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THE form of swindle which consists in building on mortgage loans, leaving the mechanics and material-men unpaid, and then cutting them off by foreclosing the mortgage, is spreading very rapidly in this country, to the injury, not only of the people who are robbed of their money and labor in this way, but of the community, which suffers seriously by the multiplication of badly built, badly located and unsalable houses, erected solely for the sake of securing the mortgage money. The method of conducting the swindle is simple. A lot of land is procured, and, if the seller of the land is prudent, is usually paid for. Preparations are then made for improving the land by building upon it, and it is characteristic of the schemers who practise such operations that they are disposed to crowd the lot unduly with houses, for the obvious reason that, as they have to pay cash for the land, and do not intend to pay for the buildings, while the mortgage loan will cover both, it is for their interest to make the value of the buildings large in proportion to that of the land. The next step is to arrange for a building-loan, under which some bank, or private lender, who is often in collusion with the speculator, agrees to take a first mortgage, covering a reasonable percentage of the total value of the land and the completed buildings, with the stipulation that money shall be advanced under the mortgage only by instalments, as the building-operations proceed, and the security for the loan is thereby increased. The mortgage loan being secured, estimates are invited, and contracts made, for the houses, and men are set at work on the improvements. Generally, the contracts are made on an extensive scale, and many men employed, so that as much work can be secured from them as possible, before they become suspicious and clamor too pressingly for their money. Often, the first payments on the contracts, which are generally small in amount, are made promptly, since one example of this sort goes far to inspire confidence; but the subsequent ones are delayed, on one pretext or another, the speculator using his judgment in doling out small sums to the more pressing contractors, so as to secure the main object, that of getting the building completed with the expenditure of the smallest possible proportion of cash, and the largest of notes and promises. If all goes well, the buildings are finished, the speculator receives the last instalment of the mortgage loan, which he promptly invests in his wife's name, or puts in some other way out of reach of his creditors, and commences a similar operation in a place where he is not known, abandoning the houses which he has just built to the mortgagee, who, finding that no interest is paid on the mortgage, forecloses and takes possession. Meanwhile, the contractors who built the houses discover that the mortgagee's claim is prior to theirs, and that, unless they buy at the foreclosure sale, they have no chance of getting back any of their money. In some cases, the contractors combine, and appoint a trustee, who buys the property at foreclosure, and manages it in the interest of the creditors; but to do this, the creditors must raise money enough to pay off the mortgage, and, as the property, particularly where the swindle is practised outside of the great cities, is apt to be unsalable and unrentable, and mortgaged for nearly or quite its real value, even this resource is unavailable, and the contractors must make a large charge to their profit-and-loss account, to be recouped later by making extra profits out of honest men, who, in the end, always have to pay the debts of the dishonest ones.

THE worst thing about this sort of rascality is that it is almost impossible, in the present state of the law, to guard against it, or to punish any one for practising it. There is no law to prevent a man from mortgaging his land for any sum that he can borrow upon it, and a first mortgage takes precedence of subsequent liens and attachments; so that the mortgagee is safe, while the speculator needs only to appear in court and take the poor debtor's oath to be absolved from all claims upon him. A declared or obvious purpose to deceive and swindle would give ground for a criminal action, but it would rarely be possible to prove this against a speculator of ordinary prudence. Of course, an effectual and logical check would be found in the prohibition of agreements under which a man can incorporate, under a first mortgage on land, loans made on the security of buildings attached to that land, and built, on credit given by other people, before the loans are made, but a prohibition of this kind would prevent an enormous amount of honest building, and it would be impossible to distinguish between the honest and dishonest operators.

THE Public Art League of the United States appeals for the coöperation of all citizens interested in the subject in its endeavors to improve the character of Government fine-arts. Although the League already has about five hundred members, this is far too small a number to carry with it the weight necessary for exerting much influence upon Congress, and the purpose for which the League was established, which has, unquestionably, the sympathy of nearly every intelligent person in the United States, must be promoted, if any great good is to be accomplished, by important accessions to its membership. The membership-fee, of a dollar a year, is hardly sufficient to cover the cost of printing and postage-stamps, and the officers and directors of the League, some of whom have done a great deal of hard work in behalf of its objects, ask only that they may be supported in their efforts by the public whose views they believe that they represent, and whose support is necessary, if those views are to be impressed upon the Government. A bill has been prepared, in consultation with persons experienced in legislation, and is ready to be urged upon the attention of members of Congress, and every name that can be added to the list of those who have declared themselves in favor of the objects of the League, particularly if the names are those of persons known to Senators or Representatives, will count as so much influence toward securing them.

A LITTLE reflection is necessary to enable us to appreciate fully the importance of the movement begun by the Public Art League in the general development of American art. Every one will admit that, at present, the skill of American artists is in advance of the appreciation of the American public, and nothing tends more to hamper and discourage the men of talent who have brought honor upon the American name in the great foreign schools of art than the consciousness that, in their own country, amid the scenes which would afford them their purest and most fruitful inspiration, their work would be exposed without defence to the ridiculous misapprehensions, and the still more ridiculous and foolish newspaper laudations, which would surely await it. In any foreign country, the artist of real merit has an unfailing comfort in at least the prospect of Government appreciation. A French painter, one of whose pictures has been purchased for the Luxembourg, or who has been employed to decorate a room in the Elysée, or the Paris Hôtel-de-Ville, is sure of immortality, and every French painter is encouraged, to the end of his life, by the hope that such good fortune may befall him; while the purchase of a picture or statue by the American Government indicates solely political influence on the part of its author, or the possession of attractive curls, or some other qualifications, to which none but barbarians would attach the slightest importance in such matters. It is certainly time that the Government of a nation of seventy-two millions of the most refined, sympathetic and intellectual people in the world should cease to take this view of the public fine-arts, and should think seriously and conscientiously of the enormous influence which official commendation, founded on the judgment of experts of the highest authority, would have in encouraging the practice of art, and the appreciation of beauty, moral, intellectual and material, for which, we might almost say, the American people is starving, and which would do more than anything else to promote popular contentment and peace. It is true that the United States Government is busy about more practical matters, and has no Luxembourg Palace to fill with contemporary pictures, but it spends, after all, a good deal of money in the course of every year on objects of art, and it is just as easy for the Government, and just as cheap, to have these objects the best that American art can produce, and, in their acquisition, to encourage and stimulate American artists everywhere, as it is to go through, at short intervals, with the process of having the members of Congress besieged by constituents who want "jobs" of painting or carving for their heelers, and, after the award, whatever it may be, to endure a storm of newspaper abuse because some other decision was not made. The plan suggested by the Public Art League, of putting the responsibility for the award entirely upon an expert commission, where it is put by all other civilized nations, cuts off such criticism, for, whatever dissatisfaction may be felt by a few individuals, the public always acquiesces cheerfully in the decision of recognized experts in matters relating to their own profession, while one approval by such a jury would do more to encourage American art and artists than any number of favorable committee reports, or votes in Congress, based only on personal or political predilections.

WE do not mean to assert that the business depression has borne more hardly on architects and draughtsmen than upon other classes, but when we consider the list of those who have become involved beyond the hope of prompt recovery, those who have felt forced to take their own lives, and those who have even yielded to the temptation to commit such "irregularities" as have brought them within the reach of the law, we doubt if there be any class of men which has suffered more. Besides this, the mortality amongst architects seems to be abnormal and we cannot help feeling that it indicates that the vital powers of resistance have been unnaturally lowered by the long strain and anxiety to which all professional men whose income is dependent on sporadic commissions have been subjected. During the last week, two more architects were added to the lengthening roll of the departed, Mr. W. H. Dabney, of Boston, and Mr. W. S. Fraser, of Pittsburgh. Mr. Dabney, born in the Azores, April 8, 1855, died April 29, leaving as the buildings with which his name will be most often associated, the Warren Chambers and the Trinity Court buildings, Boston, constructed while in partnership with Mr. H. B. Ball. Mr. Fraser, born in Ohio, July 19, 1852, died at Pittsburgh, April 27, after an active career of eighteen years in that city. The son of a contractor, he at the age of seventeen began his professional training in the offices of various New York architects, pursuing certain courses of study at the Cooper Institute during the same time. After five years spent in this way, he went to England and became a pupil of William Burges, studying likewise at the Royal Academy Architectural School, and spending the vacation time on the Continent, sketching and measuring. Those who recall the designs executed by Mr. Fraser in after life, and published in this journal — his design for the Carnegie Library at Allegheny, and the design for the Cathedral of St. John the Divine, in New York, for instance — will appreciate how thoroughly he was imbued with Burges's love for thirteenth-century Gothic, and how skilfully he modified it to meet the conditions of our time and civilization. Sad as it is to have men taken away in their prime, it is a relief that so few are called on to meet death in the horrible form encountered by Mr. S. M. Patton, who was practically burned in his bed, for, though the Chattanooga building which was burned early one morning last month was an office-building, Mr. Patton and some others had chambers in the upper story, and he and one other occupant lost their lives.

EVER since the subway-stations began to sprout in an erratic manner through the soil of the Tremont Street mall of Boston Common, a portion of the unsuspicious and unsuspecting public have watched their development with great apprehension. The presence of so many stations, which cut off a view of the Common by reason of the unneeded amount of head-room incorporated in the design of these structures, already convinces observers that the park-side air, so to call it, of the Tremont Street mall has been lost forever. This being so, the authorities ought to accept that fact and make a radical departure from past methods, and do all that the ingenuity of the architect and landscape-architect can accomplish to convert this strip of the Common into a species of formal esplanade, which, by its treatment, shall knit together the several station buildings — to which the present threatened treatment promises to give only the air of public comfort stations — and by the proper and temperate use of balustrades, platforms, steps, fountains, exedras, benches and what not, together with enough trees to break the glare of sunlight, make of this portion of the Common a feature to mark the manners and customs of this day as the Frog Pond, in a measure, marks those of earlier ones. The sketch which is published elsewhere in this issue shows that the architects expected that their stations would form parts of some proper formal treatment, and not be left as monuments of the unconcern with which engineers treat all matters of "mere looks."

MANY people will be interested to know that the School of Fine-Arts in Paris has been opened to women. According to the new law, girls and women, between the ages of fifteen and thirty, who present themselves at the office of the School, with a letter from some artist known to the authorities, certifying that they are probably qualified to pass successfully the examinations for admission, will, for the present, be allowed to work in the galleries and library of the School, to attend the oral lectures, and take courses in drawing and modelling. These courses, in general, are open only to pupils who pass an entrance examination, but this examination will, for the present, be waived in the case of women. As soon, however, as the number applying is sufficient to fill the class-rooms, the selection of pupils by examination is to be rigorously applied; and the Director of Fine-Arts gives warning that the measures which render the School accessible to women must not result in the lowering of the standard of attainment, or in opening too easily the entrance to a career in which earnestness and assiduity are not alone sufficient to insure success. "The State," as he says, "in placing within the reach of women artists the means of instruction which it can furnish, intends to do so as a matter of justice, but it does not wish to assume the responsibility of giving false encouragement, and it considers it necessary to refuse entrance to the School to all women whose preliminary instruction may be judged inadequate, or who, after their admission, do not give proof of constant progress."

THE telegraph brings the news that Mr. Aiken, the Supervising Architect of the Treasury Department, has resigned his post, at the request of the Secretary of the Treasury. Who will succeed him seems uncertain, since there are known to be fifteen or twenty applicants for the position, each asserting that he has a "backing" strong enough to secure the place. If Mr. Aiken's retirement has been occasioned by indirect compulsion proceeding from Mr. McKinley himself, doubtless an attempt will be made to give the position as a reward to some political worker, in spite of civil service requirements. If, on the other hand, the enforced retirement is due to Mr. Gage's initiative, we are fairly positive that the new appointment will be made after a civil service examination before a board of experts of standing thoroughly acceptable not only to the public but to the profession. Of Mr. Aiken, the retiring incumbent, architects will speak only with praise. Whatever might have been his other qualifications for an office which demands tact and discretion, as much, perhaps, as professional skill, it can be truly said that he brought to it high training and perfect integrity, and that he labored earnestly and successfully to make the Government building-work a creditable feature in the artistic development of the country.

## STATICS OF STRUCTURES. — THEORETICAL AND APPLIED.[1] — V.

BEAMS VARIOUSLY LOADED. — PRACTICAL APPLICATION OF III AND IV.

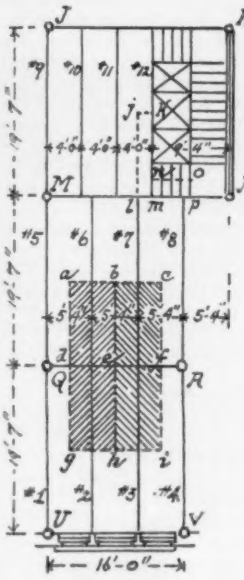



Fig. 40.

96. NOW let us take up again the floor-framing of our twelve-story office-building (§ 33, Fig. 11[2]), which we left after having decided to use, as beams, 12" — 35 lbs. I's, spaced 5' 4" on centres (§ 54).

With this arrangement most of the girders are called upon to carry four beams. We shall take one of them, for instance $QR$ (Fig. 40), and determine its size according to the methods described in Article III.

97. $QR$ carries two concentrated loads, one at $j$, and the other at $k$. The load at $j$ is made up of the reactions of beams Nos. 6 and 2. The reaction due to beam No. 6 is equal to half the floor-area carried by that beam, or $abde$, multiplied by the total load per square foot, which we assumed at 200 pounds (§ 37). This gives 5.33' x 9.79" $\times$ 200 lbs., or 10,438 pounds. Similarly, the reaction due to beam No. 2 is equal to $gdeh$ $\times$ 200 lbs., or, again, 10,438 pounds. The total load at $j$ is, therefore, twice 10,438, or 20,876 pounds. Of course, under ordinary circumstances, instead of taking the two areas $abde$ and $degh$ separately, one would take the whole area $abgh$ at once; just now, however, our object is to clearly understand how the loads are constituted.

Next, we ascertain that the load at $k$ is proportional to the area $bchi$, which, evidently, again makes 20,876 pounds.

98. This gives us a beam $QR$, of 16 feet span, with two concentrated loads of 20,876 pounds, each acting 5.33 feet from either support (Fig. 41). We are familiar with two methods of finding the bending-moment of such a beam — the graphic and the analytic. Since it appears to be a very simple case of symmetrical loading we shall choose the latter, and proceed to apply Equation 16, (§ 72):

$$M_C = P_1 a;$$

in which $P_1$ is one of the two equal loads, and $M_C$ the maximum bending-moment in inch-pounds, if $a$ is taken in inches. Inserting our present values in this equation, we get

$$M_C = 20{,}876 \times 5.33 \times 12 = 1{,}335{,}228.9 \text{ inch-lbs.}$$

Dividing this by the safe stress, 16,000 pounds per square inch (§ 37), we get as the required moment-of-resistance 83.45".

99. Turning to our Table of Beams (§ 44) we find that the moment which comes closest to this is that of the 18" — 55 lbs. I, *i. e.* 88.4"; still, it is a good deal more than what is required. Therefore, before deciding to use this beam, let us try to solve the problem in some other way.

Thus, if we were to make the girder of two beams, instead of one, each would require a moment-of-resistance of one-half of 83.45" or 41.72".

The nearest to this, in our list, is a 12" — 35 lbs. I, with a moment-of-resistance of 38.0". The Carnegie Company rolls, however, a number of special beams which we did not include in the list for want of space. Among them is a 12" — 40 lbs. I, with a moment of 44.8". Placing two of these together would give a total moment of 89.6"; again more than necessary. The 18" girder weighs 55 pounds per foot; the 12" girder, 80 pounds, or 25 pounds more per foot. The latter is, therefore, hardly an improvement over the former as far as economy of material goes; the one advantage which its use offers being a level ceiling, which, in many cases, is very desirable. We can readily ascertain how much more it would cost to use the 12" girders by finding the total difference in weight between them and the 18" beams.

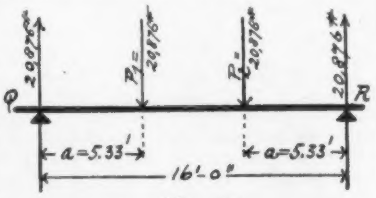



Fig. 41.

100. Since we are going to have six of these girders in a floor, each 16' long, the difference for one floor would be 6 $\times$ 16 $\times$ 25 lbs. or 2,400 pounds. Assuming the cost of this kind of iron-work at 2¾ cents per pound, 2,400 pounds would amount to $66; and for the whole building, or twelve floors, 12 times $66, or $792. This method of comparison ought to be applied in all cases in which the problem is capable of two or more solutions, to ascertain which of them is the most economical.

[1] Continued from No. 1110, page 5.
[2] Article II, No. 1095, page 95.

In the present case we make up our minds that the level ceilings are not worth an extra $792, and, therefore, decide to use the 18" girders, which are not so bad after all, as they come over partitions in most of the cases. The above calculation will apply to girders $EF$, $IJ$, $LM$, $PQ$, $QR$, and $RS$.

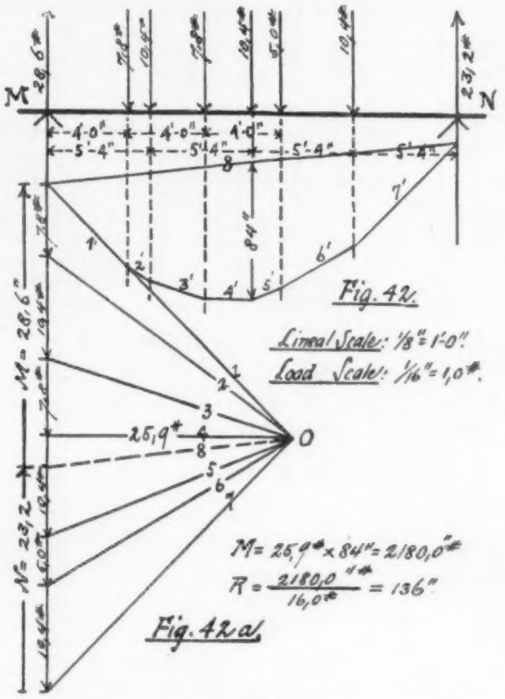



Fig. 42.

Fig. 42 a.

101. Next let us take up girder $MN$. Its loads are the reactions of the beams Nos. 6, 7, 8, each of which is again equal to 5.33' $\times$ 9.79' $\times$ 200 lbs., or 10,438 pounds; further, those of beams Nos. 10 and 11, each equal to 4' $\times$ 9.79' $\times$ 200 lbs., or 7,832 pounds; and finally, that of beam No. 12. The reaction due to this beam is made up of, first, the floor area $jklm$, 2' $\times$ 9.79' $\times$ 200 lbs., or 3,916 pounds, and the stair-area $nomp$, 2' $\times$ 4' or 8 square feet. The weight of the stairs must now be ascertained, which can be done very closely by computing the cubic contents of the different materials and parts composing them, as for instance, the treads, risers, rails, etc. This multiplied by the weights of the materials per cubic foot (which can be found in a number of hand books) will give the total weight. This, again, divided by the superficial area will give the weight per square foot.

Estimating the weight of structures or parts thereof seems to many to be one of the most mysterious branches of engineering; and yet nothing simpler could be imagined. It is done fundamentally by ascertaining the cubic contents of the different materials and then multiplying by the weight per cubic foot. Here are the average weights of the most important building materials, with which the reader ought to be thoroughly familiar:

TABLE IV.

AVERAGE WEIGHT OF MATERIALS PER CUBIC FOOT.

| | | | |
|---|---|---|---|
| Cement | 80 lbs. | Masonry, Stone.. | 160 lbs. |
| Cinder Filling | 60 " | Mortar | 100 " |
| Concrete | 150 " | Oak | 50 " |
| Brickwork | 120 " | Pine | 30 " |
| Brick, Hollow | 70 " | Plaster | 96 " |
| Copper | 540 " | Spruce | 25 " |
| Earth | 100 " | Stone | 160 " |
| Glass | 160 " | Sand | 100 " |
| Iron, Cast.. | 450 " | Steel | 490 " |
| Iron, Wrought | 480 " | Water | 62½ " |

"End" Construction Flat Arches, per square foot: 8" arch, 27 lbs.; 9", 29 lbs.; 10", 33 lbs. "Side" Construction Flat Arch: 6", 27 lbs.; 8", 32 lbs.; 10", 39 lbs. Porous Terra-cotta Blocks: 2" thick, 12 lbs.; 3", 15 lbs.; 4", 19 lbs.; 6", 23 lbs.; 8", 33 lbs.

102. We shall assume our stairs as weighing 35 pounds per square foot, which, plus the 100 pounds live-load, would make a total load of 135 pounds. The weight of the area $nomp$ would, therefore, be 8 $\times$ 135 lbs., or 1,080 pounds, and the total reaction of beam No. 12, consequently, 3,916 lbs. plus 1,080 lbs., or 4,996 pounds.

We now know all the loads on the girder $MN$. Since they are quite numerous and unsymmetrically applied, we shall make use of the graphical method (§ 64) in determining the required moment-of-resistance. Accordingly, let us draw the girder with its loads, using a *lineal scale* of ⅛" to the foot, and a *load-scale* of $\frac{1}{16}$" to 1,000 pounds (Fig. 42).

103. The loads we write down in *thousands* of pounds; thus, in place of 10.438 we write 10,4; in place of 4,996. — 5.0; and so forth. This dropping of the last two figures simplifies matters very much, facilitates calculating and does not make an appreciable difference in the final result.

After drawing the load-line we could select a pole *O at random* (§ 64), but prefer to locate it by drawing the two outside rays 1 and 7 with the 45° triangle. The advantage of this is that the cord-polygon sides 1′ and 7′ can now be drawn directly with the 45° triangle and that the pole distance is equal to one-half of the sum of all the loads. In Figure 42 the cord-polygon was begun with the

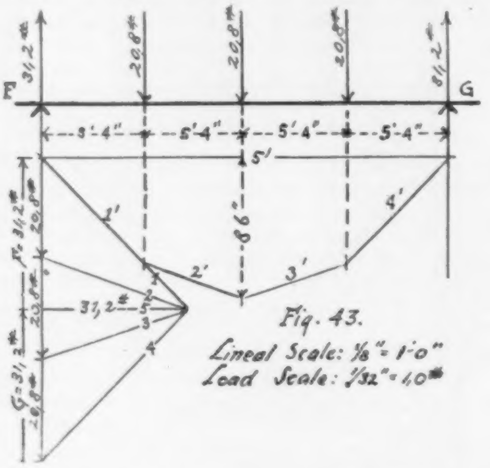



Fig. 43.
Lineal Scale: 1/8″ = 1′-0″
Load Scale: 1/32″ = 4,0#

side 2′, making part of the ray 1 act as the side 1′, to further shorten the operation. After completing the cord-polygon by drawing the closing-side 8′, we find that the longest ordinate through the diagram — that under the middle load 10,4 lbs. — scales 7′ or 84″. Our pole-distance scales about 26,0 pounds. We know it to be, however, by construction, one-half of 51,8 pounds, the sum of the loads, or 25,9 pounds.

Our maximum bending-moment, therefore, is 25,9 lbs. × 84″, or 2180,0 inch-lbs. (§64, 68). Allowing a safe extreme fibre stress of 16,0 pounds, the required moment-of-resistance would be 2180,0 ÷ 16,0 = 136″. This calls for a 20″ — 80 lbs. I, having a moment of 146.7″; or, if two beams were to be used, for two 15″ — 55 lbs. I's, the combined moments of which would be 2 × 68.1″, or 136.2″. Since the two 15″ beams would together weigh 110 pounds, or 30 pounds more per foot than the 20″ beam, and, further, since there will be no particular harm done in having the girder project down from the ceiling in the corridor, that projection being susceptible of architectural treatment, we shall decide to adopt the 20″ girder.

The same size will do for *J K*, the span and loading of which is identical with that of *M N*.

104. Proceeding, we come to girder *F G*. Its span is 21′ 4″, and it carries six beams, three on each side, spaced 5′ 4″ on centres, each 19′ 7″ long, similar to beams Nos. 6, 7 and 8 framing into girder *M N* from the south. This again results in three concentrated loads of 19.58′ × 5.33′ × 200 lbs., or 20,876 pounds each. Drawing a cord-polygon as before, we find the maximum bending-moment to be 31,2 lbs. × 86″ or 2680,0 inch-pounds. This requires a moment-of-resistance of 167.5″, so that a 24″ — 80 lbs. I will answer the purpose.

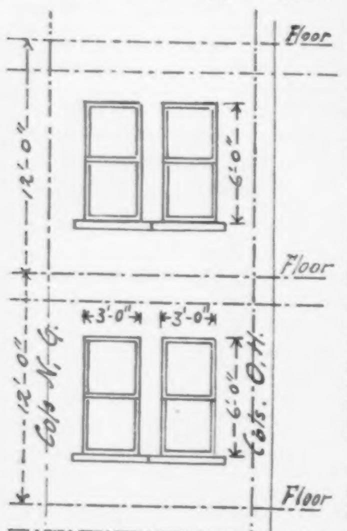



Fig. 44.

105. Girders *T U, U V, V W;* and *A B, B C, C D,* each carry one-half the load supported by the girder *Q R.* Since the latter required an *R* of 83.45″, each of the above will require one of 41.7″. 15″ — 40 lbs. channels, with a moment of 46.3″, will, therefore, do very well, because they make a good joint with the brickwork.

106. The only girders that now remain to be calculated are those supporting the curtain-walls of the light-court, or *H G, G K, K N* and *N O.* The remaining walls are intended to be made self-supporting.

Let us first consider girder *N O*. Its span is 10′ 8″ or 128″; one beam, 19′ 7″ long, frames into it at the centre, thus giving a single concentrated load of 10,4 pounds. The bending-moment for this case is best found by applying Equation 19, § 74:

$$M = \frac{P\,l}{4}.$$

Inserting values, we get

$$M_{\mathrm{con}} = \frac{10{,}4 \times 128}{4} = 332{,}8\,;$$

$$\text{and } R_{\mathrm{con}} = \frac{332{,}8}{16{,}0} = 20.8''.$$

This is the moment-of-resistance required by the floor-load; to this must be added that required by the wall supported by the girder. Suppose the elevation of this side of the court to be as indicated in Figure 44, and that the wall at this level happens to be 16″ thick. For such a thickness the New York Building Law permits of the wall being supported at every *other* floor only; according to that arrangement, and assuming the stories to be 12′ from floor to floor, our girder would have to carry a wall 24′ high by 10′ 8″ wide, less the window-openings, which are each 3′ × 6′. If we assume the weight of brickwork at 120 pounds per cubic foot, a wall 16″ thick will weigh 160 pounds per square foot superficial area. (For a square foot 1″ thick would weigh $\frac{1}{12}$ of 120 lbs., or 10 pounds, and one 16″ thick, 16 times 10 or 160 pounds; one 24″ thick, 240 pounds; in short, a cipher added to the thickness will give the weight per square foot.) The weight of the wall on our girder will, therefore, be

$$[\,(24 \times 10.66) - (4 \times 6 \times 3)\,]\;160 = 29{,}440 \text{ pounds.}$$

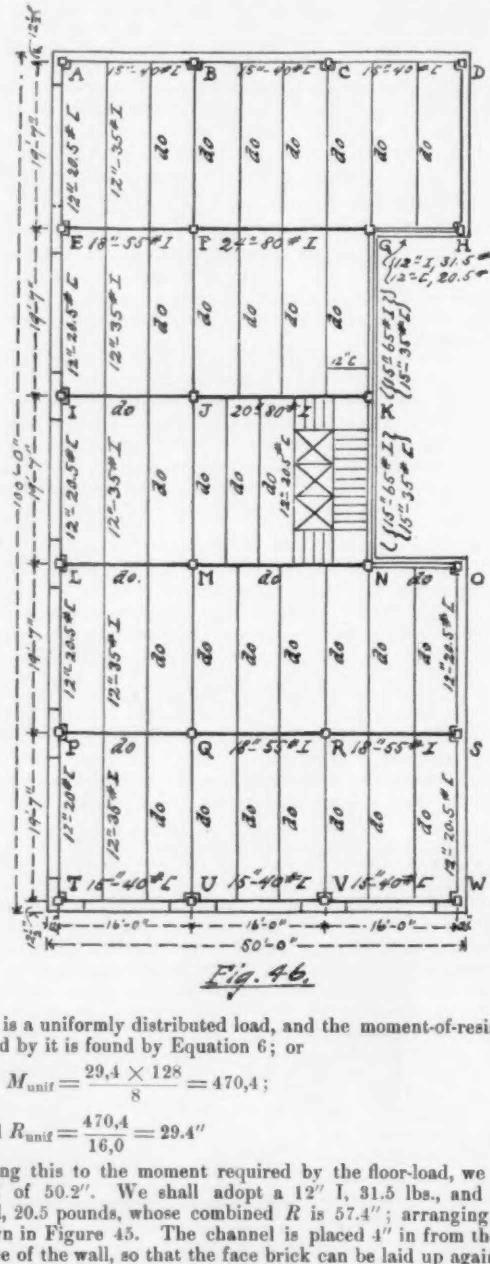



Fig. 46.

This is a uniformly distributed load, and the moment-of-resistance required by it is found by Equation 6; or

$$M_{\mathrm{unif}} = \frac{29{,}4 \times 128}{8} = 470{,}4\,;$$

$$\text{and } R_{\mathrm{unif}} = \frac{470{,}4}{16{,}0} = 29.4''$$

Adding this to the moment required by the floor-load, we get a total *R* of 50.2″. We shall adopt a 12″ I, 31.5 lbs., and a 12″ channel, 20.5 pounds, whose combined *R* is 57.4″; arranging them as shown in Figure 45. The channel is placed 4″ in from the outside face of the wall, so that the face brick can be laid up against its back, making a neat job. The I is placed on the inner side, and the whole covered with a 15″ × $\frac{1}{4}$″ plate, so laid that its edge will be 1″ from the face of the wall. This plate forms an excellent bed upon which to build the brickwork.

Girder *G H* is exactly the same as *N O*.

107. Finally, let us take up girder *G K*. The floor-load on it is equal to one-half of that carried by one of the beams spaced 5′ 4″ on centres. Since the latter required a moment-of-resistance of 38.3″ (§ 45), that of the girder due to the floor-load will be one-half of this amount, or 19.1″.

The curtain-wall resting on it will again, of course, be 16″ thick. We shall assume it to have three windows on a floor, each 3′ × 6′. The weight of this wall for two stories will, therefore, be

[ (24 × 19.58) — (6 × 3 × 6) ] 160 lbs. = 57,907 pounds.

And the moment-of-resistance thereby required

$$R = \frac{57{,}9 \times 19.58 \times 12}{8 \times 16{,}0} = 106.3''.$$

The total $R$ required is, therefore, 19.1 + 106.3, or 125.4″. We decide to use a 15″ — 65 lbs. I, with a moment of 84.8″, and a 15″ — 33 lbs. channel, with a moment of 41.7″; together, 126.5″. These two sections we arrange similarly to Figure 45.

After making girder $KN$ the same as $GK$, we have completed the framing for the entire plan. With the exception of the curtain-wall girders, which vary at the different floors according to the thickness of the wall supported, this framing will do for all the floors. Of course, the stairs might be different on one or two floors, but the difference in the framing due to this would be trifling.

108. Before closing, let us say a few words in regard to connections. These could, of course, be calculated and designed for each case; but that is hardly ever done, as the process would be a long and tedious one, and moreover, a great waste of energy, for the reason that most of the iron companies have designed "standard" connections which can be used in nearly all cases.

Let us take as an example a standard connection of Carnegie's, and demonstrate upon it the principles involved in its design. Let it be the connection between a 12″ - 31.5 lbs. I and a 12″ — 20.5 lbs. channel, which consists of two 6″ x 6″ x 7/16″ angles, each 8½″ long, and fifteen ¾″ rivets, as shown in Figures 47 *a* and *b*.

109. Instead of assuming a load, and calculating therefrom the number of rivets, etc., required, let us begin at the other end, and compute the strength of the connection shown.

In transmitting the load or reaction from the I-beam to the channel, the rivets are subjected to a shearing-strain, while the webs of the beam and channel, likewise parts of the angles, are subjected to compressive strains. The safe shear we shall assume at 10,000 lbs. per square inch; and the safe compression at 20,000 pounds.

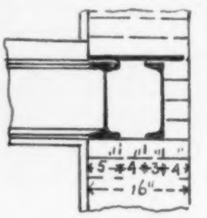



*Fig. 45.*

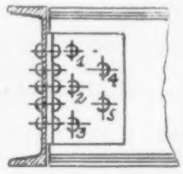



*Fig. 47 b.*

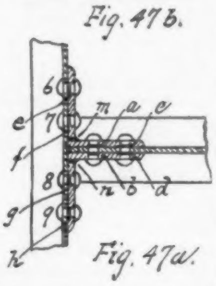



*Fig. 47 a.*

If we consider the two angles as rigidly fixed against the channel, the web of the I-beam will tend to shear off each of the rivets 1, 2, 3, 4, 5 along two planes, indicated by the heavy lines $a$, $b$, — $c$, $d$ in Figure 47*a*. Each of these rivets is, therefore, said to be in double shear; and the resistance of each is equal to twice its cross-sectional area in square inches, multiplied by 10,000 pounds. A rivet in double shear offers twice as much resistance as one in single shear, as, for instance, 6, 7, 8 and 9, in which the shear acts along only one plane ($e, f, g$ and $h$).

110. The cross-sectional area of a ¾″ rivet being 0.4418 square inches, its resistance against double shear will be 0.4418 × 10,000 × 2, or 8,836 pounds, and the resistance offered by five rivets will be 44,180 pounds. Each of these rivets in its turn exerts an upward pressure against the web of the I-beam. The area to which this pressure is applied is equal, for one rivet, to its diameter multiplied by the thickness of the web. Since the latter, in our case, is 0.35″, the safe compression or *bearing* value of one rivet will be 0.75 × 0.35 × 20,000 lbs., or 5,250 pounds; and for five, 26,250 pounds.

The reader will notice that the bearing happens to be considerably less than the shearing-value; whenever this is the case, the number of rivets required are, of course, determined by the former, and not by the latter value. Very often the thickness of the web-plate is increased in order to add to the bearing-value. The ideal connection is that in which the shearing and bearing values are equal.

111. Proceeding, we have next to consider the bearing-value of the rivets against the angles. Since the thickness of the latter is 7/16″ or 0.4375″, this value, for the five rivets and two angles, is equal to 0.75 × 0.4375 × 2 × 20,000 × 5, or 65,600 pounds.

112. By comparing the results so far obtained, we find that the greatest load which our connection is capable of transmitting successfully from the beam to the angles is 26,250 pounds. Now let us see what amount the angles are capable of transmitting to the channel; but first we must find what amount of shearing the angles themselves are good for.

The planes along which they would fail are $m$, $n$ (Fig. 47*a*). Their combined resistance at these points is equal to 0.4375 × 8.5 × 2 × 10,000 lbs. = 74,250 pounds.

Proceeding as before, we find the bearing-value of the rivets against the channel legs of the angles to be, again, 0.75 × 0.4375 × 20,000 × 10, or 65,600 pounds; and the shearing-value of the rivets now in *single* shear, along the planes ($e, f, g, h$): 0.4418 × 10,000 × 10, or 44,180 pounds.

And finally, since the web of the channel is 0.28″ thick, the bearing-values of the ten rivets against it will be 0.28 × 0.75 × 20,000 × 10 = 42,000 pounds.

None of these are as low as the bearing-value of the rivets against the web of the I-beam — 26,250 lbs., which according to the principle that a chain is no stronger than its weakest link, remains the greatest amount which the connection is capable of safely transmitting.

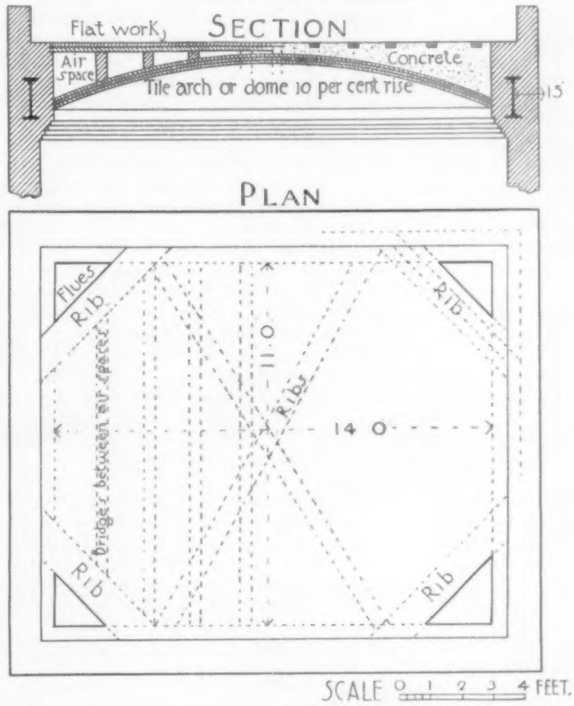
113. With this connection a 12″ I could, therefore, carry a maximum safe-load of twice 26,250 pounds, or 52,500 pounds, provided the latter were uniformly or symmetrically applied — for then the reactions would be equal to half the load. The load on our 12″ — 35 lbs. I floor-beams, in § 45, is 21,000 pounds; so that, in their case, the standard connection would be more than four times as strong as need be.

114. With this we shall leave the theory of the beam to take up that of the truss, reserving practical examples of cantilevers, and built-up and continuous-hinged girders for a future opportunity.

O. F. SEMSCH.

[To be continued.]

## FIREPROOFING TESTS.




ONE of the most interesting of the fireproofing tests conducted after the requirements of the New York Department of Buildings took place, on April 2d last, at the proving ground at Sixty-eighth Street and Avenue A, New York. At this time an arched or flat-domed floor, built after Mr. Guastavino's method of cohesive construction, was submitted to a test of unusual severity. In the first place, the area of the oven roofed-in was larger than in previous tests; next, the temperature reached a higher temperature than in some other tests, but the most interesting fact is that Mr. Guastavino voluntarily made the test as severe as possible by adopting what may be called a non-homogeneous method of constructing his test-floor, so that it might be in a measure subjected to unequal strains.

As will be seen by the diagram, one-half of the floor was constructed with open air-spaces between the extrados of the arch and the flooring above, while the other half was solidly filled with concrete, in whose upper surface flooring sleepers were bedded in the ordinary way. In this way the halves of the floor were not only subjected to varying strains, owing to the difference of conducting power of the materials used, but they were strained by differing loads. In addition to this, the lower of the three courses of tile, the templet course, was laid up with tiles of varying refractory power, some courses even being of enamelled tile.

Before the fire was lighted it was explained that the lower course was expected to "fly" under the application of heat and the drenching of water, but that so far as weight-carrying properties were concerned, only two courses of tile were required by the system, and that the lower or templet course was really added merely as a fireproofing protection to the upper courses. Further, it wa one of the merits of the system that whatever damage might befall the lower course could be expeditiously and cheaply made good, and the conductors of the test were requested to note the time and cost of repairing any damage to the lower course and then to renew the fire test.

The thickness of the arch, tile and cement included, was but $3\frac{1}{2}$ inches, and the rise of the arch was but ten per cent. Before lighting the fire, a load of 150 pounds per square foot was added, but no deflection was produced by the load.

During the application of the test, the firing continuing for the space of five hours, the maximum temperature ranged between 2,000° and 2,500°, the pyrometer recording 2,525° as the highest temperature reached. During this time, owing to expansion, the walls and ceiling gained $\frac{1}{8}$ inch in height, while the crown of the dome rose an additional $\frac{1}{4}$ inch.

Whether during the firing any portion of the templet course splayed off, owing to different powers of expansibility of its variously constituted tile, could not of course be told, but the sudden cooling under the water stream caused the tiles in many places to fly — just as was anticipated.

After cooling, measurement showed that the ceiling had suffered a deflection of $\frac{33}{100}$ of an inch, but after the loading was removed a slight recovery took place, and the final deflection was found to be only $\frac{17}{100}$ of an inch — a very notable performance in view of the area covered by the dome.

Later, the ceiling was again loaded with about 50 tons of pig-iron, so that the distributed weight was 600 pounds per square foot. Six hours was consumed in piling the iron in place, and during this time the arch slowly deflected again until the movement stopped at a final deflection of $\frac{37}{100}$ of an inch.

Taken all in all, this is one of the severest, as well as most interesting fireproof tests that have been made. The conditions were wilfully made as unfavorable as possible, through varying both the materials and the method of construction in different parts of the same dome, and yet the test showed that one method was practically as allowable as the other; the temperature reached by the fire and the duration of time during which the maximum temperature was maintained, have rarely been exceeded: the space covered by the span was much larger than usual, and the superimposed load in total bulk, as well as in rate per superficial foot, was much greater than in the majority of tests, official or private.

Amongst other fireproofing tests conducted by the New York Building Department under nearly analogous conditions, has been one which dealt with the Roebling Floor System, which consists of concrete arches sprung between and above the iron floor-beams and a plaster ceiling suspended a short distance below them, so as to entirely enclose all the floor members with a fireproof protection, and at the same time to leave considerable empty spaces underneath the crown of the arches and clear openings under the lower flanges of the floor-beams, thus providing for a full air circulation underneath the whole floor-area and affording some advantages for cooling surfaces locally heated by flames whose heat is thus intended to be absorbed and removed.

In ordinary work the floor-beams have malleable-iron clips, about 16 inches centre to centre, adjusted to their lower flanges on both sides, and through them steel rods, $\frac{5}{16}$ inch in diameter, are passed and screwed up to snug bearings. To the under side of these rods (set usually 1 inch below the bottoms of the beams) is laced a cloth of No. 20 wire, $\frac{3}{8}$-inch mesh, that has woven into it $\frac{1}{4}$-inch steel stiffening-rods, $7\frac{1}{2}$ inches centre to centre, that are at right angles to rods, etc. The horizontal surface thus made serves for a framework upon which the plaster ceiling is spread from below.

To sustain the concrete of the floor-arches until it is set, 4-foot pieces of No. 20 wire netting, of a special width equal to the length of the required arch soffit, with $\frac{7}{16}$-inch steel rods, woven in the cloth at intervals of 9 inches, are sprung between the beams and abut on the angle between flange and web. Two or three long longitudinal bars are placed on top to unite the separate strips of wire-cloth and to resist a possible tendency to displacement.

On October 28 last, over an oven chamber, 13 feet by 17 feet, was built one of these floors in three panels, the central one, having an area of 64 feet, carrying a distributed load of 150 pounds per square foot.

The highest recorded heat was 2,300°, and the firing was continued for five hours before water was applied.

During the firing the iron beams deflected 4 inches. At the conclusion of the test the ceiling had been destroyed, but the arches appeared uninjured, and 24 hours later sustained an additional load of 600 pounds per square foot (making a total of 38,400 pounds) without visible injury.

After cooling, the ironwork recovered and the final deflection after the removal of the 38,400 pounds was $1\frac{5}{8}$ inches.

During this test the exposed tie-rods of the arch were reduced about $\frac{3}{16}$-inch in diameter by the intense heat.

A final test of the last-described arch is thus reported in a recent letter to the *Engineering Record:*

"On Friday, December 11th, the middle arch in the official test structure, at Eighty-second Street, was loaded so as to ascertain its ultimate strength.

"A section 4 feet wide was isolated from the remainder of the floor by cutting through the concrete.

"Over the crown of this portion of the arch ($2\frac{1}{2}$ feet in width by 4 feet in length, or an area of 10 square feet) was built a brick pier about 1 foot high. On top of this pier was placed a platform, $7\frac{1}{2}$ feet square, of timber. Brick were then loaded on this platform until night, when a total load of about 19,000 pounds had been weighed on a scales and placed on the arch.

"On Saturday morning the loading was resumed, and at 1 o'clock a load of 30,000 pounds was in position. This load was allowed to rest on the arch until Monday morning, the 14th. The work of loading was then continued until about 1.30, when the load had become so bulky and top-heavy that the inspectors deemed it dangerous to continue the test. Brick and stone had been piled to a height of about 12 feet, on a 7 by 7-foot platform, and by actual weighing represented a weight of a trifle over 40,000 pounds on 10 square feet, or 4,000 pounds per square foot on the crown of the arch.

"Elevations taken on the adjacent I-beams and on the centre of the arch showed, with 19,000 pounds per square foot, a centre deflection of $\frac{22}{100}$ of an inch; with 3,000 pounds per square foot, a deflection of $\frac{34}{100}$ of an inch.

"On Monday, at 1.30 o'clock, after the load had been in position since the preceding Saturday and with the additional loading increasing the weight to 40,000 pounds, the total deflection of the arch at the centre, before removing the load, was just 1 inch.

"After the load was removed, the arch recovered and showed a final deflection of about $\frac{43}{100}$ of an inch."

## PROFIT IN MODEL TENEMENTS.

A CORRESPONDENT, who signs himself "S. E. C.," makes the following very interesting communication to the *New York Times:*

I notice in the *Times* of April 16th an article concerning what is there termed the economic experiment of Mr. Ross Winans of Baltimore, who erected one hundred and four model tenement-houses twenty-six years ago, which are now given up as a failure.

This touches upon a subject of extreme interest to me, as I have been both practically and experimentally interested for thirty years in this very thing, *i. e.*, solving the problem of how to make numbers of tenement-houses yield a fair profit to the owner and benefit to the tenants. I have given the matter careful thought and study, and the above incident only serves to confirm the conclusions I have reached from my own experience and a close observation of the experience of others.

In the hope of drawing out some ideas on the subject from those well qualified to give them, I will briefly state what seems to me two reasons for what you term the failure of an experiment.

First, — It seems to me one cause was a lack of individuality, so to speak, in the houses. If each one of these one hundred and four houses had been built in a different block throughout the length and breadth of Baltimore, differing somewhat in their style, and with nothing to emphasize the fact of their common ownership, I think there would have been a different story to tell. One of the first and strongest principles to be met with in a desirable, self-respecting class of tenants is the instinct to give their home the semblance of the individuality that comes with ownership, a reluctance to mingle in and lose their identity in a herd — to be just simply one of the tenants of the "one hundred and four" houses.

This wish must be catered to, or all the benefits from sanitary building or perfect conveniences are unavailing. You cannot benefit your fellow-beings in battalions; you must deal with them individually, whether it be to save their souls or provide them with good houses at a fair rental.

This trait, call it by what name you will — self-respect, personal vanity, or ambition — is inherent in all classes above the lowest and must be considered. The family who will come to you personally and receive gratefully a contribution to their larder would starve rather than go, as one of a class, to a soup-kitchen. I have seen it tried scores of times in various American cities, and in every case the blocks or collections of houses that composed a "named" neighborhood would deteriorate years before individual or detached houses that were often much less pretentious.

Another fact bearing on this is exactly the opposite of what would be supposed. One would naturally believe that any odium attached to one of a "named" block, or blocks, of houses would so lose its identity in the great number as to weaken its effect. The reverse is true. A few such unfortunate accidents as an occupancy by an undesirable nationality, or tenants of immoral reputation, would taint the whole and multiply the mischief by the entire number. Even that hoodoo of the landlord, the reputation of a haunted house, if surely fixed on one of the "one hundred and four" houses, might in time determine the fate of the whole. The drop of ink would blacken the fountain.

Second, — Twenty-six years is a very long time for one set of tenement-houses to yield the same profit and retain the same class of tenants with which they began. If I were the custodian of a trust fund, to be kept strictly invested in tenement-houses for the term of twenty-six years, out of which I was to pay, besides an annuity of 5 per cent on the principal, all the expenses of repairs, taxes and insurance, and the probable city improvement assessments, such as paving, sewerage, etc., and yield up the trust at the end of said term at its full original value, occupied by the same class of tenants, I should feel compelled to sell and reinvest three times during that period to carry out the trust and make myself good.

In other words, with an ordinary tenement-house, at the end of about eight years the expenses begin to eat up the profits. Then is the time to sell. The house is in just that condition that, if it is a detached one, somebody can afford to buy it at nearly its original value for his own occupancy, since his improvements and repairs need not be counted so closely and would be more lasting; but, if you let that opportunity slip and begin to let the house, "as it stands," at lower rental in lieu of repairs, the property is doomed, you are drawing on your principal, its tenants will deteriorate, its end will be a rookery. This seems the inevitable law of tenement-houses as compared with houses occupied by their owners. I recall a case in point. Thirty-five years ago, in a growing city, a man erected in the same block, on separate lots, two residences, one for his own home, the other for rental. Equally well built, they were occupied in the beginning by persons of the same style of living and requirements. To-day the homestead is one of the most desirable residences in the city; the tenement, with every care and expenditure that was warranted short of actual loss, is a rookery. Each decade brought a poorer class of tenants, and now it is too old for the poorest, if respectable.

Perhaps the greatest sufferers I have known from such a state of affairs have been the wives and minor children of men who invested all their savings in this kind of real estate, and after their death it had to lie tied up for a long term of years. In most of these cases the beneficiaries would have realized far more in the end had the money been in a bank at 3 per cent.

There must be many who would write wisely and helpfully on this subject.

If any person can point to one hundred and four tenement-houses in any American city, of which he has had the management, that have been rented steadily at a profit to a good class of tenants for twenty-six years, and are to-day of the same value as tenements for the same class of people that they were in 1871, he must possess a secret that the ethics of philanthropy would seem to require that he should impart to his fellow-men.

## BUILDING LAW

### ARCHITECTS' LIENS.

NO *Liens for Plans without Superintendence.* — An architect who prepares plans for a building, and also superintends its construction, is entitled to a mechanic's lien for his entire services; but the preparation of plans alone, not supplemented with superintendence, does not give him a lien. It is the part the architect takes during the construction that draws his services within the lien law. And where only a portion of the work has been done, and the construction indefinitely suspended, the argument that the plans may be used eventually in the completion of the building does not assist the architect, for he never had a lien for his plans. If nothing had been erected, he would have had his damages, — no more. He may have judgment for damages now, and the court can no further aid him.

[Rinn *vs.* Electric Power Co. (Supreme Ct. App. Div.), 38 *N. Y. S. Rep.* 345.]

*Completion of Architect's Contract and Time for Filing Lien.* — A building contract provided that all payments to the contractor should be made on certified statements of the architects, who were empowered to supervise the construction of the building at a compensation of 5 per cent of its cost, and that final settlement should be made on their certificate, showing completion of the contract according to specifications. The Supreme Court of Wisconsin held that, as the last act required of the architects was to give a final certificate of satisfactory construction, their time for filing a lien for services did not begin to run until the performance of such act.

[Bentley *vs.* Adams, 66 *N. W. Rep.* 505.]

*Architect has a Lien for Plans used.* — An architect, says the Supreme Court of Iowa, who prepared plans and specifications for improvements on a building, which are made in accordance with such plans, is entitled to a mechanic's lien on the property.

[Parsons *vs.* Brown, 66 *N. W. Rep.* 880.]

*Insufficiency of Claim by Architect for Lien.* — A claim for a mechanic's lien reciting that the architects "have by virtue of a contract heretofore made with B. . . in the furnishing sketches, plans. . . and superintendence of a certain dwelling-house. The ground on which said dwelling-house was constructed being at the time the property of said B, who caused said house to be constructed," is insufficient, for failure to state the person to whom the services were rendered, as required by the laws of Oregon.

[Leick *vs.* Beers (Supreme Ct. Oregon), 43 *Pacific Rep.* 658.]

*When Builder cannot collect for Preparing Plans.* — Where a contract for a fixed amount is entered into between the owner of property and a builder, according to certain specifications, to which a plan is annexed, as explanatory of same, in the absence of an agreement for it, no charge can be made as for extra services in the preparation of the plan. The builder appears in such transaction, not as an architect, but as a contractor.

[Maas *vs.* Hernandez (Supreme Ct. La.), 19 *Southern Rep.* 269.]

## SOCIETIES

### BROOKLYN CHAPTER, AMERICAN INSTITUTE OF ARCHITECTS.

THE regular monthly meeting of the Brooklyn, N. Y., Chapter was held at the St. George Hotel, April 17, 1897, at 6.30 o'clock. The guest of the Chapter for the evening was Francis Hopkinson Smith, Esq., Engineer, Artist and Author.

After dinner the President, Mr. Geo. L. Morse, called the meeting to order. The minutes of the last meeting, which were then read, contained a brief sketch of the talk given last week by Mr. Walter Dickson, "Reminiscences of the Practitioner." The minutes as read by the Secretary were approved.

The Secretary then read a communication from the Boston Chapter of A. I. A., enclosing a copy of resolutions of that Chapter, which were forwarded to the Honorable the Secretary of the Treasury, requesting him to retain Mr. Aiken, the Supervising Architect. The Secretary of the Boston Chapter expressed the hope that the Brooklyn Chapter may be led to take similar action. It was voted that the communication be laid on the table.

The discussion on the subject developed that this Chapter did not deem it advisable to lend its name for any such purpose.

The President then introduced the guest, Mr. Smith, who gave a very interesting address on "Colonial Architecture in the South." During the address he digressed enough to speak a good deal of the sky-scrapers in New York, some of which he criticised severely, others he praised.

He also drew the attention of the Chapter to what he considered one of the most beautiful, if not the most beautiful, piece of architecture in New York City, and which unfortunately he believed had to be torn down soon to make way for a new building. At the close of Mr. Smith's address, a free discussion ensued, in which nearly all present took part. It was closed by Mr. Smith telling some stories and experiences in the north of Italy and Switzerland, where he spends about four months every year.

A vote of thanks was proposed and carried unanimously. The meeting then adjourned until its next regular date, the 3d Saturday in May. A. G. THOMSON, *Secretary.*

### SKETCH-CLUB OF NEW YORK.

THE regular monthly meeting of the Sketch-Club of New York was held on Saturday evening, May 1st, at the Club-rooms, No. 3 East 14th St.

The regular business of the meeting having been disposed of, members and guests were entertained with a bright musical programme, and some good recitations and stories.

The Chicago exhibit of the T-Square Club, of Philadelphia, was hung on the walls. A vote of thanks was offered to the T-Square Club for their kindness in loaning their exhibit to the Club.

Fifty members and about the same number of guests enjoyed the entertainment. Refreshments were served in the Stein-room during the evening. ARTHUR M. DUNCAN, *Recording Secretary.*

## THE ILLUSTRATIONS

[*Contributors of drawings are requested to send also plans and a full and adequate description of the buildings, including a statement of cost.*]

DORMITORIES FOR THE UNIVERSITY OF PENNSYLVANIA, PHILADELPHIA, PA. MESSRS. COPE & STEWARDSON, ARCHITECTS, PHILADELPHIA, PA.: TWO PLATES.

[Issued with the International and Imperial Editions only.]

"THE CLIFFS," KEENE HEIGHTS, ADIRONDACK, N. Y. MR. R. D. KOHN, ARCHITECT, NEW YORK, N. Y.

THE only descriptive details worth mentioning are: that the house is distinctly a summer camp, unplastered; exposed studs and beams being planed and chamfered. The kitchen, servants' quarters, etc., are placed thirty feet from main house and connected with it by a covered trellis.

ST. JOHN'S CATHOLIC CHURCH, JOHNSTOWN, PA. MESSRS. BEEZER BROS., ARCHITECTS, ALTOONA, PA.

THIS church was recently completed at a cost of about $100,000.

ST. STEPHEN'S CHURCH, FALL RIVER, MASS. MESSRS. CRAM & WENTWORTH, ARCHITECTS, BOSTON, MASS.

CHURCH AT VANDERGRIFT, PA. MESSRS. ALDEN & HARLOW, ARCHITECTS, PITTSBURGH, PA.

SUGGESTIONS FOR THE TREATMENT OF THE SUBWAY STATIONS AT PARK ST. CORNER, BOSTON, MASS. MESSRS. WHEELWRIGHT & HAVEN, ARCHITECTS, BOSTON, MASS.

**[The following named illustrations may be found by reference to our advertising pages.]**

"ELIZABETH" COLLEGE, CHARLOTTE, N. C. MR. J. A. DEMPWOLF, YORK, PA.

This building, which will form one of a group, is now in course of erection and is finished throughout in a thorough manner. It embraces school, dormitory and professor's quarter, and is intended to facilitate the work of the new college until the remaining buildings can be erected. The material of the building is local "red" brick on granite base with Indiana limestone trimmings; the roof is covered with black slate. The contract price for the building, including heating, ventilating and cooking apparatus, except furniture, is $50,000.

A GROUP OF ENGLISH CHURCHES.

**[Additional Illustrations in the International Edition.]**

INTERIOR OF THE DOME OVER ROTUNDA: LIBRARY OF CONGRESS, WASHINGTON, D. C. ARCHITECTS, MESSRS. SMITHMEYER & PELZ; P. J. PELZ; E. P. CASEY.

[Gelatine Print.]

The arabesque decorations of the dome, in stucco work, were modelled by Mr. Albert Weinert, and the painted decoration around the collar of the dome and the ceiling of the lantern are by Mr. E. H. Blashfield. Those who have good eyes can test them, and at the same time the excellence of this particular print, by reading the page of the book which the figure of "English Literature" holds open upon her knee.

BOUDOIR CEILING: STAFFORD HOUSE, ST. JAMES'S, LONDON, ENG. SIR CHARLES BARRY, ARCHITECT.

NEW PORCH: "COOMBE CROFT," NORBITON, ENG. MR. ARNOLD MITCHELL, ARCHITECT.

MUSIC-ROOM BAY: "COOMBE CROFT," NORBITON, ENG. MR. ARNOLD MITCHELL, ARCHITECT.

## COMMUNICATIONS

[*The editors cannot pay attention to demands of correspondents who forget to give their names and addresses as guaranty of good faith; nor do they hold themselves responsible for opinions expressed by their correspondents.*]

### A QUESTION OF COMMISSION.

PHILADELPHIA, PA., April 27, 1897.

To the Editors of the American Architect: —

*Dear Sirs,* — Will you kindly state in your paper what you consider a proper charge for the following services on a large institution. We were the architects of the buildings, but this work was done for a Board of Trustees to whom the buildings were turned over upon completion.

Full professional services, plans, specifications and superintendence for the following equipment:

1. Laundry machinery.
2. Kitchen apparatus.
3. Large storage refrigerators.
4. Tables for congregate dining-room.
5. Finishing of floors.
6. Special plumbing for kitchen and laundry machinery.

The total cost of the work was about $11,000. We employed an expert at our own expense.

You will very greatly oblige us by giving your opinion upon this matter. Very truly yours, * *

[Ten per cent on the cost would be the ordinary charge for such service. — Eds. American Architect.]

## NOTES AND CLIPPINGS

The Gravehals Tunnel, Norway. — The Gravehals tunnel, on the Bergen Railway in Norway, is the longest tunnel on the North European continent, its length being about three miles sixteen hundred feet. Its cost will, however, be unusually low compared to most other tunnels, which are generally double-tracked and bricked to a considerable extent, whilst the Gravehals tunnel, according to the present arrangements, will not only be for a single line, but even for narrow gauge, although it is hoped that the Legislature will increase the vote so as to allow of the ordinary gauge being adopted. With regard to brickwork, it is calculated that only about 3 per cent of its length will have to be lined. These circumstances bring about a great difference in cost in favor of the Norwegian tunnel, which will only cost some 500*kr.* or 27*l.* 10*s.* per lineal metre, whereas the usual cost of similar tunnels elsewhere amounts from 100*l.* to 110*l.* per metre. Both the ends of the tunnel are at an elevation of some 2,900 feet above the level of the sea. The results arrived at as to the quality of the rock by the special committee appointed to investigate this matter have so far proved correct, and the rock has not been very difficult to handle. The work commenced at the west side, at Opsät, in October, 1895. The work was, through the whole of 1896, carried on by hand-boring, the necessary preliminary investigations as to the employment of water-power not having been completed. In order to procure water for the turbines, it was necessary to construct a reservoir on the mountain itself, and fears were entertained that the water would be so cold that it would freeze before it reached the turbines, even if the pipes were well protected. These fears were, however, dispelled, as the water's temperature never fell below 0 5° C. at the spot intended for the installation of the turbines. The power from the turbines amounts to 220 effective horse-power, there being two turbines of, respectively, 120 and 100 horse-power. The two boring machines require 60 horse-power. Some 30 to 40 horse-power will be required for ventilating purposes, there being some two or three ventilators coupled, the one behind the other, so that the one delivers into the other. Some 15 horse-power will be wanted for the two electric locomotives, which are intended to replace the horses used at present for the purpose of removing the débris. There being a gradient of 2 to 5 in 1,000, the loaded wagons will almost run by themselves, the locomotives being really only wanted for the purpose of pulling back the empty trucks. The machine tools in the workshop are also worked by power from the turbines, transmitted by electricity; this takes some 15 horse-power, and the dynamo for lighting purposes, some 25 horse-power. The smaller turbine, of 100 horse-power, works the two hydraulic pumps for the boring machines; the surplus, of some 40 horse-power, it is intended to use for two electric drills. The whole installation, which has been in operation for some two or three months, works perfectly satisfactorily. The number of hands employed amount to 125 men at the west side and 35 at the east side. Barracks have been built for the men at both places, with shops, dairy, laundry, bath-house, etc. At Opsät, the average advance per day has been about 3 feet, making some 75 feet to 80 feet a month of 25 working days. About 2 pounds to 2 1-2 pounds of dynamite have been used for every cubic metre of rock. This is by hand-boring. By machine-boring an advance of 7 feet to 8 feet has been made during 24 hours on the average, but the consumption of dynamite has been three or four times as large in proportion. According to the experience at Gravehals, machine-boring does not come any cheaper than hand-boring. The tunnel has to be ready for rails by April 12, 1903, and there is every prospect of it being ready some time before then; according to the plan, about 14,000 feet will be done from the west end — 1,000 feet by hand and 13,000 feet by machine — and some 3,600 feet from the east by hand. Some trouble has been experienced with the men, who will not settle down, although they can save considerably; but they rarely stay more than six months. The average pay for all piece-work is 4*s.* 2*d.* per day, in addition to which the men have free lodging, light and fuel. The drillers in the rock earn some 6*s.* to 10*s.* per day. Board costs 1*s.* 4*d.* per day less for those who keep house themselves. An experiment with some 20 Italian men proved entirely unsatisfactory, and they had to be sent back. — *Engineering.*

Forest Reserves and Deforestation. — It must not be imagined that, because thirteen more forest reserves have been created in the West, and because the citizens of New York State have voted emphatically to prevent any further destruction of their forests, any immediate and appreciable increase in the water-supply will, therefore, result. All that can be looked for in these districts is for them to be able to hold their own, so far as regards the present rainfall and water-supply. The deforestation of past years must be atoned for. That has stripped vast expanses of country, and even though these woods may have been, or may be replaced, the streams which have dried up cannot flow again till the general rainfall shall have returned (if it ever does return) to its former sufficiency, so as to refill the natural reservoirs. A vegetable mould must be re-created, deep enough and firm enough to hold both rain and dew — and that takes time. Still it is something that the destruction of the forests must cease — a destruction which for every dollar made by the woodman has cost the community five, owing to the consequent cost to the whole people of lowered canals and rivers, of drought and aridity in farms and vineyards, of dry wells and springs, and of loss of power for manufacturing purposes. — *Fire and Water.*

A Lighthouse in the Centre of Brussels. — Brussels has simply gone wild over the project of converting itself into a seaport. Not only the people, but the authorities as well, seem to take it for granted that the moment the ship-canal connecting the city with the coast is open to navigation, all maritime traffic will at once abandon the port of Antwerp for the capital. To such a degree, indeed, have the citizens of Brussels lost their heads that the Municipal Council has passed a resolution for the construction of a huge electric-light house in the centre of the city on the Place de Brouckere, to serve as a beacon to ocean steamers, as well as for an ornament to the city. — *New York Tribune.*

Bronze Statue of Poseidon. — On the Gulf of Corinth, near the former location of a temple to Poseidon, peasants some weeks ago found a bronze statue of that god the size of a man. An inscription on it indicated that it was made 600 years B. C. After thus surviving nearly 2,500 years, it fell a victim to the stupidity of the peasants, who smashed it in the hope of finding gold inside. — *N. Y. Evening Post, March* 24.

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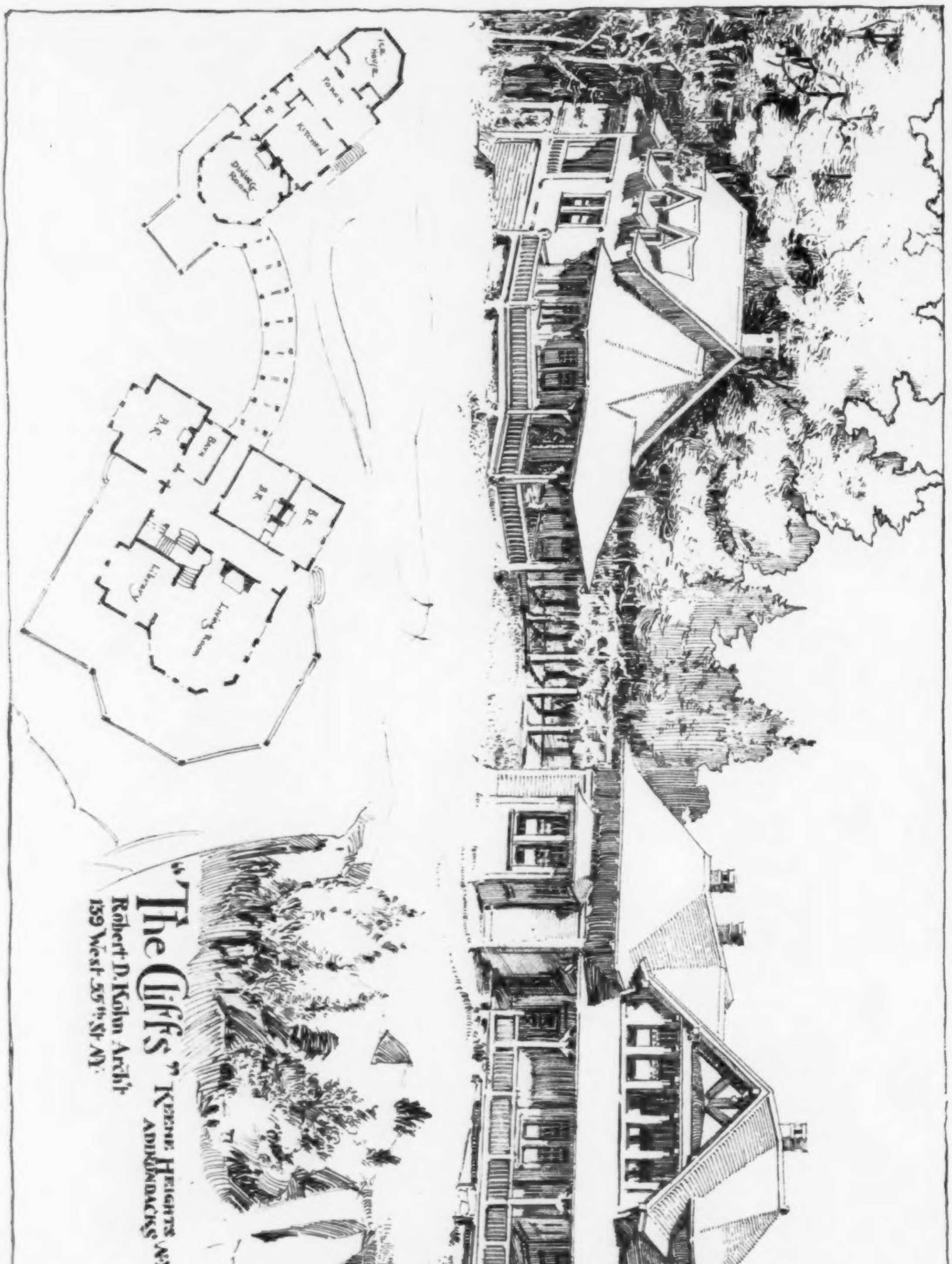
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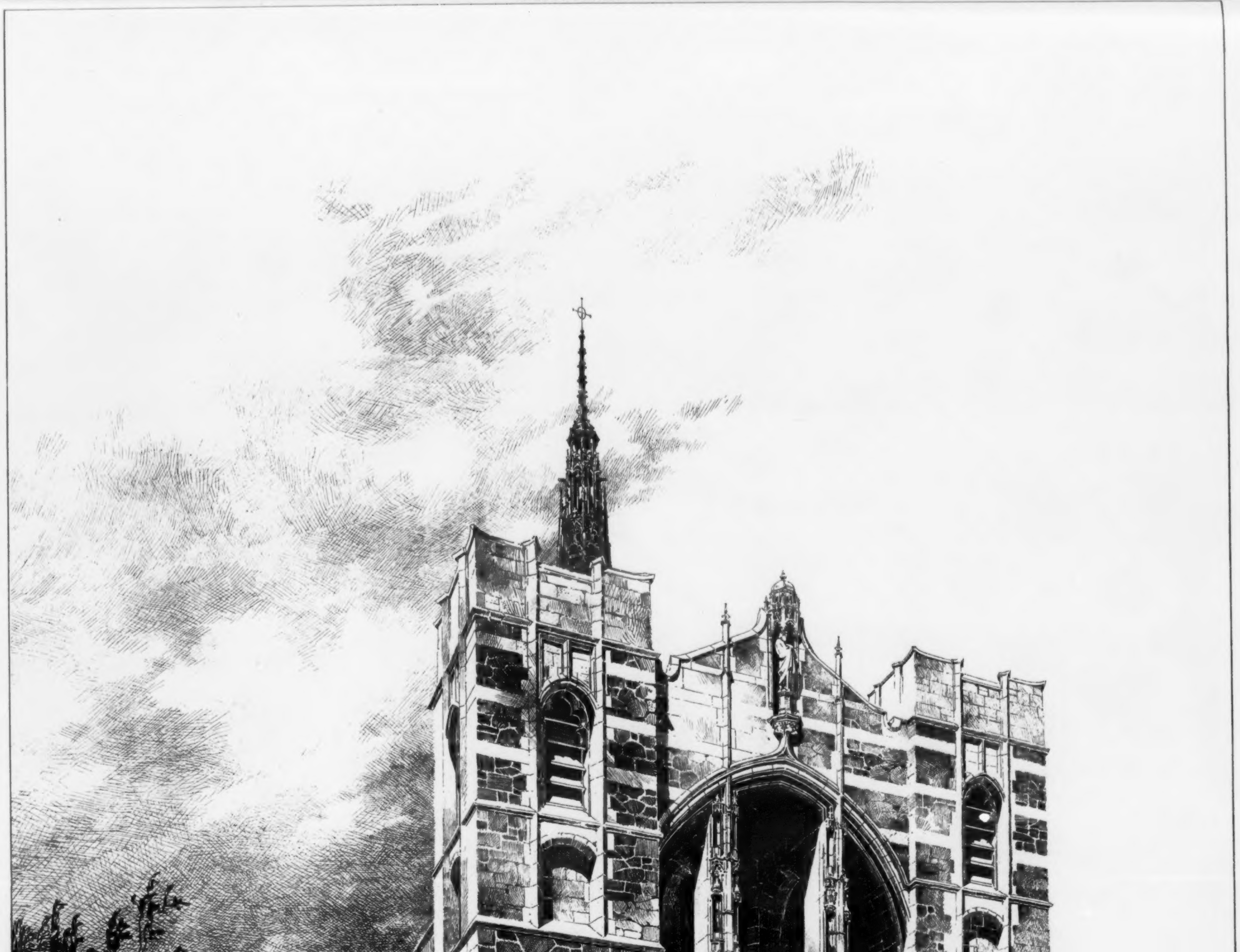

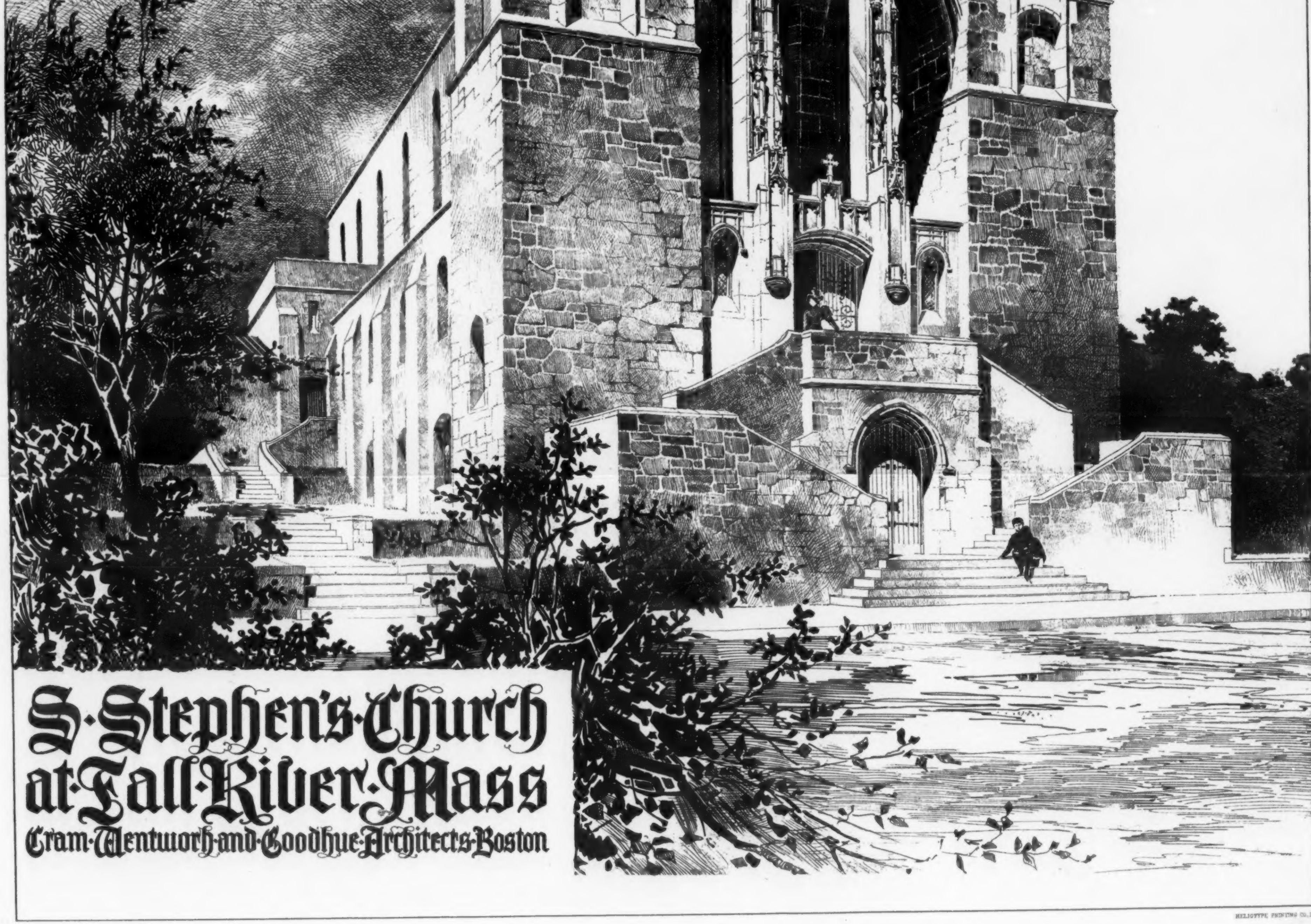


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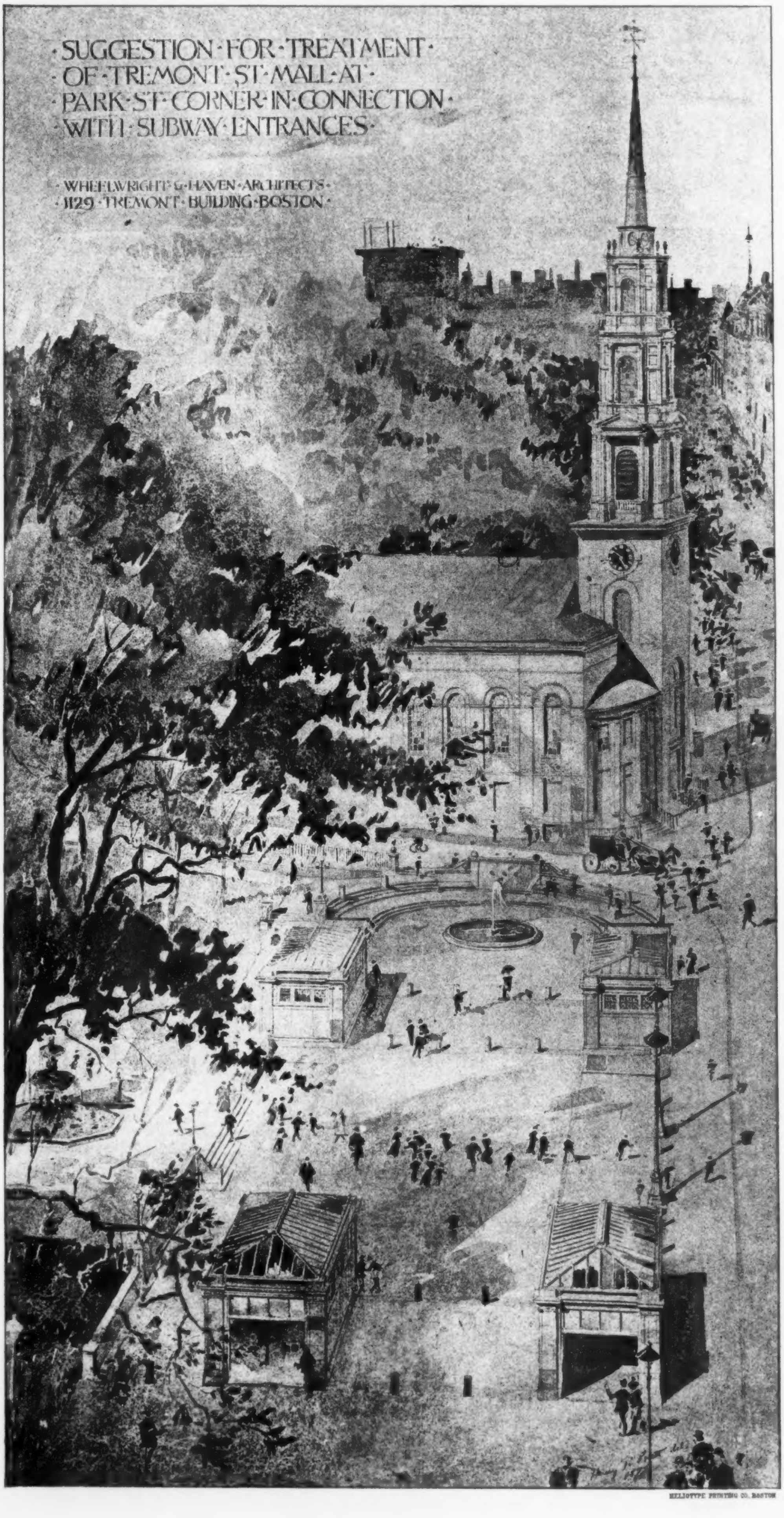


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