edward J. Shriver. G. P. Putnam's Sons. New York and London. 16 mo; p. 38.

This pamphlet treats of great questions very briefly—Why are we Poor? the Scylla and Charybdis of Socialism, the Tariff Question and the Single Tax. It takes the pessimist's view of the condition of people in America, which, we need not say, is essentially misleading and illusive, and from this standpoint argues against existing economic laws. The author assumes that poor people in great and disproportionate numbers cannot get work in this country. This is a misrepresentation of our condition unsupported by facts. An excuse for such statements can be found only in the crowded populations of a few great cities, in which 1000 idle people represent but a small percentage of its entire industrious population. The conditions of idleness and starvation in the country at large, or in nearly all the towns and cities, do not exist except in those isolated cases that are inevitable on account of sickness, obscurity, distance from help, sudden calamity or depravity. The author states what is also untrue, that the people cannot get land to cultivate, because it is held for speculation, near markets, when railroad lands are offered by millions of acres at $2.50 per acre and Government lands at $1.25 to $2 50 per acre in larger extents and in more desirable locations as to climate than ever before, without purchasers. The reason that land is not sought for cultivation is because we can raise now much more than the nation needs, and with the progress of civilization other nations are in staple products more largely taking care of themselves.

Mr. Shriver affirms that in these United States by the tariff laws the rich increase largely in wealth, and that the condition of the poor is consequently poorer. The very dependence upon labor of the numberless industries which are inspired by and contribute to increased wealth makes the statement as to the condition of the poor unreasonable, as it is unwarranted. The arbitary assertions of such thinkers on the side of economic reform do not establish the existence of any perils to the American republic which are not offset by general content and the marvelous prosperity of the whole people, as compared with other nations. The national domain contains more land than another generation, with its probable foreign increase, will wish to occupy. It posesses more resources of mine and soil, necessary for the maintenance of a great nation, than the people can possibly develop in another century, and for which there is no present need. We have a people so conscious of power and purpose to reform the current evils that come to the light in the changes and progress of society that the strength of this republican government against foreign importations of socialism and its threatenings of evil is not likely to yield or be finally overcome. For in our country national legislation effecting radical changes is of the nature of a great experiment, that requires a long period for the elucidation of its wisdom in promoting or hindering the public welfare. The power of self control is the dominant feature of our national life. It has been strengthened by every great trial it has undergone, and the self reforming spirit of our institutions, political, moral and religious, which has been repeatedly manifested in great crises and needs of a change in the conduct of affairs, is the source of our present growth and the promise of future greatness and happiness.

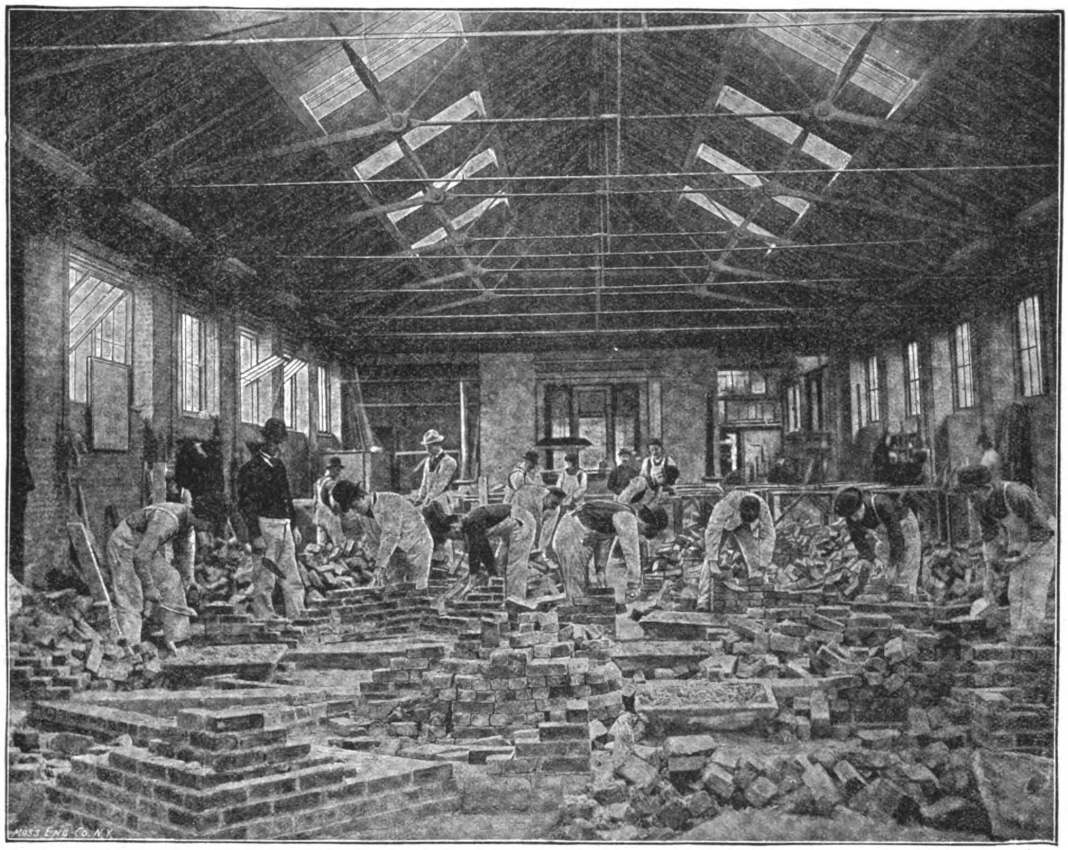
NOTES ON GAS LIGHTING AND GASFITTING. By William Paul Gerhard, C. E., 36 Union square, New York. Price 25 cents.

The pamphlet carrying the above title is a small sized publication of 54 pages, and consists of articles reprinted from the *Builder*, *Decorator and Woodworker*, to which they were contributed by Mr. Gerhard. The author is well known as a sanitary expert, and has acquired a wide reputation for both practical work and as a writer on sanitary and kindred topics. The pamphlet before us is written more from the sanitarian's point of view than from that of the actual gasfitter; and while it will give many serviceable hints to the architect and owners of buildings, and also will give gasfitters general principles to work upon, we do not find much detailed instruction that would be serviceable in the practical work of fitting a house with gas fixtures and pipes. As a general treatise, however, upon the dangers of faulty gas fitting and the general rules to be followed in securing good results, we can heartily recommend the pamphlet to the reading public. The first 30 pages or so describe broadly the requirements of a good gas piping system, and quite extended reference is made to the dangers and discomforts that attend leaks and improper construction. The author then proceeds to consider the different forms of burners, the names of which are explained; also gas fixtures of various sorts, pointing out their relative advantages and disadvantages. Toward the close of the book is given a specification for gas piping, and this is followed by some hints to consumers of gas, which can be read with profit by a large portion of the public.

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THE NEW YORK TRADE SCHOOLS.

THE OPENING of the tenth season of the courses of instruction in various trades at the New York Trade Schools, First avenue and Sixty-seventh street, New York, was an event of more than ordinary interest. It is generally during the first ten years of the life of such movements that the greatest difficulties are encountered and when opposition is most felt. It is in these years that such institutions are less prepared to meet obstacles and certain antipathies which always appear when great improvements are proposed. And with the inauguration of these trade schools great improvements were proposed and fundamental innovations were advanced against the old, very old apprenticeship system.



The New York Trade Schools.—Fig. 1.—At Work in the Bricklaying Shop.

To-day it can be said that the New York Trade Schools have overcome all opposition; they are now in their full vigor, and throughout the country numerous efforts are being made to follow their example. The opposition of certain manufacturers or employers to this system of training was not surprising, when it is recollected that the value of a seven years' apprenticeship was equal to giving the employer five years' work of a journeyman at a boy's pay, and the journeyman illogically coincided with the opposition, because it was thought that the trade schools would produce too many mechanics. These adverse and inconsistent ideas are gradually passing away, and to-day in no way affect the successful progress of the trade school system. Employers appreciate the result of the course of training, and notice the improvement which is apparent in the manner and spirit with which a young man from these schools goes about his work. The journeymen mechanics will admit that the future citizens of this country have a right to belong to any trade to which their abilities and inclinations lead them, and, therefore, the means of acquiring proficiency in such trades should be open to all.

BRICKLAYING.

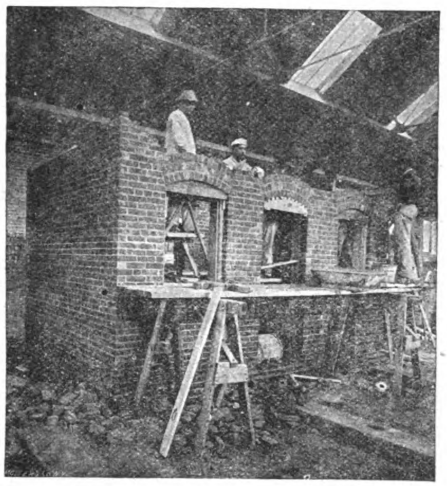
The manner in which the work is done in these schools can be partially learned from the accompanying illustrations. The young men in the bricklaying class are seen at work in Fig. 1 on walls and piers of various thicknesses, and in Fig. 2 on a model house. This house is 16 x 11 feet wide, with first floor and gables, as seen in Fig. 3, behind the arch. Concrete foundation was first laid, then three footing courses setting back 1 inch. On this the 12-inch wall of building starts, forming jambs for two doorways, and two piers within the building near fireplace are begun at the same level 16 x 20 inches wide. At the usual level four window sills of blue stone are set, and the window frames placed in position, and the jambs forming windows and doors are continued to the top of the frames, where skew backs are formed in the bricks and wooden templates or centers set, on which three rollock arches are built. To form the chimney in one end of the building three courses are projected 1 inch, and the chimney is continued up to the cornice with openings for fire places inside, with arch formed of one brick on end. The cornice on chimney is formed of a single course "saw tooth"—that is, a brick placed diagonally—and five courses setting back forming a brick chimney cap. The two 16 x 20 inch piers support the ends of two I beams, between which is turned a 4 inch brick arch with manhole opening in brick arch forming floor of upper story. A trimmer beam is framed, in which an arch is turned for fire places and hearthstone. Skew backs are formed along each wall to receive arches from iron beams and form floor. A cornice surmounts the walls consisting of one "saw tooth" course, one course above it and one projecting course. The building is of Haverstraw brick, and a band course of three courses of "Croton fronts" is used in the walls. This work was done by the day class. The arches in Fig. 3 are of 12-inch walls, surmounted in the center by a cornice consisting of one projecting course one rollock or dental course and three projecting courses, and were built by the night class of '89 and '90. Work on 12 and 16 inch "return corners" and "tied" or "intersecting" 12 and 16 inch walls is carried out, and the proper manner of laying bricks in such constructions, and the reasons for doing so, are fully explained in detail.

PLASTERING.

In the plastering room 17 compartments down stairs and 11 up stairs, showing samples of cornicing and plain plastering, as well as ceiling and wall plastering, are interesting. It is recommended that young men in the bricklaying course should follow a course in plastering also, as the two trades in some places go together. Instruction in the practical use of drawing is given to the day bricklaying class. It is certainly natural to ask where in the old apprenticeship system would the apprentice receive the general information given in the short example quoted? The an-

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swer is that during the entire apprenticeship of seven long years he never heard a reason for doing anything, and that what he did during his course of training was done by his ancestors before him without knowing the reason, and if any reasons were to be had he could find them out himself if he was able and felt inclined.



The New York Trade School.—Fig. 2.—Building House in Bricklaying Shop.

CARPENTRY.

In the carpentry trade a similar course is followed. Two model houses are built, one about half size and the other about one-quarter size, including a second floor and part of roof. Framing, sheeting and the shingles of the houses are completed, and all is ready for lathing. In addition to this, bench work receives the fullest attention, while molding and making template centers, on which to turn arches, semi-circular, segmental and Gothic; door frames and box window frames, doors and stair building are among the branches in which instruction is given. In carrying this work out all details are explained, and the pupil is actually shown how and why the work is done in this or that manner.

BLACKSMITHING.

The blacksmith's trade can also be acquired in these schools. In the last few years the work of the blacksmith has changed; but still, notwithstanding the use of steel and the introduction of machinery, it is one of the most important and useful lines of the mechanical trades. In the blacksmith shop, at the trade schools, tool making receives particular attention. From the training to be had here a good foundation is laid to become a tool smith. In the old apprenticeship system it might be said that the tool smith was an accidental production. Iron railings and other hand work of the blacksmith are also taught at these schools. Fig. 4 shows 160 samples of tongs, picks, tempering tools, &c., as part of the work done during the last season. This class should be particularly appreciated by young machinists, as they can learn here that which is most useful to them and something they cannot acquire in the average machine shop.

STONECUTTING.

Several exhibits of the work done in this trade, at these schools, is sufficient proof of what an opportunity exists to learn, in a sensible manner, a first-class trade, in comparison to the old apprenticeship way of giving a boy from five to seven years to pick up a trade "if he can," or "cares to." This class will be conducted as a day course, as the work has been found too severe to be done in the evening —particularly if some other occupation is followed during the day. The stonecutting class is under the supervision of the Trade School Committee of the Master Freestone Cutters' Association of New York.

HOUSE, SIGN AND FRESCO PAINTING.

In this department there are three separate courses, one for house painting, under which course are several samples of graining, oak, ash, mahogany and cherry; specimens of imitation marble, gilding and plain painting are also shown. Another course is sign painting, an example of the work done in this line being given in Fig. 5. Fresco painting makes the three courses into which this department is divided. The walls of the upper half of the paint shop are given up to this style of painting. Some 16 samples on plastered walls of Persian, French and Italian styles of fresco work, similar to Fig. 6, are evidence of the skilled work done by the pupils. In addition to these there is a sample of decorative painting on the ceiling of the drawing room which was done by the members of the painting class. Scientific instruction is given in the harmony and mixing of colors, properties of oils and drugs and the various materials used in painting, &c. This class is under the supervision of the Trade School Committe of the Master Painters' and Decorators' Society of New York.

TAILORING.

The class in tailoring is managed by the Merchant Tailors' Society of New York. It is under the supervision of practical men. The course is divided into four grades, the fourth being a graduating or finishing class. A committee of the above

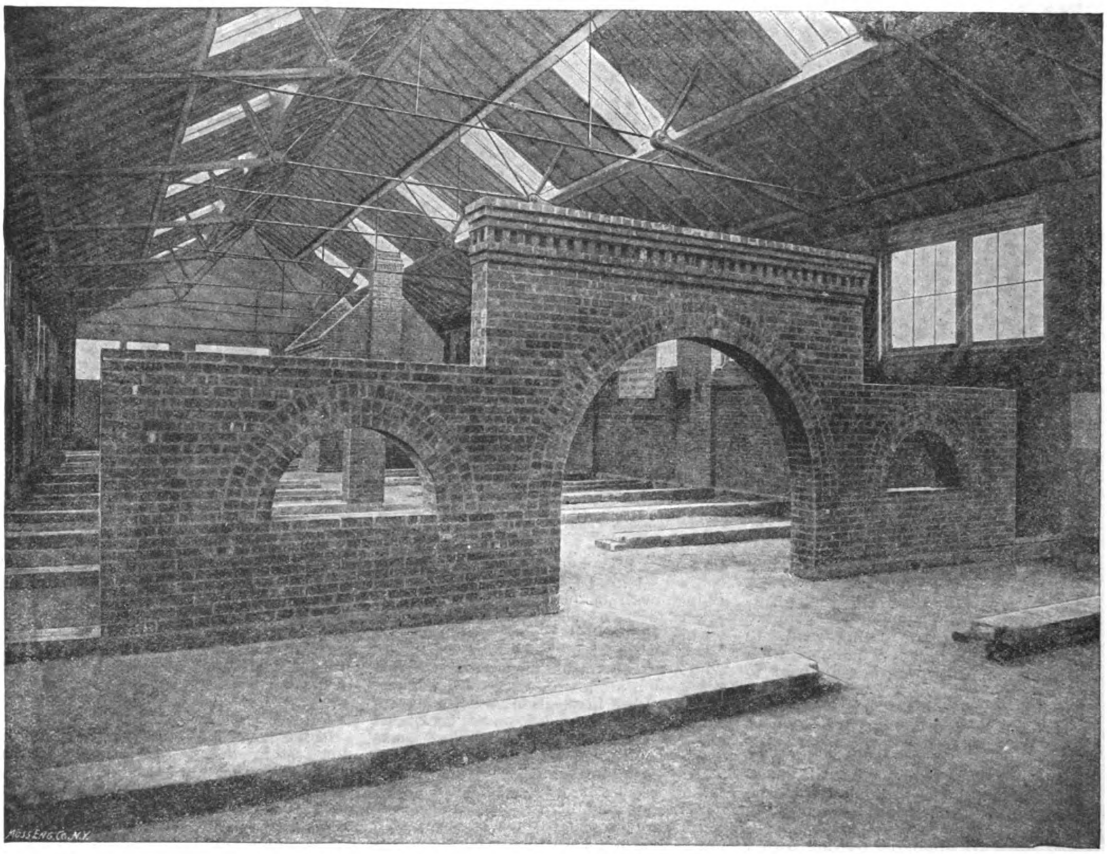


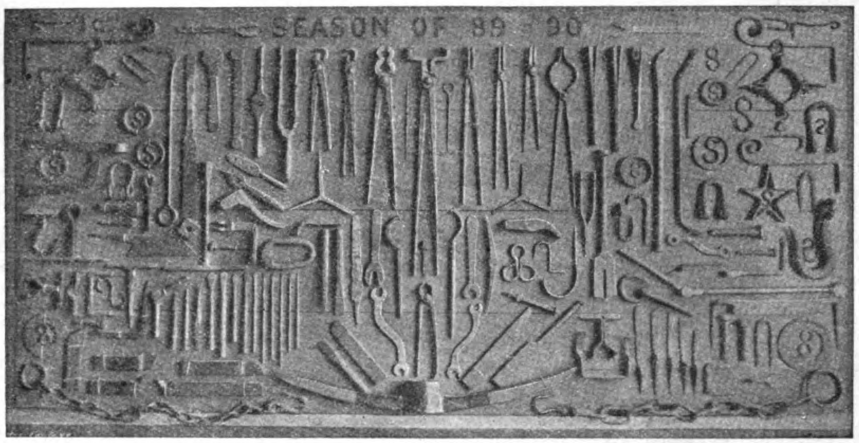
Fig. 3.—Samples of Bricklaying at New York Trade Schools.

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society examines the pupils as to their proficiency.

PLUMBING.

There is probably no trade or line of mechanics who so early recognized the impediments and obstacles to progress which surrounded the old apprenticeship system as the plumbers—that is, the successful and well informed plumbers who are now acknowledged to be the master mechanics of the trade. By the efforts and energies of such men the plumbing business is to-day carried on, as it ought to be, on a scientific basis. The advantages offered by the trade schools to promote the interests of the trade and improve the standing of the journeymen were early appreciated by the active men in the business. As usual, these men were met with opposition, and that opposition came from those who desired to see the rising generation of tradesmen learn their trade in the slow, laborious and trudging manner they had. This opposition, it may be said, has disappeared, and the "old school" plumber admits that to succeed in the trade to-day a much more general knowledge is necessary than in times gone by. Such a knowledge of the trade could not be obtained under the old apprenticeship system during the time of apprenticeship, except by young men of unusual talents, having great perseverance and application. In the plumbing class at the trade schools all this knowledge is placed within the reach of every one who desires to have it. Manual as well as scientific instruction is given to each member of the class, and the result is that at the end of the course hundreds of examples of workmanship similar to those shown in Figs. 7 and 8 are submitted for examination, as well as sketches which are replies to questions as to the manner in which certain kinds of work should be carried out. The average young man after attending one course in plumbing in these schools can explain the uses of the various fixtures, pipes, &c., in a more concise and clear manner than many journeymen of some years' standing. The plumbing classes are under the supervision of the Trade School Committee of the Master Plumbers' Association of New York.



The New York Trade Schools.—Fig. 4.—Specimens of Tool Making at New York Trade Schools.

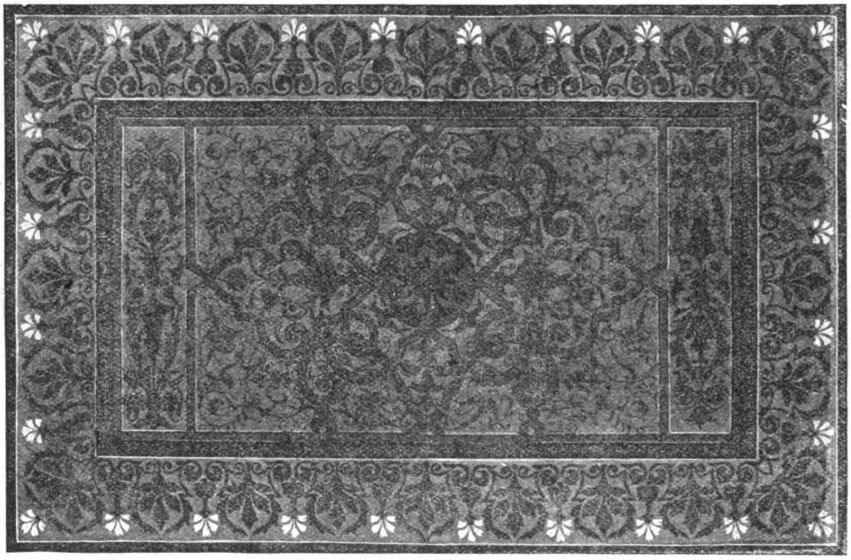
The manual and scientific instructions given to the members of the various trades just described produces results that were unknown to the apprenticeship system. Often in the first year or two of apprenticeship a spirit of antagonism between employer and employed was created to a greater or less extent. The young man felt that he was used badly or roughly by some one, and by the end of his time he was fully aware that for the last few years work had been obtained from him for which he was not remunerated. He had proof positive of this, because up to the day before the expiration of his apprenticeship he received but boy's pay and the day after its expiration he received almost the full pay of a journeyman, equal to from three to four times as much as boy's pay. He was often surrounded by journeymen without any ambitions. The principles and opinions he heard, instead of being progressive, were demoralizing, and during the years of apprenticeship in the average shop he met little refinement or help, but a good deal of coarseness and discouragement. With this knowledge of the apprenticeship system it is not surprising that the acquirement of trades is to an extent avoided, and that clerkships are more sought after by those with decent and worthy ambitions. The young man who



Fig. 5.—Sign Painting at New York Trade Schools.

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went through the ordeal of the old apprenticeship and escaped being imbued with some of the opinions he had come in contact with was generally an exception.



The New York Trade Schools.—Fig. 6.—Fresco Painting at New York Trade Schools.

In the trade school system, especially at the New York Trade Schools, all these corrupting and debasing surroundings and ideas are absent, and have no opportunity to exist. In their place there is an educational development going on, good principles are being established, justice in the matter of giving labor for a remuneration is inculcated, examples of the kind of workmen who have succeeded are seen, and instead of any feeling of antagonism between employers and employed being produced, the members of the classes at the end of the session leave with a feeling of friendship, strengthened with an ambition they already see a prospect of carrying out. The intercourse of the boys with the management is the intercourse of friends. The frequent presence of the various committees of the master mechanics' societies gives the members of the classes opportunities of seeing the men who have successfully passed through the ordeal of the old apprenticeship system. In short and interesting addresses from these men the younger men obtain a knowledge of the experiences of their predecessors. By the manner in which defects, which still are liable to occur in the work of the journeymen, are pointed out by the employers, the members of the classes are taught to prevent any similar occurrence when they are journeymen. Occasional meetings, at which lectures and addresses are delivered to the classes by men prominent in the various trades and educational institutions of the country take place during the session. The young man who is fortunate enough to pass through a course at the New York Trade Schools will find that no time of his early days has been better spent, and the instruction he will receive during the short sessions will be of use to him for a lifetime.

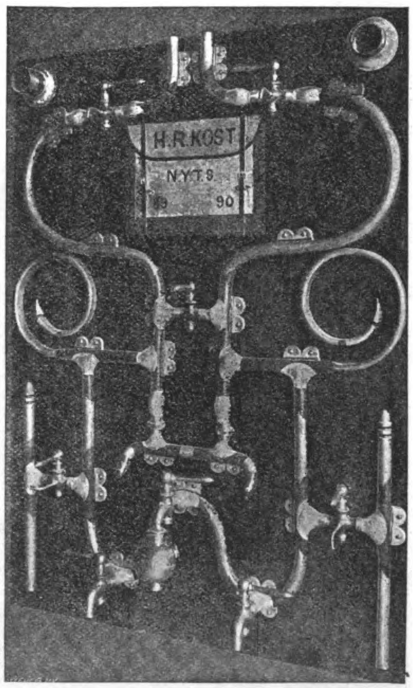
Following is a list of the classes at the New York Trade Schools for the season 1890–91:

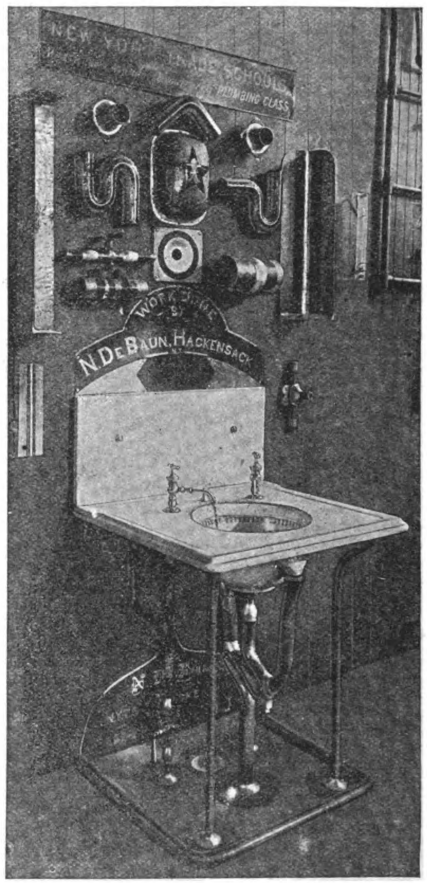
Bricklaying.—Evening class began October 22 and ends April 11, 1891.

Bricklaying and Plastering.—Day class begins January 6, 1891. Three months' course.

Plastering.—Evening class begins December 10 and ends March 18, 1891.

Plumbing.—Evening class began October 22 and ends April 1, 1891.





Figs. 7 and 8.—Specimens of Plumbing Work at New York Trade Schools.

Painting.—House painting, evening class began October 22, ends April 1, 1891; sign painting, evening class begins December 2, ends March 12, 1891; fresco painting, evening class began October 22, ends April 1, 1891; house, sign and fresco painting, day class begins December 3. Three months' course.

Plumbing.—Day class begins December 3. Three months' course.

Carpentry.—Evening class began October 22 and ends April 1, 1891.

Carpentry.—Day class begins January 6, 1891. Three months' course.

Brick Dust Cement.

In every brick yard and around every new building there accumulates a large quantity of broken bricks for which there is no present use, and which are usually consigned to the dump along with other *débris*. There is a purpose, however, for which much if not all of this brick waste might be utilized. In Cuba and some of the other Spanish countries ordinary brick dust, made from hard burned and finely powdered bricks, is mixed with common lime and sand and used as a substitute for hydraulic cement. A block of the mixture ½ inch in thickness, made without sand, was immersed in water for four months, and upon removal at the end of that time it bore a pressure of 15 pounds per square inch without crushing or splitting.

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MEASUREMENT OF ROOFS.*

BY TRIANGLE.

WITH EVERY SET of drawings for the construction of a building are included the specifications of material and workmanship. These specifications should inform one regarding the material for each part of the building and how the work is to be done, each kind of work being specified under its proper heading or title. One would naturally suppose that under the heading of painting would be included all of the painting that would be required about the building, but if the architect wished to have the gutters and other tinwork painted he might include this item in the tinwork, thinking it would be convenient for the tinner to paint some of the work before it was placed in position, or directly after the work was done. The flashings for the chimney might be included in the brickwork, with the intention that the mason should see to it that the flashings were provided and placed in position as the chimneys were laid. On the other hand, if the roof was to be covered with shingles, the architect might include the flashings in the carpenter work, so that the carpenter would provide the flashings and see that they were placed under the shingles in a proper manner. Again, the flashings could be included in the tinwork, and while the tinner would be required to furnish them, the question might arise regarding whose duty it would be to place them in position. It would be difficult for an architect to specify who was to do each part of the work, as in the above illustration, although it might be supposed that the tinner would do the tinwork, the carpenter the woodwork and the mason the bricklaying. In the construction of a building there are many points that arise that it would be difficult for any specifications to cover. The safest way for the mechanic is to read over all the specifications carefully, and to make notes of such parts of the work as fall to his part, and in case of doubt, inquiry of the architect or the other contractors. The mechanic should place his main reliance on the specifications, as in case of a dispute of any kind arising as to who should do a certain part of the work or furnish certain material, the wording of the specifications would decide more than any one's "say so."

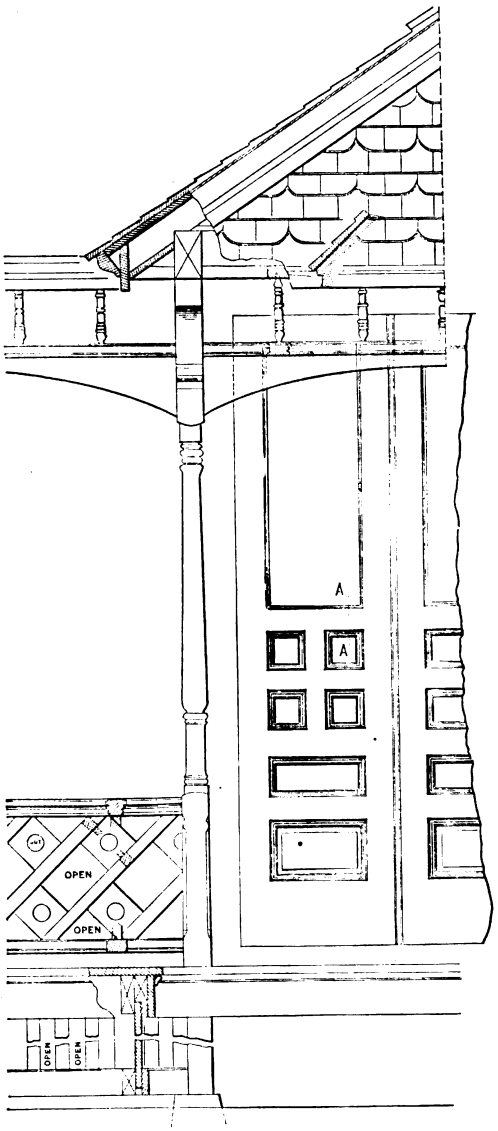


Fig. 92.—Part of Front Piazza, Showing Front Doors

Measurement of Roofs.—Scale, ⅛ Inch to the Foot.

Included with each set of drawings is generally a number of detail drawings that show various parts of the work, drawn to a larger scale than the plans or elevations. The detail of the main cornice may be full size, and show the construction of the cornice, if of wood, for the carpenter's benefit, and also show how the gutter is to be placed or the edge of the roof to be finished if the roof is to be of tin. The mechanic who is estimating a certain part of the work should look over these detail drawings carefully and note such points as interest him. As an illustration of this: The elevation, Fig. 92, showing part of front piazza and front doors, is intended for the carpenter, yet the shape of cornice is given, which would show the tinner how the trough was to be applied, or how the edge of roof, if tin, would be finished. The detail drawing of the hood over rear steps is also shown in Fig. 93. Each of the detail drawings is to a scale of ½ inch to the foot.

Before estimating the surface of a roof the roofer is expected to read the specifications carefully in order to know how to proceed with the estimate. If the roof shown in the previous engravings was to be covered with tin, it would be hardly necessary to determine the length of ridges and valleys. On the other hand, if the roof was to be covered with shingles, the length of valleys would be required, as it is supposed they would be lined with sheet metal. As the specifications for the building under considerrtion are not presented we will estimate the area of the roof in a general way, showing the lengths of hips and valleys in connection with the surfaces. It is customary for architects to made the plans and elevations to a scale of ¼ inch to the foot. With the plans drawn to this scale, it is usual to designate the distances on the plans by figures, as the pencil or ink marks are of sufficient width to cause mistakes to be made. If the reader was required to estimate the surfaces of the various parts of the roof shown in the roof plan, Fig. 91 (see previous article), it is presumed he would lay his rule on the plan or elevations and thus determine the dimensions, remembering that every ¼-inch on the rule represented 1 foot on the finished building. Sketches of the various parts of the roof could be made freehand and the figures put down, from which the surfaces could be obtained. In showing the shapes of the roof parts they have all been drawn to the same scale as the roof plans

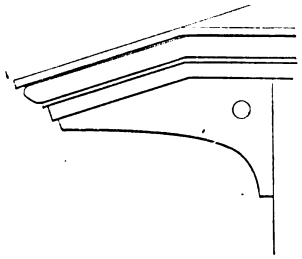


Fig. 93.—Hood Over Rear Steps.

* Continued from page 259.

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and elevations, so the reader can, by the use of a scale or rule, determine the area of any of them. As far as possible the same letters have been used to designate the shapes as are used on the roof plan or tracings of front or side. Rules will be given for obtaining the area of the various shapes referring to the letters on the diagrams, which will be used in place of the dimension figures in some instances. The area of the shapes will also be shown by diagrams, thus illustrating the methods employed.

Some Paradoxes.*

RULE 4.

There is a custom in Oshkosh, Wis., we understand, to contract by the cord of 100 cubic feet and deduct openings and measure the corners once for quarry measure. Masons measure includes the openings and doubles. and corners.

RULE 5.

Trautwines' method is to contract by the cubic yard of solid work only, and this plan is becoming quite common among engineers and construction companies, and is perhaps as convenient a way as any.

The United States engineers are in the same predicament as ourselves. I am informed that they advertise for and measure their work usually according to the custom of the locality where the work is situated. The only clear explanation of the method of measurement practiced by the architects of the United States Government is in a series of articles written by Jas. E. Blackwell, Esq., and published in the *American Architect* in the years 1887–88. These articles when completed will give full directions for classifying and measuring all kinds of materials and construction work. The following is the rule there given for measuring masons' work:

RULE 6.

Rubble work is sometimes estimated by the cubic yard or perch (24¾ cubic feet), but generally by the cubic foot; all other stonework, ashlar, dimension and cut stone by the cubic foot In measuring rubble, solid masonry walls and random ashlar the length multiplied by the average thickness, by the height of the wall, is taken to obtain the cubic feet; no allowance is made in the measurement for wastage, but in the price where a uniform projection of rock facing is required it is to be added to the thickness of the stone to obtain the cubic feet, the object being to find the actual number of cubic feet contained in the completed wall, taking the extreme dimensions for all stones, all coursed dimension and cut stone work shall be measured course by course or piece by piece. Dimension stone should be considered as each piece measured and the cublic feet obtained separately.

One of the most complete specifications that the writer has ever seen for the class of work described in this paper is a prize specification and estimate prepared by Mr. Eden Bechtel, an architect, of Philadelphia, and published in *Carpentry and Building* in October, 1882, and July and August, 1883, and for stonework, is as follows:

RULE 7.

Measure by the perch of 24¾ cubic feet. For length of wall measure it on a line drawn through the center of the wall; take the thickness and depth and deduct openings. This is simply measuring the actual quantity of material used.

Now, having detailed a few of the many customs, let us ask why is this uncertain and perplexing practice permitted to prevail in this civilized age, and are there any advantages possessed by them in severalty that would not result by the adoption of some universal settled rule for the classification and measurement of construction work? The writer answers no, but on the contrary all classes would be benefited by the adoption of a uniform system, and as the province of the physician is in part to diagnose the disease and afterward to prescribe a remedy, so we cannot well close this paper without a word to the consideration of some means of securing such a result. It would seem that some general rules might be formulated by a committee selected from some of the leading engineering societies in connection with the leading architects, which would meet the requirements of contractors and the public at large. These rules could be adopted by the different engineering societies and by the railroad and construction companies and finally by the Government, or make it compulsory in Government work by an act of Congress, we would then know how to proceed when called to measure or take charge of a piece of work in any part of the country, and the designer would be relieved from the trouble of minutely specifying the manner in which he would measure and receive the work.

* Concluded from page 250.

Ancient Engineers.

The ingenious M. Eiffel and the artistic M. Bartholdi, says an English paper, have been gravely pondering the Colossus of Rhodes—measuring it and weighing it as per description; and they conclude that the thing was simply impossible. It could not have been set up, to begin with, and when set up it could not have stood the pressure of the wind. This is demonstrated by all the rules of modern science, and he who does not admit the demonstration must be prepared to show that two and two do not make four. These antique personages who professed to have seen the Colossus were victims of an ocular delusion or flat story tellers, and that greater number who mention it incidentally, and we might mention the ruins of the Colosseum, were credulous gossips. The fact is that Messrs. Eiffel and Bartholdi argued in the fashion usual with engineers. Not all of them would pretend that they know any law of nature which applies in such a case. But very few would listen patiently if it were urged that the ancients knew some laws with which they are unacquainted.

So it appears, however, to the disinterested student; and we can bring forward evidence enough. If it be true that the Colossus of Rhodes is really proved "impossible," according to the best modern authorities, this is a good illustration to begin with; for its existence is as well authenticated as the Temple at Delphi and the statue of Olympian Zeus—or the Tower of London, for that matter, to one who has never seen it. By some means it was set up, and by adaptation of some natural laws it was made to stand until an earthquake overthrew it. One is embarrassed by the number and variety of illustrations to the same effect which crowd upon the mind. Since the Colosseum has been mentioned, we may choose examples of that class. Is M. Eiffel prepared to put an awning over Trafalgar Square when the sun shines, and remove it promptly, without the aid of a central support, of steam engines, or even chains? The area of the Colosseum is certainly not less. This may seem a trifling matter to the thoughtless, because they have never considered it. Roman engineers covered in that vast expanse with some woolen material, and they worked the ponderous sheet so easily and smoothly that it was drawn and withdrawn as the sky changed. The bulk of it must have weighed hundreds of tons, all depending by ropes from the circumference. But the ancients thought so little of this feat that they have left us only one trivial detail of the method. So Julius Cæsar stretched an awning above the Forum Romanum and great part of the Via Sacra in the space of a single night. Have any of our modern engineers pondered the contemporary descriptions of Alexander's durbar tent before Babylon? That, again, appears to have had no central support. It was upheld, says Phylarchus, by eight pillars of solid gold. Of the glorious plenishing within we have not to speak, since our theme is mechanics. Around the throne and the great courtiers stood 500 Macedonian guards; in a circle beyond them 500 Persian guards; beyond these again 1000 archers. To fix a tent which held 2000 soldiers on duty with arms and accoutrements, surrounding, in successive circles, the most gorgeous Oriental court that ever was, with hundreds of satraps, councilors, generals, eunuchs and slaves, would perplex a mechanician of the nineteenth century. He will reply that the story is false—must be, because he could not match it. Happily the awning of the Colosseum stands beyond dispute, and Alexander's tent is a small matter compared with that.

But we undertook to deal with the engineering of the ancients in connection with the theater, having chanced on that class of illustration. Pliny tells how Metellus Scaurus, Ædile, built a wondrous edifice, which stirred his rival, C. Curio, to frantic jealousy. It may be worth while, in passing—since we are all so much interested in the theater nowadays and think so much of our new ones—to tell what sort of a building that Curio set himself to outdo. It had 360 marble columns, each 38 feet high and 38 feet apart. About 3000 bronze statues stood among them. The stage had three floors, as was usual; the lowest paved and fitted with marble, the second with glass, the third gilded, boards and all. It held 80,000 people. This account will seem so fabulous to steady going Britons that it is prudent to give chapter and verse. The description will be found, with curious details and passionate reflections on the luxury of the day, in Pliny's "Natural History," xxxiii, 24.

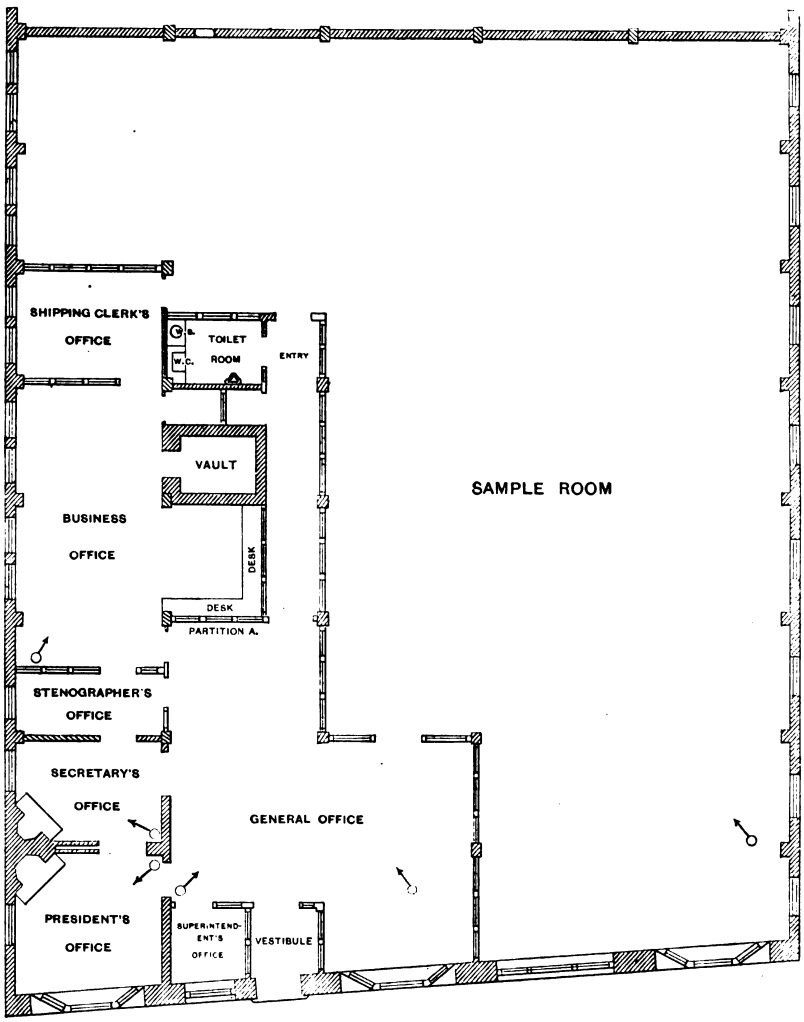
Such was the wonder which Curio resolved to beat, and feeling himself unable to vie in outlay, he summoned the engineers of the period to design something to "fetch" the public. They built two enormous theaters of wood, each to contain an audience of 25,000, which stood back to back. When the spectators assembled in the forenoon, Curio was chaffed, no doubt, on the issue of his attempt to excel Scaurus. But the audience returned in the afternoon, for these entertainments were devoted to the manes of Curio's father and lasted a month. In the place of two theaters back to back they found an amphitheatre holding 80,000 persons, wherein gladiators and wild beasts contended until dewy eve. The two great buildings had been swung round and united, and day by day for the month following this colossal trick was repeated. The perfervid indignation of Pliny could not make him altogether indifferent to the ingenuity of the thing. The fact is, in brief, that those who know what ancient engineers did, with their imperfect means, feel a qualified admiration for the work of the moderns. If Archimedes or Stasicrates had been acquainted with the forces and the laws with which every old woman is familiar in these days, they would have changed the face of the earth and the destinies of mankind.

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A WELL ARRANGED SUITE OF OFFICES.

IT IS VERY OFTEN the case that the builder is called upon by the business man to make alterations, remodel a warehouse or other building in such a way as to specially adapt it to office requirements. In large cities where regular office buildings are the rule, such demands are less frequent than in places where office accommodations have to be created as they are wanted for use. In many cases the want referred to comes as the result of a rapidly growing business. A warehouse can be better changed into a suite of offices than a new office building erected. It is readily apparent that there is a vast difference between a well arranged suite of offices, and those which are unsatisfactory by reason of their lack of attractiveness and general disposition, one to the other, and which are in various respects inconvenient. A very happy illustration of what may be accomplished in the way of remodeling a warehouse building to meet the office requirements of a large and growing business is shown by means of the illustrations which are presented upon this and the following pages.

The offices shown are those of the Detroit Stove Works, of Detroit, Mich., and were recently fitted up on the lower floor of one of their warehouses in order to more nearly concentrate all branches of the business. The company, previous to that time, occupied offices in another portion of the city. In making this change no little attention was given to the location of the different apartments, and the arrangement finally adopted is one which for convenience and comfort is regarded as fully meeting the requirements of the case. Our readers will be able to form a very clear idea of how the different offices are placed, one to the other, by an inspection of the floor plan, shown in Fig. 1 of the accompanying illustration. This floor plan, omitting the sub-divisions, and some of the side windows, also illustrates the condition of the building when the work was begun. In Fig. 2 of the cuts is presented an interior view of the general office as now arranged, looking from the front diagonally toward the cashier's desk, or what is marked on the floor plan as partition A. At the left is seen the entrance to the offices of the president and secretary, while directly in the front is the door leading to the treasurer's department. A portion of the sample room is shown through a glass partition at the right. In Fig. 3 is indicated a corner in the president's cosy office, as viewed from the doorway opening into the general office. It needs but a glance to show the neat and attractive manner in which this apartment is fitted up and its comfortable appointments. Fig. 4 is an interior view of the office of the secretary, which is provided with roll top desk, easy revolving chair, bookstand, open grate and artistic mantel. Fig. 5 shows a section and elevation of the partition marked A upon Fig. 1, and clearly indicates the style of construction, while Fig. 6 is a plan of the partition illustrated in Fig. 5. In Fig. 7 is another view of the general office looking toward the treasurer's department. In this instance the sample room is shown at the right, the door leading to it being partially indicated. The floors of the office and vestibule are of clear red oak, while that of the sample room is of hard maple. The interior finish is of quarter sawed red oak, securing a very neat and tasteful appearance. Every convenience for the proper conduct of the company's business has been incorporated in the fitting up of these offices, and they may justly be styled a model in their way.



A Well Arranged Suite of Offices.—Fig. 1.—Plan View.

Maori Architecture.

In his recent novel, "Nation Making," says a late issue of the New York *Times*, a description of Maori architecture is given by J. C. Firth, one of the early settlers in New Zealand. The Maoris built their council houses of large size, and enriched them with much carving and paint. One that was 150 feet long, 45 feet wide, and covered with a high roof, with eaves reaching nearly to the ground and a porch at one of the ends, is described as follows: "The front gable was ornamented by deep barge boards, boldly and richly carved in open scroll work, the terminal at the peak of the gable being the figure-head of a renowned ancestor of the tribe, the face tattooed with the *moko* tattoo (practically the 'tartan') of the tribe. Within the porch were a low doorway and two small square openings to admit light and air, closed when required by sliding panels. Six massive posts, 25 feet in length, running down the center, supported the heavy roof tree. From the roof tree rafters, usually 6 feet apart, came down to a heavy wall plate, this being supported by carved massive wooden figures 6 feet apart, each representing an ancestor, and every face tattooed with the *moko* of the tribe. These figures were carved in a grotesque, sometimes in a hideous, manner, but considering the rude implements employed, not without great artistic skill and boldness. Every face wore a strange, placid gravity, almost Egyptian in character. The eyes were represented by pieces of mutton-fish shell like mother-of-pearl, the usual three fingered hands resting on the breast; the walls between the carved figures were filled in with reeds, plain and colored, arranged in various patterns. The spaces in the roof between the rafters were filled with fronds of the *Nikau* palm, and were blackened with the smoke of many council fires.

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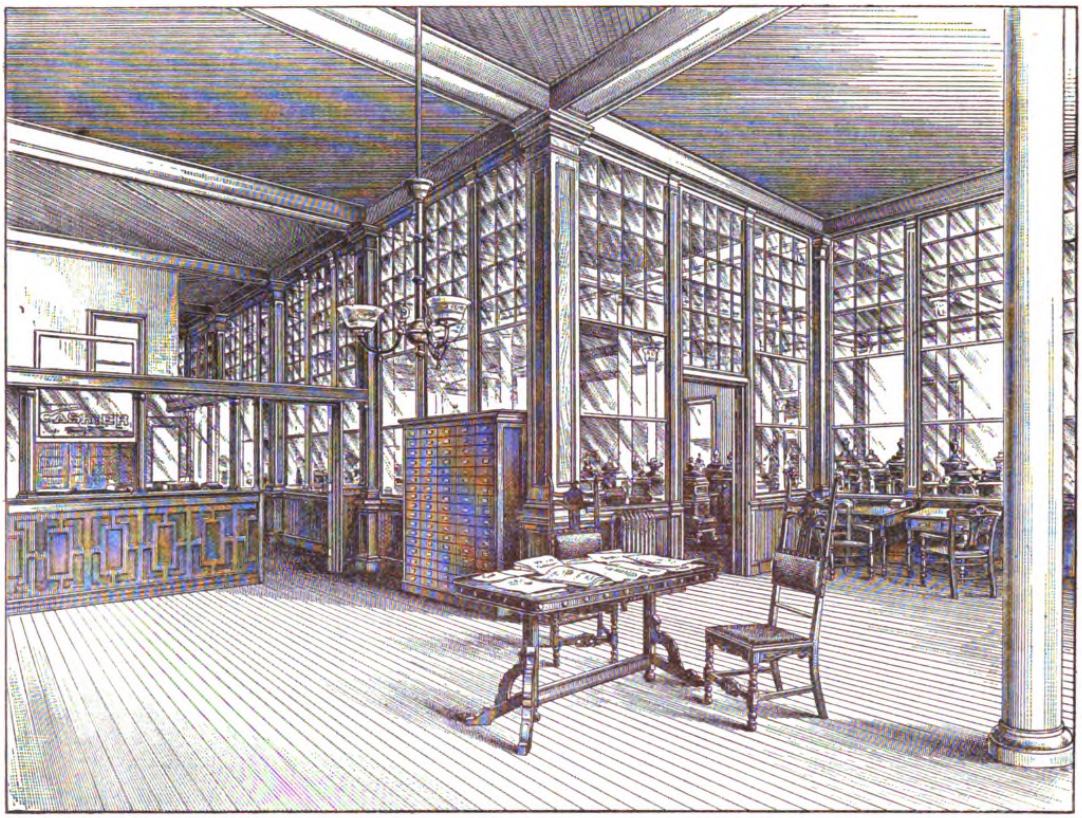


Fig. 2.—View in General Office Looking Toward Salesroom.

FOR DESCRIPTION SEE PAGE 281.

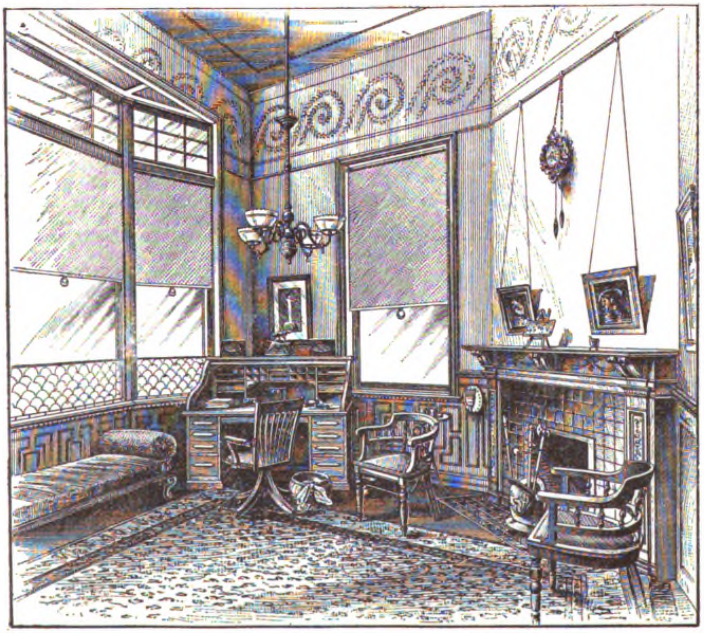


Fig. 3.—The President's Office.



Fig. 4.—The Secretary's Office.

A WELL ARRANGED SUITE OF

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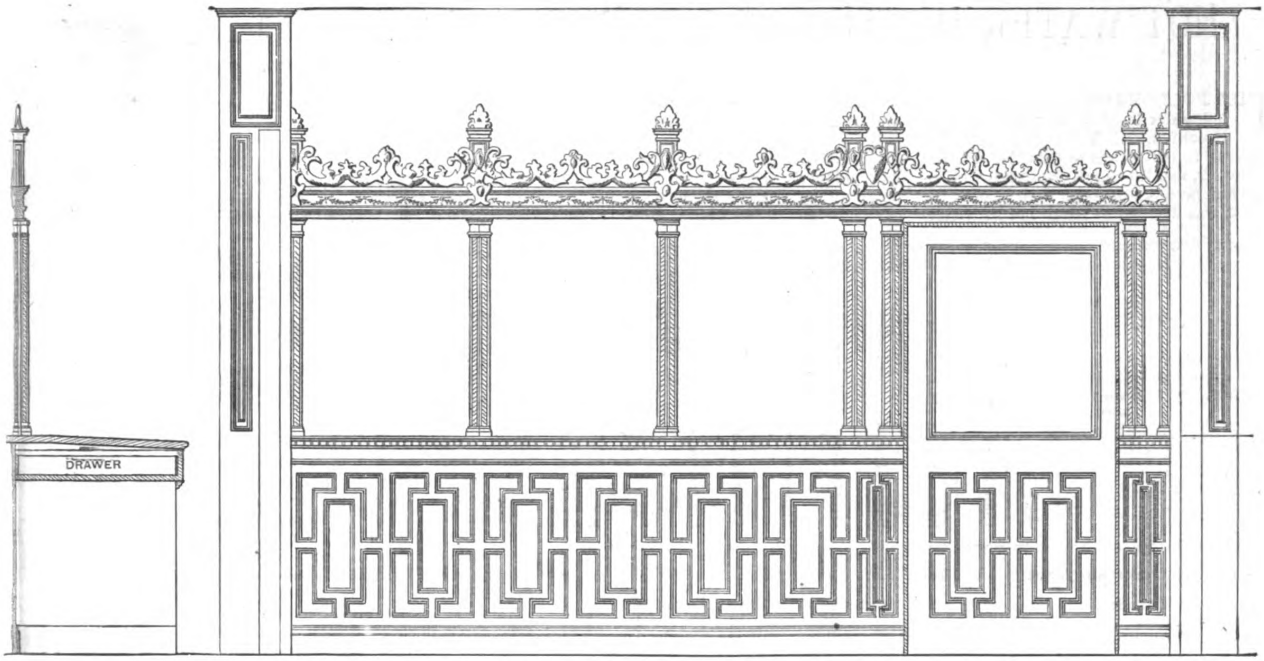


Fig. 5.—Section and Elevation of Partition A, Fig. 1.—Scale, ⅜-Inch to the Foot.

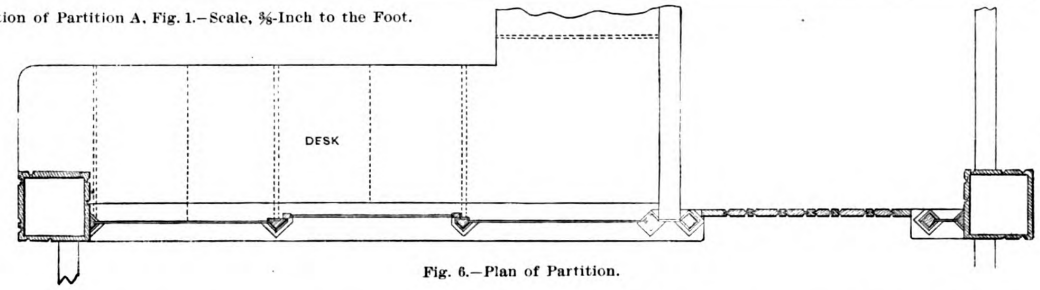


Fig. 6.—Plan of Partition.



OFFICES.

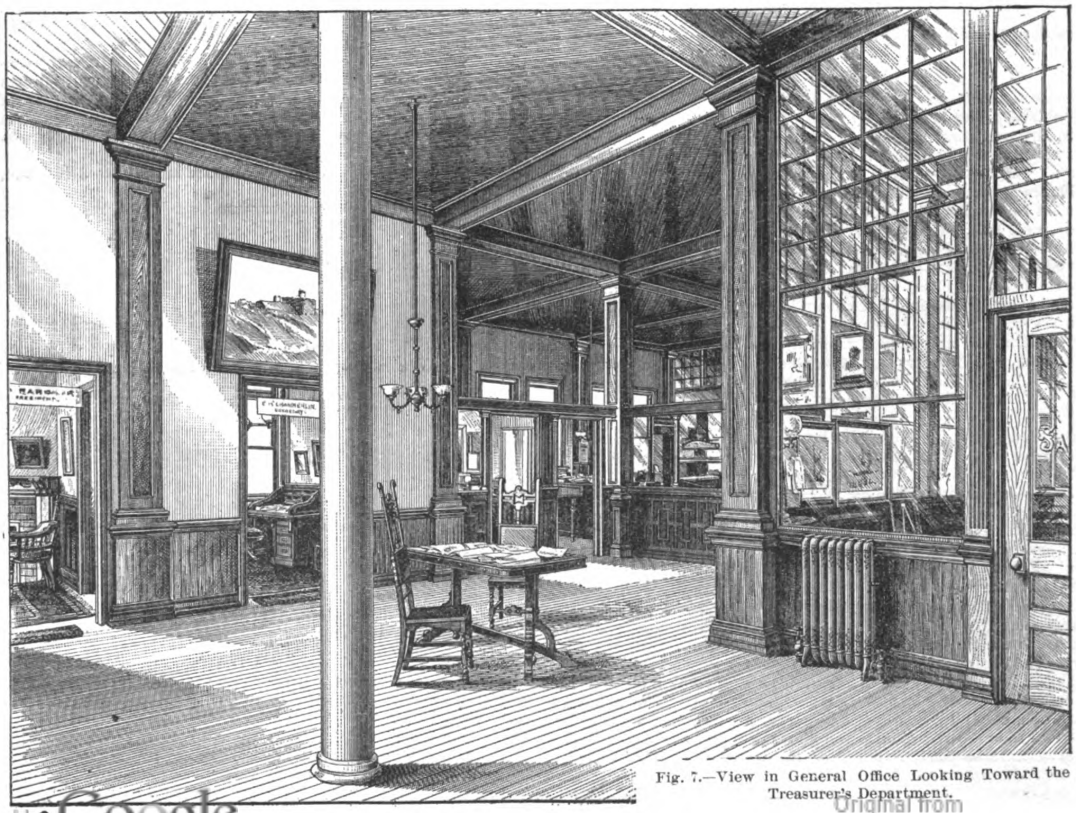


Fig. 7.—View in General Office Looking Toward the Treasurer's Department.

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HOT WATER HEATING PLANT IN CITY RESIDENCE.

THE FOLLOWING article describes a hot water heating plant installed in a Brooklyn, N. Y., residence. The original intention was to heat the building by hot air, and the usual air pipes and openings had been provided for such heating before it was decided to adopt hot water circulation. The building is what is known as a high stoop four story brown stone front, with bay windows, consisting of basement and three stories. Fig. 1 shows a general plan. The depth or length of the building is 50 feet inside by 21 feet wide, with an extension to first floor 10 feet deep by 10 feet wide, near which is a conservatory of the same depth on the basement floor. Fig. 2 is a general sectional elevation. The cellar, which is 7 feet high, extends under the basement and extension, but not under the conservatory. The basement is 8 feet high. The hall and dining room at front end and the laundry under extension at back are heated by direct radiation, as well as the conservatory, which is heated by two rows of 4-inch cast iron pipe. The kitchen and pantry or closets are between the conservatory and dining room, and are not heated by radiators. The first floor is 12 feet high. The reception room extends from front to back, with library in extension and entrance hall with stairway. This floor is considered as one room, as it is the intention to keep the doors between the apartments open. It is heated by five direct radiators and one register, 9 x 14 inches, from the indirect radiator in cellar. The second floor is 10 feet 6 inches high, and consists of bathroom and two chambers, as well as hall and staircase. The bathroom contains one direct radiator, and the two rooms are heated through a register 9 x 12 in each room from the indirect radiators in the cellar. The third floor is 9 feet 6 inches high, having stair-case and hall, front and back bedrooms and one back hall bedroom. The front and back rooms are heated from the indirect radiators. The front of the house has northerly aspect and it is located nearly in the center of the block. The door of the hall in the basement is protected by a vestibule formed by the high stoop, and the one on the first floor has a vestibule about 4 feet deep. The house, which is not greatly exposed, is situated on Carroll street, Prospect Hill, Brooklyn. Its construction and finish may be considered the best. The hot water heating system was designed so as to heat easily without forcing the fire and to circulate the water at from 140° to 150° F., instead of at from 180° to 200°. It is for this reason that the proportions of surfaces in tables I and II will be found excessive, for under ordinary circumstances these surfaces in radiators may be reduced by from 30 to 40 per cent. In these tables the surfaces in the indirect radiators are proportioned to the apartments for the sake of comparisons, according to the size of registers in each room. The sizes of the air pipes could not be changed, and as a high temperature is not desired on the upper floors, the sizes of registers adopted are found to give satisfaction.

Floor.	Rooms heated.	Aspect.	Contents of rooms heated, in cubic feet.	Square feet of glass.	Square feet of exposed walls	Square feet of surface in direct radiators.	Square feet of surface in indirect radiators.	Cubic feet of contents to 1 square foot of surface in radiators.	Square feet of glass or its equivalent in exposed wall to 1 square foot of surface in radiators.	Square feet of surface in radiators to 1 lineal foot of exposed wall.	Square feet of surface in radiators to each square foot of glass or its equivalent.
Basement....	Conservatory.	South	.....	140	.....	40	.....	.....	3.5	.....	0.28
Basement....	Laundry.	South	760	16.5	119.5	22.5	.....	33.7	1.26	1.32	0.78
	Hall.	North	1,664	.....	52	31.5	.....	52.8	0.16	4.8	6.05
	Dining room.	North	2,884	55	81	72	.....	40	0.87	4.2	1.14
	Totals....	.....	5,308	71.5	252.5	126	.....	42	0.76	3.1	1.3
First floor.	Reception room and library	North and south.	11,458	168	756	261	107	31	0.66	5.8	1.5
	Hall.	North	2,352	.....	84	54	.....	43	0.15	7.7	6.42
	Totals....	.....	13,810	168	840	315	107	32	0.58	6.0	1.6
Second floor.	Bath room.	South	682	21	47	22.5	.....	30	1.15	1.07	0.86
	Back room.	South	2,499	45	102	.....	85	29	0.64	6.0	1.54
	Front room.	North	4,310	97	144	.....	92	46	1.2	4.0	0.82
	Totals....	.....	7,491	163	293	22.5	177	37	0.96	4.5	1.03
Third floor...	Back room.	South	2,261	42	91	.....	75	30	0.68	5.3	1.47
	Front room.	North	3,990	91	127	.....	81	49	1.28	3.5	0.77
	Totals....	.....	6,251	133	218	.....	156	40	0.9	4.2	1.00

Table I.—Showing Contents of Apartments, Square Feet of Glass and Proportion of Surface to Each Apartment.

The boiler used is a No. 5 Scollay portable boiler, Fig. 3. It is 56 inches high by 36 inches in diameter at the base. It consists of an outer shell, within which is an internal fire box; the space between these two parts forms an annular and vertical water space. In the fire box directly over the fire is an inner water chamber having corrugated tubular and extended rib and pin surfaces. This chamber is connected to the annular water space at one side, and its top is connected by means of a gooseneck pipe to the upper part of the water space formed by internal fire box and outer shell. This connection is immediately beneath the flow pipe outlet in external shell, so as to enable the water heated in the inner chamber to pass off as directly as possible. The surface on the bottom of the inner chamber is corrugated circularly and studded with pin extensions, while the vertical sides have vertical rib extensions. These extensions, it is claimed, absorb a large quantity of heat, especially from flames, which heat might, without their presence, go to waste. They also strengthen the casting, which is in one piece. Table III is a summary of the heating surface in this boiler.

To obtain 3.56 square feet of extended surface 0.56 of a square foot of plain surface is covered, and this surface is not counted with the plain surface. The extended surface is in a proportion of about 15 per cent of the plain surface and 13 per cent. of the total surface.

The total top surface—that is, horizontal surfaces facing upward—covers an area of 1.77 square feet, or about 6 per cent. of the entire surface. Of this 1.376 square feet are plain surface and 0.394 square foot extended surface.

The area of grate is equal to 3.408 feet.

Floor.	Total contents of all apartments, in cubic feet.	Contents of apartments heated, in cubic feet.	Total square feet of surface in radiators.	Cubic feet of total contents to 1 square foot of surface in radiators.	Cubic feet of contents of apartments heated to 1 square foot of surface in radiators.	Square feet of glass or its equivalent to 1 square foot of surface in radiators.	Square feet of surface in radiators to 1 square foot of glass or its equivalent.	Square feet of surface in radiators to 1 lineal foot of exposed wall.
Basement.....	8,248	5,308	126	65	42	0.76	1.3	3.1
First floor.....	13,810	13,810	422	32	32	0.58	1.6	6.0
Second floor....	10,332	7,491	199.5	51	37	0.96	1.03	4.5
Third floor.....	9,348	6,251	156	59	40	0.90	1.00	4.2
Totals.....	41,738	32,860	903.5	46	36	0.77	1.28	4.5

Table II.—Summary of Proportions of Surfaces in Radiators to Contents, Glass and Exposed Wall.

The total actual surface in this heating system may be thus summarized:

	Square feet
In conservatory, cast iron pipe.....	40
In residence, in Union radiators.....	463.5
In cellar, in indirect pin radiators.....	440
Total surface.....	943.5

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From the foregoing data it will be seen that 1 square foot of grate surface is proportioned to 8.74 square feet of boiler heating surface, and that 1 square foot of grate carries 276 square feet of surface in direct and indirect radiators in this heating system.

When the total boiler heating surface is taken, 1 square foot of this surface carries 30 square feet of direct and indirect radiating surface. When the top surface is omitted, 1 square foot of boiler heating surface carries 33.7 square feet of radiating surface, and when the top and extended surfaces are withdrawn, as if of no value, 1 foot of boiler surface carries 38.5 square feet of radiating surfaces. From these comparisons it may be inferred that the effectiveness of boiler heating surface varies greatly according to its position, which makes it what is sometimes termed "fire" or "flue" surface. It may also be concluded that large quantities of boiler heating surfaces do not always present the most effective heating surfaces

The registers are of the sizes given on elevation, Fig. 2. It is not intended to use the register on first floor when the rooms on upper floors require the heat. There are two stacks of indirect Gold pin radiators, sixteen sections in one and twenty-eight in the other, in double rows, as shown in Fig. 2, one above the other. This was done to maintain the temperature as high as possible at the bottom of the small air pipes, as well as to economize space in the cellar. The casings are of brick, with large manhole doors, marked D D, Fig. 2. The cold air duct is from the front, or north end, of the building, is of wood, and passes along the ceiling of cellar to casings, as shown in Fig. 1.

The direct radiators are those known as the "Union" hot water radiator. They are located and are of the sizes as shown on plan and elevation. Each radiator is handsomely decorated and finished, presenting a neat appearance.

The expansion tank EX, Fig. 2, is on the third floor, in room above bathroom. It is fitted with a water gauge, WG and water supply pipe, WS, with stop cock. The expansion tank is connected to the return pipe of radiator in bathroom, and thence to main return pipe. Valves and air cocks are on the direct radiators and pipes in conservatory, but not on the indirect stacks, the pipes being so arranged from and to these stacks that the air passes out of them into the pipes, and from the pipes out of the direct radiators.

The pipes in this system are very neatly arranged in the cellar as well as through the house, none of the vertical lines being visible, as they are passed up through closets or between partitions. On the plan and elevation the double lines and letter F denote the flow pipe and the heavy black lines and the letter R the return pipes. The main flow and return are side by side, an equal distance from cellar ceiling. In Fig. 2, sectional elevation, the main return is shown a little below the main flow pipe, in order to show the two pipes more distinctly. All the side openings in the tees face up in the main pipes, so that the connecting pipes pass over the main flow or return pipe, as may be the case. The pipes are out of the way, and it cannot be said that the cellar is full of pipes in this instance. The following is the quantity of pipes used: 90 feet of 4-inch pipe, 80 feet of 2-inch pipe, 20 feet of 1½-inch pipe, 95 feet of 1¼-inch pipe and 110 feet of 1-inch pipe. The 1-inch pipe marked B, at north end of main flow pipe, is a blow off pipe to the sewer, and is fitted with stop cock. This pipe empties the system into the sewer as far down as the flow and return main pipes, and was placed

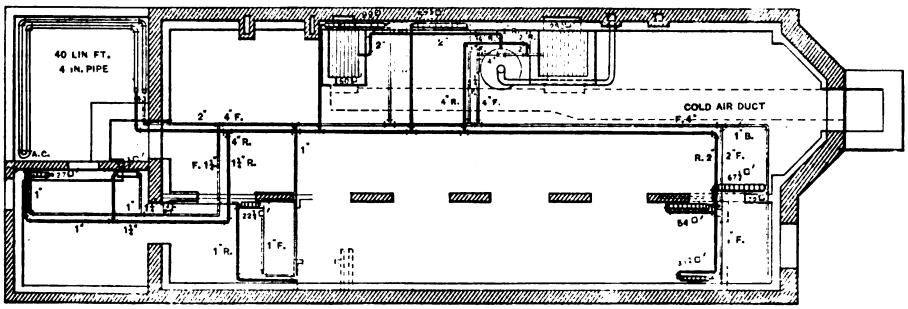


Fig. 1.—General Plan.

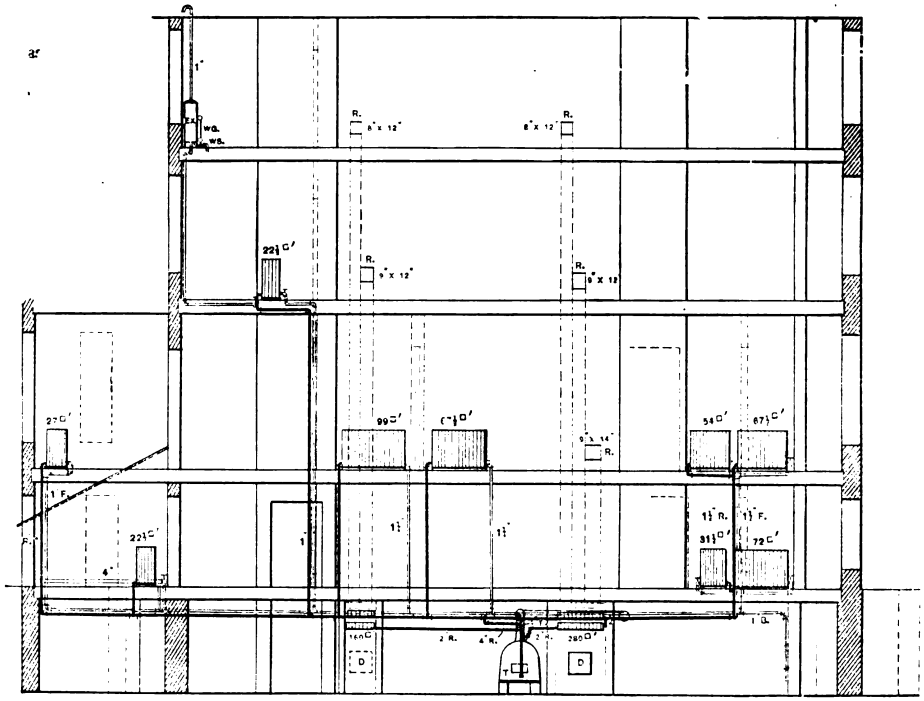


Fig. 2.—Sectional Elevation.

Hot Water Heating Plant in City Residence.

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in this position, as the sewer is higher than the boiler. The rest of the water is drawn from boiler at T, Fig 2. During the past winter the main pipes in cellar were not covered, as it was desired to dry the cellar, and there was no difficulty in heating the house with the greatest ease, the damper being closed nearly all the time.

	Plain surface.	Extended surface.	Total surface.
The "gooseneck" contains in square feet.	1.06	0.39	1.45
The circulating inner chamber contains in square feet.	6.17	3.56	9.73
The fire box contains in square feet.....	18 60	.....	18.60
Total surface in square feet.....	25.83	3.95	29.78

Table III.—Summary of Heating Surface in No. 5 Scollay Portable Boiler.

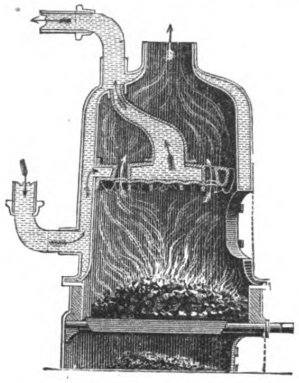


Fig. 3.—Sectional view

Furthermore, the houses at each side were unfinished during the winter, and were partially dried by the heat from this residence. The work was done by John A. Scollay, hot water heating engineer, 74 Myrtle avenue, Brooklyn, N. Y.

Ventilation of Dwellings in Winter.

Dr. V. Budde, of Copenhagen, contributes to a recent issue of *Zeitschrift für Hygiene* some interesting remarks relative to experiments on the most convenient method of removing air from living rooms during the winter months. He says:

In the ventilation of dwellings the aim is to disperse as much as possible the fresh air at the time of its admission, and conversely to withdraw the vitiated air as speedily and as directly as possible in order to prevent it from becoming mixed with the fresh air. In actual practice the solution of these problems depends upon a multiplicity of details which the author states that he has here undertaken to investigate. Whether the apartment is heated by close or open stoves, or by hot air from some central apparatus, the tendency of the warm air is to rise toward the ceiling, there to spread itself out, and from thence to descend in currents toward the lower portion of the room, where the outlets are usually placed. The heat radiated in a horizontal direction may be here left out of consideration, as being of minor importance. All the excretions of the human body and the products of combustion have a similar tendency to ascend, in spite of the density of the carbonic acid gas, and these impurities, mixed with the heated air, also rise to the upper part of the room. These facts would point to an exhaust placed at the highest part of the room as the more suitable arrangement, with an up-draft system of heating and ventilation instead of the down-draft system now in vogue. Deny has recently formulated a series of objections to this plan, and has at the same time proposed a different arrangement. He states that when the heated and impure gases just beneath the ceiling come in contact with the cold external walls, these gases contract in volume, increase in density, and stream downward close against the wall. In lieu of a few scattered openings for the extraction of this cooled and impure air, Deny proposes a perforated plinth or paneled opening all along the face of the cold walls near the floor level. This collecting channel should be led into a vertical flue, the air in which is made to move with a velocity of from 1.8 m. to 2 m. per second. The air in the collecting chamber should have a velocity of not more than 1 m. to 1.2 m. per second.

No information is given by Deny's treatise as to whether any practical tests have been made to verify the accuracy of his theories, and in particular whether the volume of carbonic acid present at different levels and in various parts of the room is in accordance with his assumption. As this question is one of undoubted public interest the author deemed it expedient to undertake a series of experiments under varying conditions. The results of his investigations, in which he was aided by Messrs. Jensen and Struer, are here recorded. The experimental room was 4.68 m. long, 2.59 m. wide, and 3.11 m. high; its area was therefore 12.1 sq. m. (130.24 square feet), and its contents 37 7 c. m. (1321.41 cubic feet). It was heated by means of an open stove in one corner; it had one window with a door opposite to it, and it was furnished with a long horizontal exhaust flue, and apertures for inlet and extraction of air capable of being opened or closed. The tests were conducted with 12 stearine candles and a lamp, and all the arrangements are described with reference to a plan and section of the room. The temperature observations were taken by five thermometers placed at various levels, being attached to a cord stretched from floor to ceiling in the middle of the apartment. Two anemometers, the formula for the use of which had been accurately computed, and a manometer of special construction were employed. The measure of the pollution of the air was based on carbonic acid gas determinations on the system of v. Pettenkofer. The proportion of carbonic acid gas was estimated in eight different places, and the temperature was at the same time observed in the same places. The results of four sets of experiments A, B, C and D, are set forth in tabulated form.

The most important point observed was the great difference in volume between the fresh air admitted and the foul air exhausted in each of the four experiments, the latter being in all cases nearly three times the bulk of the former, the fresh air varying from 53 to 61 c. m. per hour, the foul air extracted varying from 142 to 169 c. m. hourly. The balance must, of course, be due to natural ventilation by crevices, percolation, &c. Five sets of observations on the contents in carbonic acid gas follow; these are also arranged in a series of tables, and show the proportions of carbonic acid gas, the volume of gas in the outlet flue being taken as unity. In two of the experiments in which the paneled collecting flue on Deny's principle was used, it was found that the air in the exhaust ventilator was richer in carbonic acid gas than was that in any other part of the room. This plan of exhaustion, however, is only really advantageous when a system of heating is employed which causes a powerful up draft and a consequent horizontal movement of the stratum of hot air beneath the ceiling. Among the points insisted upon as the outcome of the experiments are the need of warming the fresh air before it is introduced into the apartment, and the fact that an exhaust flue at the upper part of the room, while it removes large volumes of heated air, does not extract an equivalent volume of polluted air. The evidence was all in favor of the longitudinal exhaust flue at the skirting, which extracts the largest volume of polluted air in the most economical way—that is, by insuring the fullest possible utilization of the artificial heat produced within the chamber.

A Pair of Ornamental Gates.

A pair of ornamental iron gates which will compare with any of the kind in New England have recently been placed in the new town hall at Rockville, Conn. The gates, which stretch across the arched entrance to the building, are 8 feet high and 6 feet wide, with a grill 2 feet wide bordering the outer ends, giving a total width of 16 feet. The center of the gates is of basket pattern at the top and bottom, while between for 2 feet vertical rods are twisted. Inclosing the center is a border at the sides and top made up principally of scroll designs within rings. The scroll pattern is omitted at the middle of the vertical strips and instead are two wave line strips crossing each other diagonally. The base of each gate is bounded by a heavy plate, into which a row of curves is cut in a stencil pattern. The upper corners of the gates are surmounted by unique scrolls, serving both as supports and ornaments. The grills have a center part consisting of a large circular scroll surrounded by heart-shaped designs. Above and below this center panel are longitudinal ones, on which are reproduced the half scroll and wave line device used in the border pieces on the sides. The gates, weighing about 750 pounds each, are hung upon three butts. In the recess back of them a grill at right angles to the entrance faces off an inclosure which will be devoted to memorial tablets. This grill is 6 feet high, about square and weighs about 500 pounds. The entire design, patterned after drawings by Richmond & Seabury, is perhaps the most striking specimen of the work that is now being turned off by the Springfield Iron Works.

New Composition for Moldings.

A new method of making a composition for moldings consists in mixing wood pulp with bronze powders or with aniline, vegetable or metallic colors, so as to impart a uniform color of any desired shade to the pulp. The latter is to be in nearly a dry state before being mixed with the color, and, after making, the pulp is sufficiently dry to be powdered by suitable machinery, and combined with about one-third soapstone or its equivalent, and to this mass is added a binding substance of considerable adhesive strength, such as one-third of glue dissolved in two-thirds of starch boiled in water, these two being also boiled for a few minutes before being mixed with the mass. About 20 to 30 grains of the binding substance, glue and starch, are used for every 500 grains of pulp and coloring matter, according to the specific gravity of the pulp. This quality of this gelatinous substance, says an exchange, must be sufficient to form a paste or dough of the mass, which, in a semi-fluid or plastic state, can be shaped into molds and left to dry. The dried substance is an imitation bronze or of wood or metal, and its density can be increased or diminished and made to equal that of the different woods and metals by adding more or less of the soapstone, glue and starch. The mass may be fashioned into articles without artificial heat or mechanical pressure, as, for instance, after having been applied to a wall. The adhesive materials, when combined, allow of the composition being worked into any shape or design, assuming, when dried, great hardness.

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CORRESPONDENCE.

Roofing Ladder.

From F. T., *Monroe, N. Y.*—I inclose sketches of a roofing ladder that may be of use to the readers of your paper. We found it convenient since contriving the adjustable bracket, which is shown. The bail makes the bracket secure, while the bolt prevents it from dropping from the ladder when moving about on the roof. The slotted plate through which the bolt passes is placed under a smaller slot cut in the top of the bracket. Only a round hole large enough to pass the bolt should be bored in the ladder, thereby holding the bolt firmly in the ladder, while the slot allows enough play to the bracket to prevent the leg of the bracket from climbing the roof, as ladders with a fixed bracket will do while working upon them. By removing the thumb screw the bracket will be free to slide upon the ladder, and the bail can be lifted and placed under any cleat desired to move the ladder up out of the gutter, and the bracket is refastened by putting the bolt through one of the other holes which have been previously bored for the purpose. We fasten the cleats to the ladder with No. 8 wire nails, setting the clinches well up in the wood so as not to scratch the roofing plates. The cleats are fastened 12½ inches apart. In the sketches that I send you Fig. 1 shows the finished ladder, and Fig. 2 shows the bracket. It will be noticed that by means of a hole under the different cleats the ladder can be adjusted to different lengths of rafters. It is made from pine board 16 feet long, 7½ inches wide and ½ inch thick. The cleats are 7½ inches long, 2½ inches wide and 1 inch thick. The bracket top is 12 inches long, 7½ inches wide and ½ inch thick, while the bracket leg is 8 inches long, 7½ inches wide and ½ inch thick, and the bracket brace, connecting the two parts is 11 inches long, 7½ inches wide and ½ inch thick. The bail, Fig. 3, is 8 inches square, formed of $\frac{5}{16}$ rod, welded solid. The bail is stapled to bracket brace, as shown in Fig. 4, with barbed wire fence staples. Fig. 5 is a carriage bolt $\frac{5}{16}$ x 2½ inches, which is used for fastening the bracket to the ladder, as previously mentioned. The iron plate shown in Fig. 4 is 2 x 4 inches, screwed to the underside of bracket, with slot in both plate and bracket through which the bolt passes down from ladder, the thumb nut, Fig. 5, being screwed up next to the iron plate.

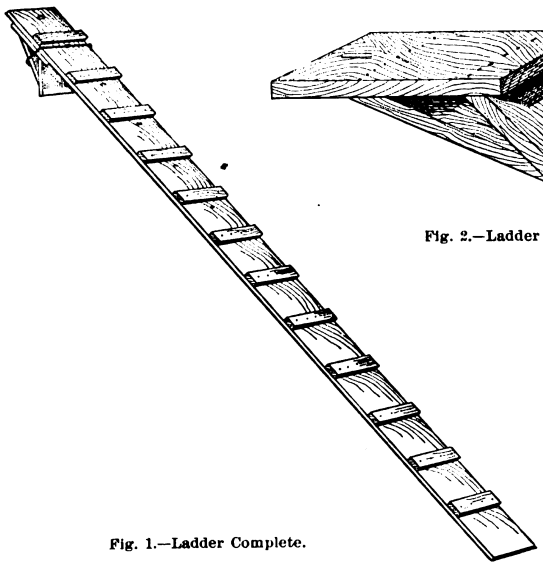


Fig. 1.—Ladder Complete.

Fig. 2.—Ladder Bracket.

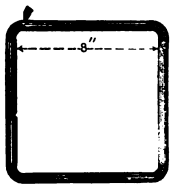


Fig. 3.—Bail.

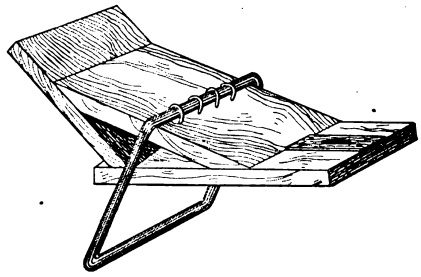


Fig. 4.—Bracket and Bail.



Fig. 5.—Bolt and Thumb Nut.

Roofing Ladder as Suggested by "F. T."

The Falling Mold vs. the Tangent System.

From L. W. T., *Upper Alton, Ill.*—Some men are born funny, some grow up funny and some become funny by accident. The late controversy between J. H. Monckton and William Jingletinker Blower, of England, is a case to the point. The letters are found in the July and August numbers of *Carpentry and Building*. "W. J. B's" humor seems to be accidental, while Mr. Monckton becomes funny by attempting to answer seriously. For a number of years I have noticed that periodically some English or Canadian stairbuilder comes to the front and extols "the falling mold system" and derides "the tangent system." He generally closes by promising to give us some instruction on the "The Falling Mold Art" and then subsides, evaporates, vanishes into thin air, or outer darkness, and we hear of him no more.

If Mr. Monckton had given "W. J. B.'s" Fig. 3 close attention, he would not have wasted time and paper in his laudable effort to make an honest argumentative reply. That Mr. Monckton and other authors deserve sharp criticism is to my mind indisputable; otherwise they have some very clumsy followers. Mr. Monckton and R. Riddell seem to exert all of their ingenuity to get irregular nosings into the cylinder with the consequent longer and shorter balusters, accompanied by those charming and graceful lumps and humps which appear in the curves of the wreath, &c. "W. J. B.'s" diagrams 1 and 2, possess at least the merit of equal nosings in the cylinder and when unfolded from a straight line. "W. J. B." says in reference to the tangent system employed by Mr. Monckton and others, "which system would certainly not meet all the requirements and conditions of several jobs which I call to mind, and, I would add, work which I have done in a superior and graceful way with ramp and wreath in one piece, &c." That is what is wanted, "W. J. B." Let the work be "superior and graceful." We don't want the ins and outs, ups and downs, longs and shorts which prevail in the tangent system, but the "superior grace" and beauty of the "falling mold" is what we are hungering for now, and hope you will not commit an error and send us off in the wrong direction at the start. "W. J. B." also says: "Perhaps it will surprise 'J. H. M.' to know that it is quite possible to give wreath and ramp, &c. . . . also that the face mold would be no part of an ellipse or any known regular curve." Well, yes; that would puzzle the best of them to see an irregular curve come down in "superior grace," and yet I believe (?) you put it on your Fig. 3, for nothing else would fit the place, "W. J. B."

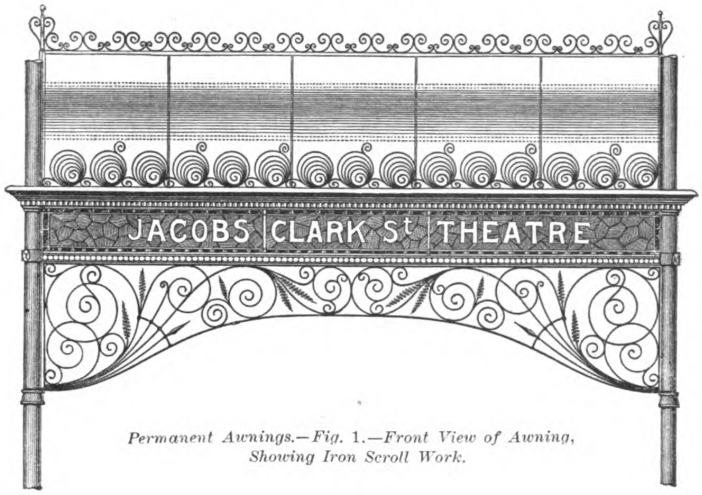
"The joints would not be square to tangents or face of plank"—what have tangents got to do with the falling mold system? "and the center line of rail would not lie in the central or any other parallel plane of the plank"—well, well, well, it seems to be a phenomenal nondescript—"but is it not a 'pearl of great price' to a man to be in conscious possession of superior knowledge and ability that enables him to accomplish more than his fellows?" Yes it is, my dear fellow, otherwise you never could have mounted Fig. 3 with a "superior, graceful falling mold" rail, chiseled from the Rock of Ages, "with the balusters all the same length." You say Fig. 3 "would puzzle 'J. H. M.' to do on the tangent system, with ramps included in the wreath, . . . no cripple allowed, but must carry a graceful (falling) line when finished." I believe, "W. J. B.," you are correct in that assertion. It is certainly a puzzle of huge proportions. Look at the diagram. From step 14 to 17 there are four risers, all centering at one point, and all on a vertical line one above the other. Stranger still, none of them come into the cylinder by about 6 inches. Counting one riser off for fair play, I find about 21 inches vertical drop on the falling mold at that point, and yet it comes down, "no cripple al-

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lowed," and "carried a graceful line when finished."

I would like to know, "W. J. B.," if you believe that? When speculating, ruminating and cogitating on this "falling" science with "no known curve," I imagine you chiseled that stone rail in one straight piece and then placed it in a sweat box, steamed it to its greatest elasticity, then set up a few balusters—one dogleg baluster over those four risers—and placed the limber, yielding stone rail on and "yanked" it down 21 inches to the pitch line below. At two points the plastic stone would be considerably compressed in the "falling mold" and bulge out like soft dough, but that can be whittled off when it gets dry, and is an accommodating assistant in those unknown curves. You show us a section of rail, "W. J. B.," and tell us it is a mutton leg that will waste much good stuff. Is it possible that an Englishman would allow any good stuff about a mutton leg to be wasted? It is recorded that in past centuries and extending up into the present one, Englishmen were so exceedingly fond of mutton leg that the feudal lords passed a law making it a capital offence to eat mutton before the lord of the manor had received his price in shillings and pence. Would it not have been appropriate to have named Fig. 3 a mutton head plan?

Baron Munchausen was an English tramp who one day slipped into a navy yard, and, after inquiring concerning the "jours'" dinner cans till he was satisfied with their contents, crawled into a "big gun" to take a snooze. While dreaming of a terrible salt water fight a practicing party came along and touched off said big gun, shooting the baron across the channel into a hay stack which a charitable Frenchman had placed in convenient range with the big gun aforesaid. I am not prepared to assert that the baron returned to England, but think he did and left numerous descendents. But that is no proof that any of them engaged in the falling mold stairbuilding science with its unique "unknown curves" and "graceful lines." You claim "W. J. B." to be an "excelsior" citizen of these United States of America. If so, let "excelsior" be your motto, and, "borne onward and upward by the strange device," unbutton your collar, roll up your sleeves, and give the tangent stairbuilders of this "greatest republic" practical lessons in the new and occult "falling line science," by "one who has developed it in a new light." Then, and not till then, will the coming generations of cubs rise up and shout: "Blessed W. J. B."



Permanent Awnings.—Fig. 1.—Front View of Awning, Showing Iron Scroll Work.

Oil Stones.

From J. M. B., *Burlington, Pa.*—Replying to the questions about oil stones of "G. W. S.," Detroit, Mich., in the order in which they are asked, I would say: 1. I think the soft Arkansas stones are the best for general use if I can only have one stone. 2. If "G. W. S." will write to the Pike Mfg. Company, Pike Station, N. H., I think he will obtain what he wants. I think, too, he might get what he desires by calling on C. A. Strelinger, of his own city. 3. I know of no way, except by the color, a reddish yellow, and the fine, even grit. 4. For some uses yes; for carpenter's tools I would as soon have the Turkey. 5. Yes; it makes them hard and smooth. Neat's foot or sperm oil is the best. 6. I do not know why, but I know it to be a fact.

Jack Rafters.

From T. S., *Toledo, Ohio.*—I have had frequent arguments regarding the bevel cut on a jack rafter. No one has ever shown me how to cut a jack rafter, nevertheless I can cut any jack rafter on the ground. I have two ways of doing such work. One is to take the thickness of the material, say 2 x 6 inches, mark my pitch the same as any common rafter and add 2 inches on the pitch line, then draw a line square across and meet the other line on the opposite side; this gives me the bevel. I find this works in many cases. Another plan is to take the valley cut and apply it on the jack and use the long miter. This also works. I would be glad to know from the readers of the paper if I am right.

Note.—Our correspondent's description of his method is perhaps sufficiently explicit to enable our readers to understand him. We fear, however, there is difficulty to be encountered in this direction. This general subject is of constant interest to a large class among our readers, and we are always glad to present questions and also to print answers.

Permanent Awnings.

From BUILDER.—Awnings have long been used for protecting the fronts of buildings and the people who pass by them from sun and rain, but, as usually constructed, they are of comparatively little use to those who arrive at a building in a carriage during a rain storm. Particularly is this the case unless the awning is provided with a trough to take away the water that falls from the eaves, and also projects as far as the curb of the sidewalk. Awnings of cloth or wood are not durable; besides, they are cumbersome and obstruct the light. Accordingly it is not to be wondered at that iron and glass should be selected as materials for permanent awnings, resulting in structures that are durable and ornamental and answering all requirements. By the use of colored glass, the roof and other parts can be made pleasing to the eye and also to serve as an advertisement, especially when the interior is illuminated by gas or electric light. For the worker in iron who delights in scrolls and curves, the ornamental awning gives him an unlimited field for the display of his talent or skill.

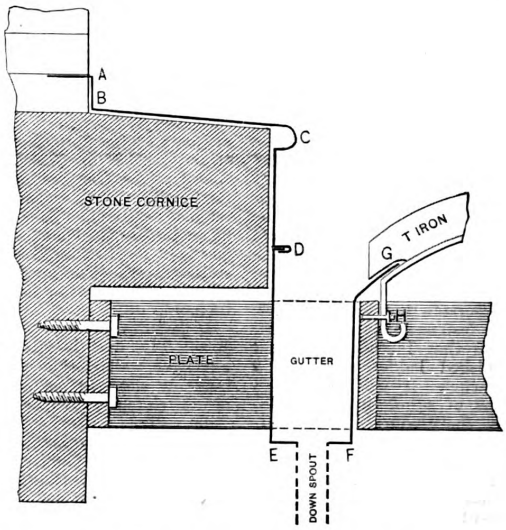


Fig. 2.—Construction of Gutter Between Stone Cornice and Awning.

In Fig. 1 of the accompanying engravings is shown the front view of an iron and glass awning over the entrance to a Chicago theater. The main part of the awning may be considered as a projection of the lintel cornice, although the design is entirely different. The crown molding of

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the awning cornice is of galvanized iron, above which is the ornamental scroll work shown in the front view. The frieze of the cornice is composed of dark colored ornamental glass, excepting the sign, which is in opaque or white glass, which allows the letters to be read by day, or at night when the interior is illuminated by electric lights. The foot molding of the cornice is of iron, and serves for strength and ornament. Below this comes the ornamental iron work, which is mainly constructed from ¼ x 1 inch bar.

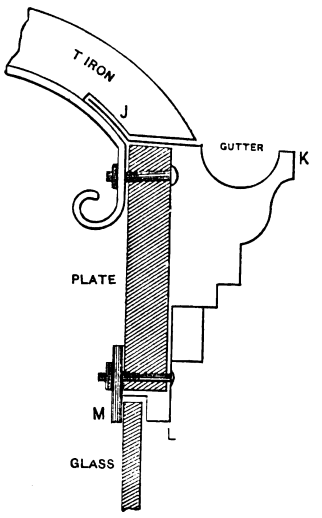


Fig. 3.—Method of Joining ⌊ or ⊥ Rafters and Gutter Cornice to Plate in Front.

The scroll work below the cornice is somewhat similar in design to that in front. As the roof is ogee in shape, a part circle of ornamental glass is introduced and the remainder of the space filled with scroll work. From Fig. 1 it can be seen that the front of awning is supported by two iron posts of a character to be made as desired of cast iron, gas pipe or angle iron.

In Fig. 2 is shown how the plate or frame of the awning is secured to the building below the stone cornice, by bending out the end of the plate at right angles and fastening by screws or bolts. As part of the roof pitches toward the building a gutter is necessary to carry off the water. The gutter is indicated by D E F G. At G the ⊥ iron is notched for the reception of the edge of gutter, and over this the glass is placed, the glass not being shown in the cut. The lower part of the ⊥ iron is bent over and fastened to the plate as at H. The connection between the building, or the flashing, is shown by A B C, and the joint at D. The roof is "framed" from ⌊ or ⊥ iron. At the ends, ⌊ iron is used for the rafters, and for the intermediate rafters ⊥ iron is used. In Fig. 3 is also shown how the ⊥ irons are fastened to the plate, a cut or notch being made in the iron for the reception of the edge of the front gutter at J, over which the glass is placed. J K L is the crown molding of cornice which contains the gutter, which is bent at L, so as to receive the ornamental glass frieze, further held in position by bolting on the bar at M. The foot molding is constructed in a similar manner, if desired as partly shown in Fig. 1.

The construction of awning at ridge is shown in Fig. 4. The T-iron N O P can be of sufficient size to cover the rafters Q and R, the section of which is shown by S. While a bolt is used in the illustration to secure the rafters to the ridge iron, countersunk rivets would be better in practice, as they would not be in the way of the glass. In Fig. 5 is indicated the manner by which the cresting can be fastened to the ridge by the bolts or studs T U V, and how the parts of the cresting can be secured at W by bolts or rivets. The scroll work over the cornice in front can be fastened in a similar manner. The shape of finial is also shown in Fig. 5.

As ornamental glass set in lead is used in the construction of the roof, brace rafters are placed under the glass to give it strength and to avoid too many rafters which would interfere with the design. In Fig. 6 is shown the relative position of rafters, brace rafters and glass. A represents an end rafter, B one of the center rafters, C D the two brace rafters between A and B, over which the glass, indicated by the dotted line, is placed. By drilling holes in the rafters A and B and driving through pins, the glass would be secured in position, after which putty could be applied in the usual manner. As the glass is in small pieces, joined by lead, no difficulty appears to have been encountered in bending it (nearly) to the required shape, as shown in the end view.

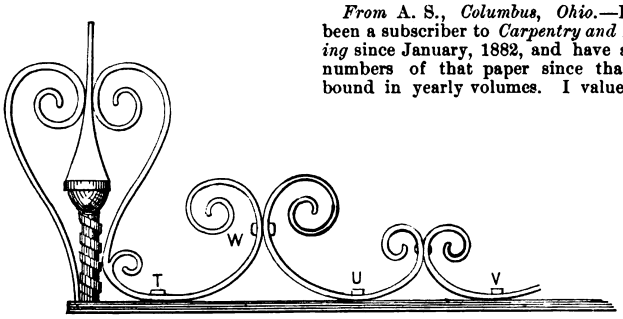


Fig. 5.—Side View of Cresting Shown in Fig. 4.

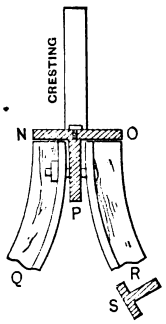


Fig. 4.—Construction of Awning at Ridge.

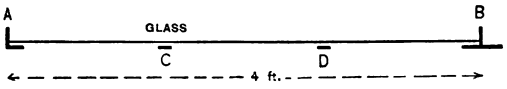


Fig. 6.—Section Showing Rafters, Glass and Brace Rafters.

Design for Hen House.

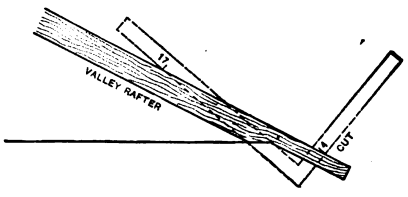
From R. R., *Lachine.*—Will some of the practical readers of *Carpentry and Building* kindly give me a plan of an improved hen house?

Suggestions to Stair Builders.

From A. S., *Columbus, Ohio.*—I have been a subscriber to *Carpentry and Building* since January, 1882, and have all the numbers of that paper since that time bound in yearly volumes. I value them very highly as a work of instruction, especially in the line of stair building. I think, however, if some of the corresponding authorities on this subject would give less time and space to quibbling on technicalities and more to practical points the average student would appreciate it to a far greater extent than at present. Previous to reading *Carpentry and Building* I used to do all my stair railing on the "face and falling mold" principle, which I still consider ahead of all others for getting over some of the very crooked places encountered in practical work.

Bevel for Valley Rafter.

From I. P. H., *Omaha, Neb.*—In answer to "F. H. W.," of Williamsport, Pa., whose letter of inquiry relating to the bevel of lower end of valley rafters appeared in the September number of *Carpentry and Building*, I would say it may be found in the following manner: Take 17 inches on the blade of the square and one-half the rise of the common rafter to a foot run on the tongue, and the tongue gives the cut. For example, suppose we have a roof of one-third pitch. This is a rise of 8 inches to the foot run. Eight and 12 will make the common rafter cuts, and 17 and 4 the cut on the end of the valley rafter corresponding to a square cut on the common rafter. In the diagram which I send is shown the manner of applying the square to a valley rafter. So far as I am aware this rule will work on any pitch of roof. If the correspondent had asked how to make a cut in a miter box that would properly miter moldings meeting in valley on roofs having the common rafter cut square on their lower ends, the question would have been a difficult one to answer. Nevertheless a cut can be made in a box which will make perfect miters in valleys as above referred to. If the ends of the rafters were cut on the plumb line then a square miter would make the cut, but as the ends of the rafters are cut square it



Bevel for Valley Rafter.

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gives the molding a different pitch, therefore a different cut must be made.

Framing a Barn.

From J. & A. H., *Ohio.*—We are readers of *Carpentry and Building*, and are much interested in the questions and plans lately published relating to barn building. We have some well defined ideas as to how a barn should be framed, and in order to convey them to other readers of the papers we send a few rough sketches illustrating our method. Fig. 1 represents the side view of a barn 54 x 36 feet in size. It is drawn from 18 feet to square, which is the way we usually build barns here. Fig. 2 represents an end view of the barn, while Fig. 3 represents a bent on each side of the barn floor. We consider the method here illustrated better than any of those which have yet been published, for the reason that the end posts run up to the purlins, thus preventing the barn from bulging when filled with hay.

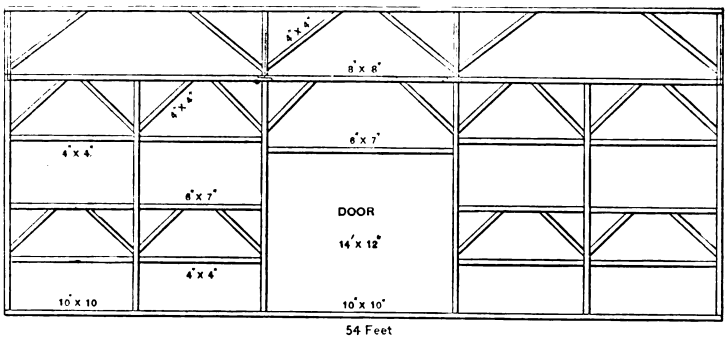


Fig. 1.—Side Elevation.

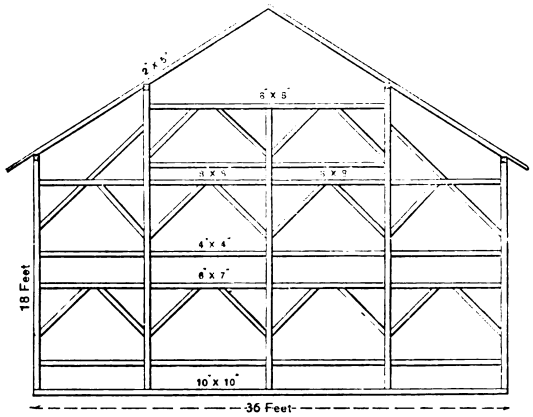


Fig. 2.—An End View.

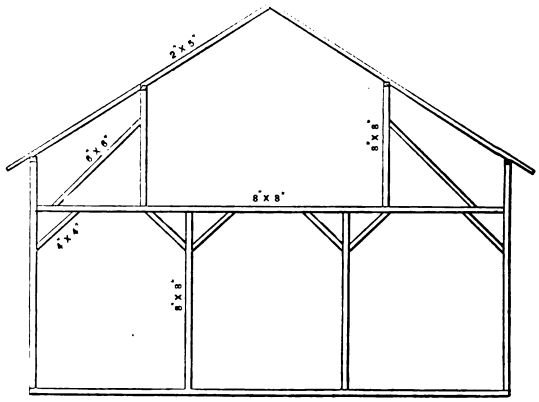


Fig. 3.—Bent on Each Side of Barn Floor.

Framing a Barn.—Sketches Submitted by "J. & A. H."

Framing a Bank Barn.

From H. J. C., *Volante, Pa.*—Allow me to inquire, through the columns of *Carpentry and Building*, how to frame a bank barn having five bents, two floors and two bays. The floors drop down 5 feet, in order to allow the cattle to eat from them. The barn is to be 40 x 64 feet, with the upper story 18 feet and the lower 9 feet under bays and 4 feet under floor. Are not sloped purlins better than straight purlins, and can the barn be framed with the center piece of middle beams cut out? I desire to be informed upon this point, for the reason that I know of several barns of this kind where the roofs have sunk and the ends bulged out at the bottoms. I would also like to be informed as to the size of timber to be employed. Could a curb roof be used upon such a barn?

Note.—If our correspondent will refer to previous issues of *Carpentry and Building* he will find a number of suggestions for framing barns, from which it is possible he may be able to gather something which will be of interest in this connection. The question, however, which he raises is one affording opportunity for interesting discussion, and we present it to our readers in the hope that they will give it such attention as its merits may seem to demand.

Balloon Framing.

From S., *Boonville, Mo.*—Will some reader of *Carpentry and Building* kindly give us explain the term "balloon framing," for the benefit of the uninitiated?

Brownhard Door Checks and Window Fasteners.

From D. S. AND N. MFG. COMPANY, *Dallas, Texas*—Will some of the readers of *Carpentry and Building* kindly give us the address of the manufacturers of Brownhard's patent door strips or checks and also window fasteners?

Base Board for Circular Bay.

From J. M. B., JR., *Burlington, Pa.*—I notice in the April number of *Carpentry and Building* several answers to the problem of "F. S. S.," Charleston, S. C., in regard to cutting a base board for a circular bay window. Now, these answers may be all right, and probably they are, but to divide a space of 4 inches into the same number of parts into which $\frac{1}{4}$ of the circumference of a circle of 10 feet radius is divided, makes one set of spaces rather short and the others long. I find the quarter of a circumference having 10 feet as a radius, to be 15 feet $8\frac{4}{10}$ inches. A practical way to obtain the joint would be to kerf the board and then tack it on level. Take the dividers, extend to 4 inches, representing the fall of the porch floor, and scribe the board to the floor. Then take it off and rip to the scribe line, and you have a tight joint. I know this is not a scientific way, but it is practical. I desire to thank "J. H. P.," Grinnell, Iowa, and others, for answering my question in regard to mitering a rake and level molding.

Pitch of Roofs.

From J. J. A., *Madison, Neb.*—I notice in the September issue of *Carpentry and Building* a letter from "W. S.," Paterson, concerning the pitch of roofs, and in reply thereto a note, to some portions of which I beg to take exception. In one place it reads, "Thus if the span is 30 feet and the length of the rafter 20 feet, the pitch would be called two-thirds pitch." Now, this is not the way we get two-thirds pitch in the "woolly West." For a two-thirds pitch on a 30-foot span, we must have a 20 foot rise—for 20 is two thirds of 30. Therefore, to find the length of rafter, we want to find the hypothenuse of a right angle triangle of 15 and 20 feet respectively, which gives 25 feet.

Convenient Door Holder.

From H. H. C., *Denver, Col.*—To-day I was looking over *Carpentry and Building* for the last year and was more than pleased with the information it contained. I think I would like to rescue "N. P. W.," whose letter relative to a convenient door holder appeared in the September issue for 1889, from other forms of holders advocated by various correspondents. I have tried all other kinds of door holders, but they did not work to my satisfaction. We have to get a hustle on us here, as well as in other places. I use "N. P. W's." plan, but I choose a door opening about the center of the house, and then saw the ends of the door stiles off at the top and bottom; scribe the doors at their several openings and then take them to the center of the house and proceed to plane to the scribing marks. I then put on the hinges and take them to the places where they belong. After they are all hinged, I proceed to swing them. I come very near getting there with the best of men in this section. For mortise locks I use an $\frac{11}{16}$-inch bit for mortise and knob and $\frac{3}{8}$ inch for key holes. I only bore three holes for the mortise lock and leave the door on its hinges. My foreman says that one can

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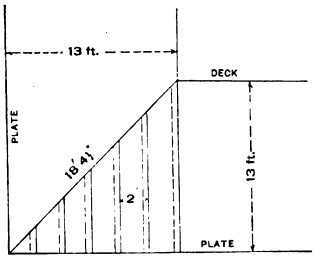
lock a door while "W. K. H." is taking his off the hinges and getting to the bench with it.

An Eyebrow Window.

From J. W. I., *Chicago, Ill.*—Will some practical readers of *Carpentry and Building* kindly show me the way to strike out an eyebrow window? It must show no valleys, but gradually die away into the roof. I also desire to have some one show me how to obtain the lengths of all the ribs, as it is obvious that every one is different.

Length of Jack Rafters.

From F. J. E., *Elizabeth, N. J.*—I have been reading in *Carpentry and Building* the different methods of finding the lengths and bevels of hip and jack rafters. It is a subject in which I am particularly interested. I have what I consider a short, sure and simple plan of finding the lengths of jack rafters, and as being of possible interest to other readers of the paper, I present it herewith. Referring to the sketches which I inclose, Fig. 1 is



Length of Jack Rafters.—Fig. 1.—Diagram of Hipped Roof to be Framed.

a hipped roof, which is to be framed. The run of the common rafter is 13 feet, the rise 9 inches to the foot, or 9 feet 9 inches. Now, to obtain the length of the hip I first take the steel square, it being my practice to employ a square and rule with twelfths marked on it, so as to use a scale of 1 inch to the foot. Measure across from 13 on the tongue to 13 on the blade, as A, Fig. 2. By this means I obtain 18 feet 4½ inches, which is the run of the hip. Now, take the run on the blade, the rise on the tongue, as shown at B, Fig. 2, and the result is 20 feet 9½ inches, which is the length of the hip. For the bevels take the same figures, referring now to

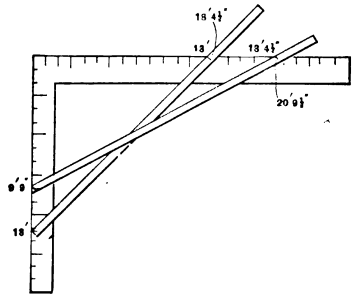


Fig. 2.—Obtaining Length of Hip.

Fig. 3, and the tongue gives the plumb cut, while the blade gives the level cut. Take the plumb line on the stick C, Fig. 3: Square across the top, draw a line parallel to the plumb line at a distance of the thickness of the hip rafter. Connect the lines on top, and the top bevel is obtained. I obtain the jack rafter in the same way. In the July issue of *Carpentry and Building* "M. E. B." says, divide the common rafter into as many parts as

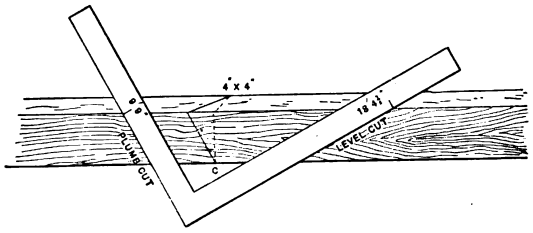


Fig. 3.—Method of Obtaining the Bevels.

we have spaces between jacks, and the first part will be the length of the first jack, and the first and second will be the length of the second jack, and so on. That plan is very good, as the number of jacks is given, and not the width of the spaces, but suppose the width of the spaces is given instead of the number of jacks, say 2 feet, shown by the dotted lines in Fig. 1. If the space is 2 feet, the run of the first jack is 2 feet, the second 4 feet, and so on. Now, the run 2 feet and the rise 18 inches will, by measuring across, give 2 feet 6 inches, the length of the first jack rafter, and each jack will be 2 feet 6 inches longer. Of course, as we obtain the length from the center of the hip, we must take off half the thickness of our hip rafter, as measured across the top bevel of the hip.

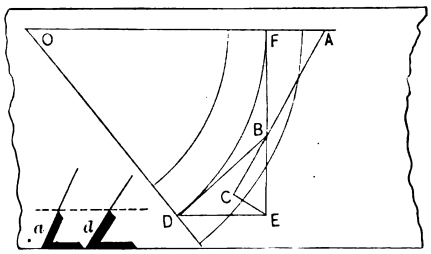
Classes in Turning.

From H. B. W., *Elkhart, Ind.*—Please inform me where I can take a thorough course in turning.

Note.—We cannot give our correspondent definite advice in this matter, for we are not certain that there is any institution at present making a specialty of courses in wood turning. We think, however, that some attention is given to this department of work at Sibley College, Cornell University, Ithaca, N. Y., and also at the Worcester Free Institute, Worcester, Mass.

A Piece of Stair Work.

From A. L., *Napa, Cal.*—In the accompanying sketches I send you a plan of turn out at the bottom of a flight of stairs, which comes to a level at D in Fig. 1. The work in this case is done for the most part with the aid of the square. Take a piece of straight edge board, as indicated in Fig. 1 of the illustrations, and with O as a center strike the center line of the rail F D. The plan of tangents is indicated by F B D in the same figure. Extend F B to E and square over to B. In the same figure F A is the hight raised over the tangent F B. Draw the pitch line A B, extend it to C and square over to E. To get the bevel for the joint F, take C E on the tongue and E D on the blade of the square and apply to the edge of the board at *a*; mark at the tongue of the square. To get the bevel for the joint D take the hight A F on the tongue and E D on the blade of the square and apply to small *d*, marking at the tongue of the square. To draw the face mold make A B C of Fig. 2 equal to A B C of Fig. 1. Square over from C indefinitely on B of Fig. 2, with the tangent B D of Fig. 1. Mark the arc at D of Fig. 2. Connect B D. Make the face mold half the width of rail on bevels each way from A and D, as indicated at *a* and *d* by the dotted lines, Fig. 1. Bend a flexible strip and mark the curve lines.



A Piece of Stair Work.—Fig. 1.—Method of Laying Out the Work.

Leave some straight wood at joint H, as shown.

Estimating Cubic Contents of Buildings.

From S. W. R., *Boonville, Mo.*—I have read *Carpentry and Building* since last May with a great deal of interest and benefit, and would very much desire some of the practical readers of the paper to answer a few questions which I will propound concerning the subject of estimating by the cube. In estimating the cubic contents should one take the outside di-

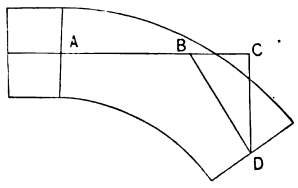


Fig. 2.—The Face Mold.

mensions or the inside? In arriving at the hight of a building what point is it desirable to measure from, the apex or the hight of plumb work, when gable is used? Is the estimate for brick and frame buildings made in the same manner? What is the safe estimate per cubic foot, with carpenter's wages at $2 per day, in the case of a low priced brick residence; also in the case of a medium city residence and a first-class brick residence? I would also

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like to know the safe estimate per cubic foot, with wages the same as above, in the case of a low priced frame residence, a medium priced frame city residence and a first class frame city residence.

Answer.—We submitted the inquiries of our correspondent to a well known civil engineer and architectural writer, from whom we have the following answer:

In estimating the cubic contents of a building for cubing its cost, as the saying is, various methods are pursued which may be briefly stated: In England the most usual practice is to multiply the length of the building by the breadth and the result by the hight from the bottom of the footings to half way up the roof. In America the general practice is to measure half way up the hight of the roof to one-half way down the depth of the foundations and multiply by the length and breadth of the structure; the number thus obtained is then multiplied by the value of a single foot for an approximate estimate. Both of these methods are approximations of an approximation, and should not be adopted by any builder in starting out to obtain data for cubic values. The method I have adopted is to measure the cube of the building independent of the roof and measure the roof separately, taking the outside wall lines as starting points for the building proper and beginning at the level of the footings, and not at grade or curb line, as practiced by many. The roof prisms and pyramids are so variable that to establish anything like a rational relation between two dissimilar buildings each roof should have its cubic contents estimated separately and added to the wall enclosed building.

Consider an ordinary 25-foot dwelling house as an example. Its total clear frontage is 25 feet. It is composed of a main building and a rear wing or ell. The main part of the house is, say, 25 feet by 30 feet; the ell is 16 feet by 20 feet; the hight from footing to eaves, both front and rear, is 30 feet; the roof of the main front is an ordinary gable, whose rise is 8 feet, and whose eaves overhang 1 foot on each side. It is a solid similar to a prism of three vertical faces; its base is, say, 27 feet and its altitude is, say, 8 feet. Its are is $27 \times 8 \div 2 = 108$ square feet. The hight of the prism is, say, 32 feet, and its contents, therefore, are $108 \times 32 = 2456$ feet. The contents of the main building is $25 \times 30 \times 30 = 22,500$ cubic feet. To this must be added the roof prism of 2456 feet, making a total of 24,956 cubic feet. Proceed in the same way with the rear portion of the building and add the two results together for the whole building. Sometimes the rear roof may be a hipped gable; in that event its solid may be conveniently separated into that of a triangular prism and a wedge whose base is equal to the base of the prism.

The estimates for brick and frame are never alike, because brick is more expensive than frame work, although the ratio between the two is a variable one, owing to the great difference possible in the range of each as to cost:

Low priced brick house with carpenters' wages at $2 per day and masons' at $3.50 would amount to 12 cents per cubic foot.

City residence, brick, ordinary decoration, 14 to 16 cents per cubic foot.

City residence, brick, fine decoration, 20 to 24 cents per cubic foot.

City residence, brick, first-class decoration, 30 to 40 cents per cubic foot.

Frame buildings, wages $2 and $3.50 per day, as above:

Low priced residence, 8 to 12 cents per cubic foot.

City residence, medium decoration, 14 cents per cubic foot.

City residence, fine decoration, 18 cents per cubic foot.

In a frame house built this summer for a client at Newark, N. J., the total cost of the structure, including furnace, three mantels, range, gas fixtures and architect's fee, amounted to nearly $4000. It contained in basement a dining room, kitchen and cellar; on the first floor a parlor, living room and library; and on the second floor three bedrooms and a bathroom. The attic was unfinished. There was no hardwood in the house, and no decoration of any kind. There was natural finish to woodwork and hard finish to walls. The front windows had the Willer sliding blinds; other windows outside blinds with rolling shutters. The house was stained where shingled and painted where clapboarded. The roof was of slate, and the chimneys were capped with terra cotta molded blocks. The bathroom wastes sewered to the street connection with the sewer, and the kitchen wastes drained to a cesspool in the rear yard. The front walks were flagged with bluestone, while the yard walks were laid with 2-inch plank on sleepers. There were no fences in front. The cubic contents of the house were 31,102 cubic feet, making a cost of $0.1286 per cubic foot. The ground floor area was 865 square feet, making a cost of $4.63 per superficial foot of such area. In this house, carpenters' wages were $3.50 per day and masons' $4 per day.

A safe rule for a suburban house in or near New York City is from $5 to $6 per square foot of first floor area, or 15 to 18 cents per cubic foot. This is for first-class work in a framed structure without decoration, but admits of good materials throughout, first-class plumbing, good foundations, hardwood hall stairs, and hardwood or parquetry flooring for a moderate sized hall. Brick structures of the same class are more expensive, and the ratio depends on the quality of the brick, as well as the extra cost of the fine workmanship necessary to artistic work. In England dwelling houses of the commonest character (such as speculative builders indulge in) can be built for 5 pence (10 cents) per cubic foot. The cost of dwelling houses ranges from this price to about 16 pence, the price of the most expensive mansion. Warehouses of plain character cost 5½ pence to 6 pence; stables from 5 pence to 1 shilling, and the list might be extended.

In America cheaper houses are built than would be tolerated in England, and costlier houses are built in such a city as New York than exist anywhere else in the world. The ordinary apartment house, not fire proof, costs from 20 cents to 25 cents per cubic foot for an inside location, but for a corner site the increased cost may run the total figure up to as high as 30 to 32 cents per cubic foot. If built of fine cut stone and brick combined, a corner apartment house may amount to from 35 cents to 40 cents per cubic foot. Usually such a house has fire proof floors or halls, hardwood hall floors, elevators and every modern improvement.

Points Worth Considering.

From L. E. THORNTON, *Columbus, Ga.*—The first thing to be taken into consideration by one contemplating building, whether he be architect or builder, is the size and shape of the lot on which the structure is to be erected. This, in connection with the design, is an important question. It is also desirable to consider whether the lot upon which it is proposed to erect a building is a corner or a middle one; whether the ground is high or low, rolling or flat, and whether the lot is large or small? These questions should first be settled by one who has an eye for designing, having in view neatness of appearance, convenience of rooms, sanitation, heating, light and ventilation. All of these are necessary considerations in making the home healthy, attractive and convenient.

Many a beautifully designed home has been placed on a lot which was not adapted to the design, thereby rendering the whole unpleasant to the eye. On the other hand, many a beautiful building site has been ruined by erecting thereon a house which was not designed in keeping with the environment. There can be no rule laid down for designing homes. The true architect must be familiar with human nature, and his success will depend largely upon his ability to judge from a short conversation with his clients what will best suit their requirements, and then to be able to adjust them in such a way as to maintain the several points above alluded to. There are many people who consider themselves competent to design a home, and only require the aid of a carpenter to carry out their ideas. Generally speaking, however, when they have built a house the complaint comes up, "If I had only had this to do over again I would make this and that very different;" and the architect engaged who fails to point out to his clients this or that feature which they think they want, and which the architect knows, or ought to know, will not be satisfactory in the end, fails to do his duty and will probably miss it in the long run by lack of recommendation or just condemnation. Then again the locality has to be considered. While in the North sleeping rooms, or chambers, as some are pleased to call them, are generally small and usually unprovided with grates or other heating apparatus, in the South they are, if anything, the largest rooms in the house, and seldom is one seen without a grate or open fireplace.

In the North the kitchen is often in the main body of the house, sometimes directly at the rear of the hall. In the South it is generally, and with few exceptions, as far from the main body of the house as it is possible to get it, and often at a considerable distance from the dining room. I strongly advocate the separation of kitchen from dining or other rooms of the house by a passageway, pantry or some other method, for the purpose of preventing fumes from the kitchen entering other portions of the house. The manner of ventilating this space between the kitchen and the dining room depends upon the locality and the position of the house. Convenience requires a pantry or china closet and store room. If not too much limited in means a butler's pantry, where the better class of dishes can be washed without the necessity of their being taken to the kitchen, and also where pastry may be prepared away from the heat of the kitchen, might be provided. Some people prefer sleeping rooms on the sunny side of the house, while others prefer them on the shady side, and the same variation of opinions exists in regard to all the different rooms and other arrangements about a house. It is incumbent upon the designer therefore to incorporate as many of the different ideas as possible in order that when the house is completed the people will say they have got just what they wanted, when in reality it is probably quite different from what any one would have understood to have been meant by these suggestions. The true designer simply draws out ideas, and putting them with facts, mingles them together in such a manner that the client thinks the designer is carrying out his ideas, when any one else would have placed an altogether different meaning upon the suggestions proffered. The result is, however, that the architect has made use of his own knowledge, having certain points in view, and has produced a house pleasing to the eye, healthy on account of proper drainage and ventilation, cheerful by reason of abundance of light, comfortable from proper heating arrangements, and convenient, owing to the position of the various rooms, one to the other. The result is a happy family—friends of the architect.

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The Builders' Exchange

CONDUCTED BY WM. H. SAYWARD, SECRETARY OF THE NATIONAL ASSOCIATION.

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The next convention will be held in New York City, on the second Tuesday of February, 1891.

Arbitration.

One of the fundamental points of the Declaration of Principles of the National Association is: "Employers in the building trades should recognize that there are great opportunities for good in associations of workmen, and while opposing and condemning improper methods and action upon the part of such associations, they should still be ready to aid and assist them in all honorable purposes."

The report of the Committee on Arbitration, as submitted to the mid-year meeting, contained the following: "No association desiring recognition as an authoritative body should, either in its form of organization or through its by-laws, rules or practices, attempt to independently or arbitrarily control or influence the action of others; but, recognizing the rights of others, should adopt measures that will lead to joint consideration and joint action in all methods of mutual concern."

"Associations established upon the principles above expressed should be heartily encouraged, all persons eligible thereto should be urged to join, and every legitimate effort made to convince them that it is their duty to unite with their fellows in all honorable methods for the establishment and maintenance of just and proper practices among themselves and in their relations to others."

It is a fact that the majority of the best workmen in many branches of the building trades are members of unions, just as it is a fact that the majority of the best employers are members of builders' associations, and the motive that actuates the former is exactly the same as that which actuates the latter. The primal object of the trades union, at the time of its inception, is the improvement of the conditions which surround and control the sale of the only commodity the workman has to offer—*i. e.*, labor.

The organization of trades unions, the power of united and concerted action, has discovered to the workman the strength that lies in association, and as a natural result they have been led into arbitrary and unjust action because of the fact of there being comparatively no opposition to the course they have seen fit to pursue.

It is impossible for the employers in the building trades to take any other position than one of antagonism toward organizations of workmen *as they are at present conducted*, they having declared, as an inherent part of their existing functions, certain things that appear to the employer to be not only beyond their province, but have attempted to subvert principles that cannot be changed either by employers or by workmen.

One of the principal sources of the misunderstanding between employers and workmen is the fact that a party of employees get off in a little group by themselves, and a party of employers get off in a group by themselves; they do not understand each other, and the relations between the two become strained until open antagonism is declared, while the trouble is that if they were brought together they would soon discover that they were not so far apart after all.

It is the getting apart with fists all doubled up and ready to strike out that creates the misunderstanding and trouble, and employees are beginning to learn that this indiscriminate striking back is not bringing the solution that they are all so anxious to reach.

The plan of arbitration as submitted to the mid-year meeting by that committee, which provides for an equal number of arbitrators from both sides, and tie votes on any question to be finally settled by an umpire chosen by the joint committee, work to progress without stoppage pending a decision, seems to be most just and feasible. The plan is founded on principles of equity and honor, and seems to be

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least likely to excite opposition or antagonism, and most likely to accomplish the result which all are striving for—complete and harmonious co-operation—and little by little the ground will be finally reached where there there will be no more troubles, at least of the character that has existed in the past.

What is the reason that there has been so much trouble? It is because the employers have been doing no thinking, but have been huddling together over their little private affairs and letting the welfare of the whole take care of itself, while the workmen have been coming together, organizing, gathering strength; and have been so little opposed, so little met, so little cautioned by employers, that they have done things which a strong man frequently does, neglected the rights of the weaker party, and have encroached upon the rights of the employer and placed stumbling blocks in the path of capital and labor, mainly because employers have neglected their plain duty.

It is absolutely impossible to permanently settle the differences which arise between employers and employees by action exclusively from the standpoint of either one party or the other.

Some plan must be developed whereby questions that will be considered as of mutual concern to both parties may be freely placed before a tribunal, which shall be just and fair, for final adjudication.

The biggest bugbear seems to be the settlement or fixing of what questions shall be deemed by the employers as of mutual concern.

The question of apprentices, for instance. It has been proven, from conversation and discussion with the best men in some of the unions, that they think they are right and justified in the position they take on the subject, and that they have fair reason for maintaining that they have an interest in the question as well as the employers. How is the question to be settled? Are the employers to define that "questions of mutual concern" must not touch apprentices? If the employers reserve the right of such distinction to themselves, the unions whom they are approaching for the purpose of reaching some ground upon which to build a new condition of affairs have also the right to say that this, or that, is not a question of mutual concern, until every subject in the calendar is branded as not being of mutual concern, and employers will be left with nothing to do but resume the inconsequent ground upon which they have stood for the last 25 years, being no nearer a peaceful solution than before.

The solving of this problem will only be obtained by thorough and careful consideration and discussion, and these are the only means that will secure peaceful settlement of the disturbing questions.

It has been proved that thinking members of the unions are in about the same position as the conservative members of employers' associations, and are of the opinion that it would be better for all to come to joint conclusion on the apprenticeship or any other question.

The motives of the union men are to reach better conditions, and employers have been doing practically nothing to correct their methods.

Arbitration is the fairest and best means for securing harmonious action by two elements whose interests are so closely identified as those of the employer and employee, and the plan provided by the Arbitration Committee of the National Association of Builders contain the principles that are most likely to bring about the desired end.

A Building Fund for a Builders' Exchange.

Thomas J. King, secretary of the Builders' Exchange of Washington, D. C., by request made the following explanation at the mid-year meeting of the methods used by his Exchange in securing funds for the purchase of a site and the erection of a building of its own.

The Exchange started out with the expectation of having 150 members, 100 corporate and 50 non-corporate, but soon found it necessary to increase the number to 200, with every indication pointing to a necessary further increase to 300.

The initiation fee was placed at the low figure of $50, which was considered as the best charge to make for membership. The fee for the corporate class has since been increased to $75 and later to $100, the non-corporate fee still remaining at $50.

During the month of March Mr. King and a few others conceived the idea of purchasing a piece of property and erecting a building thereon for the use of the Exchange. At the time of organization the quarters at present occupied by the Exchange were leased for a term of five years, with an option of one year at $60,000 in case it was decided to buy. It was discovered, however, before the Exchange was nine months old that the building would be entirely too small for the purpose, and a committee was appointed with instructions to select a site for the erection of a new building.

The committee found the selection of a site slow work, hampered as they were by the fact that there was but little money in the treasury at that time, with the exception of the general fund, which was then very moderate.

Mr. King with others at once set to work to devise means for raising a fund to be used in building, and as a result it was decided by the Exchange to issue to the members of the corporate class a certificate of membership at a certain recognized value.

The certificates were placed at $200 with a valuation of $300, making the amount payable in one year at the rate of $25 per month. All corporate members who have not subscribed for a certificate of membership by January 1, 1891, will forfeit such membership and be set back into the non-corporate class.

There were secured in about 30 days 120 individual subscribers at one share each, leaving about 80 shares or certificates unsubscribed for. All but 15 or 20 of these shares were taken by the members of the corporate class and the extra ones held in trust and are at the disposal of the board of directors. When a member makes application into the corporate class the board of directors designate by ballot which member holding two or more shares of stock shall relinquish one share to the applicant, he receiving for that share 10 per cent. premium. Thus, if the holder paid $300 for the share relinquished he received $330 for it, the new member paying the premium. This plan was found to work very satisfactorily.

On a basis of $300 each for 200 shares, $60,000 in all, the first six months brought in $30,000, and assessments for the succeeding three months will produce $15,000 more. Many of the members have paid for their certificate in full and some of those holding extra shares also paid cash for them, and in this manner have anticipated the assessments and correspondingly increased the amount of the fund at present on hand.

The certificates or shares are non transferable and, therefore, not negotiable, and members who invest in a share of stock virtually have their money tied up therein, but in the event of the death or retirement of a certificate holder the board of directors are instructed to place a value upon his stock, and the retiring member or his heirs may make demand on the Builders' Exchange for the value of the stock in question.

The object in making the stock nontransferable and distinct from that of a stock company was to prevent the stock from being placed on the market and losing its identification with the ownership of the building, and also to prevent any speculating therewith should the stock be held by outside parties. Another strong reason in favor of the plan is that the holding of a certificate of membership in the corporate class is a guarantee to the public that each member is worth at least $400, for he has paid up into the Builders' Exchange $300 for his share of stock and $100 initiation fee.

The site ultimately selected as desirable for building purposes is on Thirteenth Street and only a square and a half from the present location. The ground is 65 feet front by 155 feet deep, with an alley 30 feet wide in the rear and 20 feet wide on the side. On the premises at the time of purchase was a church building with as fine a church interior as there was in the city, with a class room in the lower story 55 x 60 feet, 13 foot ceiling, and above an audience room of about the same dimensions except that the ceiling was much higher.

Fortunately the building set back in the lot about 40 feet, so that after removing the vestibule a depth of 50 feet was given, upon which is being erected a six story building that is to be the future home of the Builders' Exchange.

On the rear part of the lot, 65 x 55 feet, which fronts on the 30-foot alley that is practically a street, it is intended to put up a trades school, while the lower story of the old church will be used as an exhibition room and the main body of the building as the exchange room, leaving the new structure free for offices.

The cost of the property was $45,000, and was paid for by $15,000 cash and a deed of trust for $30,000. The assessments are being used for building purposes only.

The contracts with the builders already amount to $48,000, and it is expected that the changes in the church building will cost about $12,000 more, thus making the total expense $45,000 for the property, $60,000 for new building and alterations —$105,000 in all. The value of the investment may be estimated by the fact that ten days after the purchase the Builders' Exchange was offered $50,000 for the property, and the offer has since been raised to $75,000, an advance of $30,000.

It was deemed necessary for the protection of members of the Exchange, who have invested money in the enterprise, to create a separate organization known as Certificate Holders' Association of the Builders' Exchange. This association is composed exclusively of certificate holders, and the Board of Directors of this organization is like the Board of Directors of the Builders' Exchange. The reason

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of this action was that, having the deed drawn, it was deemed proper that parties investing their money should be protected individually, as, if the deed had been made to the Builders' Exchange, all members in the corporate class would have had equal benefits with the actual investors; hence the deed was made in accordance with the number of shares held by each individual. There are about 90 per cent. of the corporate members in the Certificate Holders' Association at present, and it is expected that the other 10 per cent. will be taken in before January 1, 1890.

It is only proper to say, in addition to the forgoing, what was modestly omitted by Mr. King which is that the trade for the property was made personally by Mr. King, and he could have turned the property over at an advance of $30,000 before it was finally accepted by the Exchange. Notwithstanding this fact, Mr. King gave it to the Exchange for just the price at which he bought it, thus forfeiting the handsome profit and virtually contributing $30,000 to the Exchange out of his pocket.

The Philadelphia Trades School.

A desire was expressed at the mid-year meeting of the directors of the National Association for more thorough dissemination of information relating to the methods used in establishing and the workings of the Philadelphia Trade Schools connected with the Master Builders' Exchange of that city.

The prospectus, as published by the Executive Committee in charge of the school, has been given in a previous issue of *The Builders' Exchange*, together with all available information that would be of value to other exchanges undertaking the establishment of a similar institution. In consideration of the fact that it would be impossible to attach too much importance to so completely successful a move in a direction most strongly advocated by the National Association, a digest is here given of the remarks on the subject made in the mid-year meeting by Wm. Harkness, Jr., secretary of the Executive Committee of the trade school.

The first thing that was done after the establishment of the school was decided upon was the selection of a general committee on trade school from the Master Builders' Exchange, which was composed of three members from each of the seven trades in which it was proposed to give instruction. This committee in turn appointed an executive committee from among its members consisting of the chairmen of the different departments, seven in all.

The Executive Committee were given full power to provide all necessary paraphernalia and equipment, and to incur such expense as was deemed expedient.

The prospectus was next formulated; each trade committee having the supervision of the rules and conditions governing their several trades. These separate plans were taken in charge by the Executive Committee, compiled and 5000 printed and distributed throughout Philadelphia and the United States.

The next thing in order was the selection of a superintendent who should have personal charge of the entire school. Advertisements were placed in Philadelphia and New York papers, and the result was a number of replies from which a selection was made, and the applicants notified of desire upon the part of the committee for an interview. After subjecting the applicants to a thorough examination it was decided to employ W. A. H. Allen, of Philadelphia, a retired navy engineer and a man in every way fully capable for the position.

Mr. Allen at once assumed charge of the work in hand and selected his instructors for the different branches of instruction. This action was reported to each of the seven committees, who in turn submitted the reports to the Executive Committee for approval.

During the time that was occupied by the foregoing preliminary work the newspapers had been giving full information to the public of the prospective school, and a great number of applications for admission were received and filed under the various trades in which instruction was desired.

It was decided that pupils should pay an initiation fee of $18 for nine months' instruction, and applicants were accordingly notified.

Finding that the number of pupils would exceed the capacity of the room devoted to the school, it was necessary to divide the pupils into two classes, with general instruction in drawing and similar studies by the superintendent every Wednesday night.

At present there are about 100 pupils in the school. The bricklaying class takes 20; plumbing class, 50; carpentry class, 20; painting class, 10; blacksmithing class, 6; plastering class, 8; stonecutting class, 10. The bricklaying class is full, and other applications on file; the plumbing class is full, with 84 applications on file at the date of the mid-year meeting; the carpentering class is also full and the other trades have several pupils each.

There are a large number of applications received from young men desiring admission, who do not specify any particular trade, and requesting that the committee select a trade for them. This the committee positively refuse to do, and require the pupil to determine for himself what trade he will study.

Upon payment of the fee of $18, which must be paid in full in advance, each pupil is furnished with a card of admission, upon which is printed the dates of each month, and the gate keeper punches out the date of each attendance. In addition, each instructor keeps a record of each pupil and of what he does during each lesson or session.

The bricklaying class are furnished with bricks and mortar, a laborer and two instructors. The pupils are taught to lay bricks in walls, columns, chimneys, arches and such other work as is pertinent to the trade.

As some of the pupils are apprentices seeking better instruction in their chosen trade, and some boys are more advanced than others, it has been found necessary to subdivide the classes into grades, in order that the advanced pupils may not be held in check by the slower ones.

An applicant to be admitted must be between the ages of 16 and 21, and must be able to read and write, and must know something of arithmetic, and preference is given to boys recommended by members of the Master Builders' Exchange. Many young men over 21 years of age have applied for admission, but of course had to be refused.

Instructors are paid an average of $2 per evening of three hours, from 7 until 10 o'clock. The pupils begin work, or study, at 7.30 o'clock and quit at 9.30, thus requiring the attendance of each instructor half an hour before and after each session.

A gong is sounded 15 minutes before quitting time, and pupils are required to clean up all tools, benches, &c., that have been in use.

The same tools are used by classes No. 1 and classes No. 2. Each pupil in each class has a number, and that number is stamped upon a complete set of tools for each trade. Thus, No. 1 pupil in class No. 1 uses the set of tools marked No. 1 on the evening when his class is being instructed, and No. 1 pupil of class No. 2 uses the same set of tools during the instruction of his class.

The pupil has nothing to provide in the shape of tools or implements, as the school is thoroughly equipped with everything that a journeyman workman in any of the trades would need in the course of his work.

All instruction is, at present, given in the evening, but it is the ultimate intention of the projectors of the school to secure more commodious rooms in a building that shall be separate and distinct from the Master Builders' Exchange, to increase the capacity of the school in every way, and to give instruction both day and evening.

It is also the intention to give scientific instruction to all the pupils, on some specified evening, in the shape of lectures by practical men. For instance, a carpenter will be selected by the committee who will give the pupils in carpentry a lecture on Wednesday evening upon scientific subjects relating to their trade. On the next Wednesday evening the same course will be pursued in relation to some one of the other trades taught, and so on over and over.

It is expected that the first term of the school will be somewhat experimental in its nature, as every day develops something new in the way of improvement in methods and facility of instruction.

The great object of the Philadelphia Trade Schools is to produce a more intelligent class of mechanics and to raise the standard of the trades.

It is not the intention of these schools to turn out finished mechanics, but rather to firmly ground all pupils in the fundamental principles and rudiments of the various trades, and to give thorough and practical education both to the hand and brain. It is expected that those who have been pupils in this school will be taken on by master workmen as boys or apprentices until they have acquired sufficient skill and dexterity to perform an equal amount of work with a journeyman.

The school is founded upon the lines suggested by the National Association of Builders, which are practically the same as have proved so successful in Colonel Auchmuty's New York Trade Schools.

Building Trades Club.

The regular quarterly meeting of this club was held Monday evening, November 10, at its cheerful rooms, 20 East Twenty-first street. After the transaction of the usual routine business a collation was served, followed by an exceedingly clever musical and dramatic entertainment, rendered by Bert Andruss and William J. Daly. The assured success of this club, as yet but little over a year in existence, fully demonstrates the wisdom of its originators in providing for the social element in the building interest of this city, a field hitherto sadly neglected. As soon as the Convention of the National Association of Builders has been held the club proposes to secure more capacious and permanent accommodation for the constantly increasing membership.

Mechanics' and Traders' Exchange.

We are very glad to see that the New York Exchange is moving on the matter of possessing its own "home," as shown by the adoption of the following preamble and resolution at its last meeting:

Whereas, The need of a better and more permanent exchange accommodation seems so apparent that some consideration should certainly be given to the subject; therefore be it

Resolved, That the president be requested to appoint a committee of ten members, consisting of representatives of the several trades as far as possible, which shall be charged with the duty of careful investigating the matter of an exchange building in all its phases as to location, cost of site, character of building and every other involvement, including the most

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feasible plan for creating the necessary fund and its custodian.

Resolved, The said committee shall possess the power of adding to its number any member of the exchange, but it shall contract no debts nor expend any money without first having obtained the consent of the exchange and a specified appropriation for the same.

The president appointed as the committee the following:

John J. Tucker,	Geo. Moore Smith,
William C. Smith,	Benj. A. Williams.
Marc Eidlitz,	Augustus Meyers,
James B. Mulry,	John Byrns.
John McGlensey,	Stephen M. Wright.

We shall look forward with considerable interest to the result of this movement and earnestly wish it every success possible.

Mr. Sayward's Tour.

Secretary W. H. Sayward, of the National Association of Builders, was in the city this morning and made an address before the Builders' Exchange, says the Cincinnati *Times-Star* of November 19. To a reporter at the Burnet House he said:

I have been on a missionary tour among the building associations of the country. It is the regular yearly round. I will have visited 20 builders' exchanges when I complete my rounds. There have been exchanges organized in San Francisco, San Diego, Atlanta, Memphis and Peoria since our last convention. I found the building business a little dull in some places that had been overdeveloped—St. Paul, Minneapolis and Kansas City, for instance. But in the majority of cities visited there is a good demand for labor and fair prices. Our next convention will be in New York, in February next, in the Masonic Temple, and it will undoubtedly be the largest and most important of any yet held, and I will predict that over 1000 people will be there, not as delegates, but those interested in the great building and economic questions. Yes, arbitration; that will be the great question before the convention, the ameliorating of the friction between the workingman and the employer.

TRADE NOTES.

THE CENTRAL EXPANDED METAL COMPANY, of Pittsburgh, are meeting with a large demand for their Expanded Metal Lathing and Fencing, the demand for the lath being particularly heavy. At present they have enough orders on hand to keep them fully employed for some time to come. They have just received a large order from the Government for the lathing to be used in the construction of the building to be used as headquarters of the United States Military Academy at West Point, N. Y. In this connection we desire to refer to the new use being made of expanded metal lath for outside finish, which is coming into favor in different localities. The method pursued is that of covering a studded wall on the outside with expanded metal lath instead of weather boarding. The lath is then covered with Portland cement in imitation of stone. It is stated that a house built in this way will cost but little more than a good weather boarded one, and one-third less than a stone wall, while the advantages are much in favor of this construction in point of comfort, the claim being that the house will be warmer in winter and cooler in summer, and free from dampness, very important qualities for a residence.

IN A LETTER RECENTLY RECEIVED from the Gage Tool Company, Vineland, N. J., the fact is mentioned that in going into their storehouse recently they were much surprised to find that rats had been at work upon their plane stocks, which had been previously saturated with linseed oil. In some cases the rats had gnawed away as much as 1 inch from the corners of the plane stocks, and, as this is something which has never before occurred in the experience of the company, it may be interesting to others to know that rats are fond of plane stocks saturated with linseed oil.

C. E. JENNINGS & Co, 79 Reade street and 97 Chambers street, New York City, show in their advertising space this month a number of specialties of interest to the carpenter and builder. The line includes Cleavers and Choppers, Triple Stock Ivory Rules, Box Scrapers, Combination Boxwood Rules, Bung or Tap Borers and Tool Chests. The statement is made that all tools bearing the company's name are fully guaranteed and may be obtained through the hardware trade generally.

THE FLEMING DOOR HANGER COMPANY, of Kansas City, Mo., for whom F. M. Pirsson & Co., of 1251 Broadway, New York, are agents, showed by means of a full sized working model the practical application of the Fleming Single Track Parlor Door Hanger at the American Institute Fair, recently held in this city. This hanger involves the use of a single track, does not require an expert to put it up, and is claimed to be of such construction as not to get out of order. The track is simply fastened to the main partition, and is noiseless in operation.

WE HAVE RECEIVED from the Backus Portable Steam Heater Company, with office and factory at Twenty-third and Filbert streets, Philadelphia, and New York office at 347 Fifth avenue, a copy of a catalogue in which is fully illustrated and described the Backus Patent Heater, claimed to possess all the cheerfulness of the open grate, and which can be put either in the ordinary fireplace or in any position in the room. It is of portable form, has an open front and a reflecting steam radiator. Gas or oil can be used as a fuel, thus permitting the fire to be instantly lighted. The pamphlet also contains full information and directions for operating this heater, and prices are given, covering the various styles and sizes in which it may be furnished.

AT THE AMERICAN INSTITUTE FAIR, recently held in this city, Holdsworth & Co., 771 Grand street, Brooklyn, N. Y., exhibited the Holdsworth Patent Combination Gate, Window Screen, Hanging Hack and Sign. The construction of this device is such, the makers state, that it is always in place and does not require to be taken off every morning, as it can be readily raised to a position in which it will prove both useful and ornamental.

E. T. BARNUM, Detroit, Mich., manufacturer of Ornamental Wire Work and Iron Work, issues a catalogue devoted to the Bostwick Folding Steel Gate made by him. It is stated that the want of an outside guard to doors, windows, vestibules, elevator entrances, stables, &c., which would be a safeguard while in use, that could be removed with ease, without the trouble of unhinging and stowing away, has long been felt. Numerous experiments have resulted in the Bostwick Folding and Extension Gates. These Gates and Guards are made of rolled refined channel steel, but for particularly fine work can be made of brass or bronze, and can be nickel plated or electro bronzed upon steel. The point is made that a gate 10 feet in width can be folded in the space of 15 inches, and turned aside out of the way, and may be operated as easily as an ordinary swing door. The ornamentation on the top of these gates is of various designs; for opera houses, theaters, &c., may be made with tramway, without stiffening bar or track.

THE ALLEN LUMBER COMPANY, of Mount Morris, N. Y., favor us with a little pamphlet relating to their business. The statement is made that they have been engaged in the retail lumber trade at their present location for 26 years, and that with cheap water power, excellent railroad facilities, complete modern plant and large stock they are able to promptly meet the demands of their trade. A number of pages in the pamphlet are devoted to an explanation of the company's policy of extending short terms of credit, which will be read with no little interest by those into whose hands a copy may come.

WE ARE INDEBTED to the Builders' Exchange of Worcester, Mass., for a copy of their 1890 hand book. It is a substantial volume of 140 pages, containing the addresses of delegates at the last convention, list of members of the exchange, by-laws of the exchange, city ordinance relating to buildings in Worcester, lien law in the State of Massachusetts, list of officers of the Worcester Exchange, list of officers of the National Association of Builders, with various other matters of interest to local builders and a large number of advertisements.

"THE SECRET OF SUCCESSFUL BAND SAWING" is the suggestive title of an interesting pamphlet distributed by Goodell & Waters, of Philadelphia, Pa. It is neatly printed on good paper, profusely illustrated, and is bound in colored paper covers. The information set forth is in the nature of a conversation between a salesman and a sawyer, the illustrations showing the various stages, from the attempt on the part of the salesman to get the sawyer to use the Mohawk Dutchman Band Saw Guide to that in which is pictured the satisfaction resulting from its use. A number of pages are devoted to testimonials and directions for ordering. The pamphlet is neatly gotten up and is likely to prove interesting to all users of band saws.

THE DETROIT HEATING AND LIGHTING COMPANY, Detroit, Mich., have recently secured one of the largest hot water contracts of the season at Columbus, Ohio. It calls for the heating of St. Anthony's Hospital of the Sisters of the Poor, in the city named, and requires about 15,000 feet of radiation. In connection with this work, the company state that the new extra large Bolton heaters, adapted for this kind of work, will be employed for the first time.

JAMES B. SCOTT & Co., of Pittsburgh, Pa., have issued a circular calling attention to the brands of roofing plates which they keep constantly in stock. Reference is made to some of the more important buildings throughout the country in connection with which Scott's Extra Coated Plates have been used, while the statement is made that each sheet is stamped, squared and guaranteed. The names of a number of brands of plates are given, and reference is made to some of their characteristics. In addition to the list given, the firm state that they import a number of makers' brands, a few of which are enumerated in the circular.

THE JOSEPH DIXON CRUCIBLE COMPANY, of Jersey City, N. J., are distributing an announcement relating to Dixon's Silica-Graphite Paint, which they manufacture. It is stated that the Pennsylvania Railroad Company are erecting at Jersey City an elevated structure over one mile long and four tracks wide, the iron work of which is being painted with Dixon's Silica-Graphite Paint. The work is progressing rapidly, and the superintendent of painting states that while at first he was very much opposed to the use of Graphite Paint, he now finds that it is easily laid on, with a covering power superior to that of white lead and other mineral paints. The manufacturers refer to the paint as having been on the market for some years, and to the fact that there are tin roofs in Trenton, N. J., that have been coated with the paint for 15 years without repainting.

THE BLOUNT MFG. COMPANY, for whom E. J. Hussey & Co., 28 Cliff street, New York, are sole agents, exhibited at the American Institute Fair, recently closed in this city, the Blount Patent Door Check. In this device, which operates noiselessly and is always positive in action, the checking power is controlled by a regulating screw on the side of the cylinder, which can be quickly adjusted so as to close the door at any speed desired, rendering the slamming of doors practically impossible. The device is provided with a patent automatic temperature adjustment, is free from packing friction, and is provided with arms connected by a ball joint, claimed to prevent the check from binding in case the door sags or swings out of line.

ISAAC A. SHEPPARD & Co., of Philadelphia, Pa., have issued a little pamphlet of 24 pages, bound in stiff board covers, entitled "Instructions for Setting Excelsior Ranges." It is intended for distribution among architects, builders, bricklayers and those engaged in allied industries. Full and explicit directions for setting the Excelsior goods are contained, and the various points touched upon are treated in such a manner as cannot fail to be understood by the builder. On the inside page of the front cover is a pocket containing a chart, printed on bond paper, showing, by means of sectional engravings, the flue construction, &c. This chart will be found especially convenient for use, as being separate from the book, it can be taken by the bricklayer and readily consulted while the work of constructing the flues is in progress. We understand that this chart has been copyrighted by the company.

WILLIAM WILLER, Milwaukee, Wis., directs attention in another part of this issue to Willer's Patent Sliding Blinds, which are claimed to use absolutely balanced slats and do without the stick so generally employed to move them. The blinds are made in two, three, four or more sections, to run between guideways placed at the sides of windows, and may be made to uncover the entire opening by running into top or bottom pockets, or both, and to the floor in front of the panel back. Each section is held in place by adjustable friction block springs, so arranged as to secure free and easy motion. The manufacturer says these blinds are giving universal satisfaction, and that the demand for them is constantly increasing.

THE NORTHWEST BUILDER PUBLISHING COMPANY, St. Paul, Minn., announce a competition in residences, offering premiums to the value of $125. The competition will be conducted under five heads, the first involving residences costing $4000 or less, while the fifth covers residences regardless of cost. A premium of $25 will be awarded in each class for the photograph of residence taking the highest rank in exterior architectural merit. The company have issued a circular setting forth the conditions under which the competition will be conducted.

JAMES B. SCOTT & Co., Pittsburgh, Pa., present in their advertising space this month a letter from James Hunter & Co., in which flattering reference is made to Scott's Extra Coated Roofing Plates, which have been used on a large number of buildings in Cincinnati. The most prominent of these structures was the Grand Central Depot, which called for a large number of squares. Another letter is also presented from H. K. Read, in which it is stated that a large amount of Scott's Extra Coated Tin was used on the extension of the train sheds of the Central Union Depot Railway Company, of Cincinnati.

WE HAVE RECEIVED from the Technical Society of the Pacific Coast a copy of Volume VII of their Transactions. The headquarters of the society are located at San Francisco, and the Transactions are edited by the secretary of the society, under the direction of the Executive Committee. The volume before us contains a paper by Prof. Irving Stringham on "Napier's Definition of a Logarithm and Its Consequences," as well as a paper by P. J. Flynn on the "Flow of Water in Open Channels, with Tables Based on Kutter's Formula." The minutes of the meetings of the society held on May 2, June 6 and July 9 are also included.

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