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CONTENTS

BOTH in New York and Chicago there are complaints from those who ought to know about the matter that the sub-contractors of the city are in league with each other and with the labor unions to exclude competition, and raise prices to an extortionate point. The large contractors compete with each other sharply enough, but they are obliged to sublet different portions of their contracts, and for these portions they must pay whatever price the local combination may dictate. If they rebel, and accept bids from outsiders, they are likely to find their operations blocked by a strike of the workmen in the trade concerned; and, rather than subject themselves and their patrons to annoyance and loss, they submit to the terms dictated to them, of course making their contract price cover the extortionate sub-contracts which they know that they will be obliged to make. This system has, in Chicago, produced its natural effect of checking building operations, as people who have money to invest, and intelligence enough to invest it prudently, do not care to put any of it into contracts at exorbitant and artificial prices. Building work having nearly ceased, the prices of some of the materials controlled by combinations have been reduced; but it is suspected that the prices will be put up again as soon as the market improves, so that the concessions have been so far without effect.

IT is hardly necessary to point out that these combinations are carried on, in the end, at the expense of the workingmen. The walking-delegates, who assist with strikes and threats of strikes the plans of the sub-contractors, presumably get their share of the profits, but none of this goes to the workingmen themselves, who simply see their rents increased and themselves thrown out of work, in support of conspiracies in which they have no interest. In New York, a beginning has been made at the exposure of the corrupt bargains by which the poor are plundered far more than the rich, and, if President Roosevelt has his way, publicity, the best antidote for corruption, will be applied more generally to such cases than has hitherto been possible, much to the advantage of honest people.

THE Cleveland papers publish illustrations of the famous scheme for grouping all the public buildings in the city, as now recommended by the Commission. The original plan, of making a park on the lake front, and grouping certain public buildings on it, is held to be impracticable, and a new scheme has been prepared, by which the union railway-station is made the centre of a vast, symmetrical group of buildings. This project, by which the railways occupy a large tract of land which it was hoped to retain as a park, meets, apparently, with some popular objections, but the Commission, consisting of Messrs. Burnham, Carrère and Brunner, say, with much reason, that a railway-station, although belonging to a corporation, is a public building, and not only deserves to be, but should be, studied in connection with structures more purely municipal. What will be the result of the discussion no one can predict, but architects will find great interest in the Commission's idea.

THE Secretary of the Treasury has removed the special architect of the Chicago Government Building, Mr. Henry Ives Cobb, for reasons which are not stated. There have been many complaints of the slowness with which the construction of the building has proceeded. The first appropriation for it was made early in 1895, and it was then estimated that five years would be required to complete it, but now, after nearly nine years, it has neither a window nor a floor. Whether Mr. Cobb is in any way responsible for the delay is not stated, but the newspapers say that he has for some time been without actual authority in connection with the structure, all his recommendations being passed upon by the Supervising Architect of the Treasury, after independent examination of their merits. It is said to be probable that no other special architect will be appointed for the building, but that the Supervising Architect will provide for its completion.

WE wish that one of the brilliant lawyers who devote themselves so ably and unselfishly to the public good would take in hand the subject of legislation, or, perhaps better, of judicial procedure, for repressing the swindling, to call it by its proper name, which is met with everywhere in this country. We once met in Europe a German business-man, who expressed himself vigorously in regard to the mercantile methods of the Italians with whom he had had dealings. "In Germany," as he said, "you can trust a man, but in Italy everything is swindle, swindle, cheat, cheat." It must be confessed that this country has not always appeared, to foreigners, to keep its eye steadily fixed upon the beacon light of perfect integrity, but the reputation of American business-men and methods has greatly improved abroad of late, and it is a matter of national importance to guard our mercantile honor as Holland and England guarded theirs in their days of prosperity, and as Germany is trying to guard hers.

ANOTHER needed reform, which might be carried out in a few days in any State which has a board of railroad commissioners, acting in conjunction with the Inter-State Commerce Commission, is the requirement that all railroad tickets shall have their price printed on them, as the law makes compulsory almost everywhere in Europe. No one who does not travel much has any idea of the vast aggregate of the frauds, petty in themselves, but repeated hundreds of times daily, which are perpetrated upon travellers by railway in the ticket offices of the stations in the great cities. Nine people out of ten, in this country, in buying a railroad ticket, the exact price of which they do not know, put down a piece of money, take whatever change the ticket-seller chooses to give them, and put it in their pockets without looking at it. Even if they did look at it, they would be none the wiser, and the ticket-sellers are practically free to swindle them out of whatever amount they can take without attracting their attention too sharply. Where the victims are poor people with families they are sometimes robbed of considerable sums; and the evil seems to be increasing.

WHERE the price of the ticket is printed on it, the purchaser is enabled, however hurried he may be, to compare, later, the price marked with what he gave for it, and, if he chooses, to demand the correction of the "error." We once had occasion to test the value of this system, on purchasing, at an Italian ticket-office, tickets for a party for a journey of considerable length. As we happened to know exactly what were the denominations of the bills which we gave in payment, it was easy, in comparing the change, on our way back to the hotel, with the price printed on the tickets, to discover that the change was fifty francs short. Fortunately, we had some hours before the departure of the train, and, as the result of some very pressing representations, the fifty francs were refunded. The tickets were for an international route, and the guide-books did not specify clearly the proper price; so that, if this had not been printed upon them, we should probably

never have suspected the mistake. Most tourists in Italy can tell of similar experiences, except that they do not usually succeed in getting their money back, and, in this country, travellers have practically no protection.

THE receivers of the Norcross Brothers corporation have resorted to a novel expedient for securing the bonds which they propose to issue, by insuring the life of Mr. O. W. Norcross for five hundred thousand dollars. As Mr. Norcross is sixty-three years old, the premium paid must be a very substantial one, and some of the creditors will question whether the cash required for the purpose might not have been with advantage applied to the debts of the concern; but Mr. Norcross, at least, will have reason to consider the action a compliment to himself, and to the administrative ability which the receivers think would be replaced with such difficulty. We hope that it may be many years before the policy is presented for payment.

MANY of our readers have probably witnessed such transactions as the following: A client, distinguished for his "business talent," has received bids for the construction of his new house. The lowest estimate, we will say, is twenty-five thousand dollars. The client sends for the lowest bidder, who, as he has ascertained from the architect, is a skilful and honest man, and informs him that he has received a bid from a responsible party to build the house complete for twenty thousand dollars, but, in consequence of the very favorable accounts which he has received from the architect and others, he is disposed to give him the preference, to the amount of a thousand dollars, and that if he will reduce his bid to twenty-one thousand dollars, the matter can be settled on the spot. Most architects, if they understand that their client is simply lying, have courage enough, under such circumstances, to interpose some feeble protest; but, in most cases, the client deceives them, as well as the builder, by pretending to have received the alleged bid from an outsider; or he may carry on his negotiations with his victim without the knowledge of the architect, who, even if he knows the facts, does not feel justified in betraying unreasonably his employer's interests for the benefit of a man unable to look out for his own. If the contractor is credulous, and anxious for the job, the chances are that he thinks he must have made some mistake in the figures, and that he agrees to the owner's proposition, and endeavors to carry out the building for less than cost, and is partly or wholly ruined in the attempt. If he pulls through, the chances are that he retains a grudge against the architect, which may injure the latter, even though innocent of all complicity in the matter, and he is very likely, if he has an opportunity, to meet guile with guile, by joining one of the secret cabals of contractors which have done so much of late to keep up the cost of building, and, in consequence, to check building operations.

IN the end, it is the community which suffers from frauds of this kind, which are everywhere prevalent, and it is the community which should put a stop to them. It is quite possible that at common law a contractor who had been induced by falsehood to sign a losing contract could recover the difference between the contract price and his original bid, and Master Builders' Associations, or similar bodies, would do a service to the public by testing the matter in the courts at the first opportunity. The fact that a bidder signed a contract for less than his estimated price would be evidence that some inducement had been held out to him to do so, and the inability of the owner to produce in writing the lower bid which he claimed to have received, or to tell a story which would stand skilful cross-examination, would be almost conclusive as to his fraudulent conduct, independent of that of other witnesses. If the principle were established that contracts could be set aside for fraud of this kind, a beneficent revolution would soon be accomplished in American business methods, to the immense advantage of American trade in general, as well as of honest American business men in particular.

THE editor of the *Builder* gives an account of his experience in the matter of tests of stone which will afford architects food for reflection. A certain quarry-owner had made public the results of "tests" of the crushing strength of the stone from his quarry which attracted the attention of the editor, who knew that the quarry produced only a soft limestone, and observed that the alleged tests indicated a resistance about five times as great as the usual strength of such stone. Some time later, the quarry-owner was asked how it happened that his stone showed such remarkable results; and, in a burst of frankness, he replied that, as he was going out of the stone business, he did not mind confessing that he had sent cubes of granite to be tested, purporting to be his limestone, and the expert who made the tests "did not know the difference." From this occurrence, and similar ones, the editor argues that it would be an excellent thing to have in England some authorized testing establishment, similar, as he says, to that at Cornell University, and in other places in the United States. He has apparently forgotten the splendid Government testing laboratory at Watertown; but, in any case, there is no doubt of the necessity, in all civilized countries, of establishments where the materials of engineering and architecture can be thoroughly and impartially tested, for the benefit of all concerned.

THE annual competition in Paris for the Prize of Rome in Architecture has resulted in the award of the Grand Prize to M. Jaussely, pupil of MM. Daumet and Esquié. The first second grand prize was awarded to M. Wielhorski, pupil of M. Laloux; and the second second grand prize to M. Joulie, pupil of M. Pascal. The subject of the composition was an unusually interesting one, being the arrangement of a public place. The programme indicated something closely resembling the Place de la Concorde, specifying that the open space should be bordered on one side by a river, crossed by a monumental bridge, and should be the terminus of several streets; while, facing upon it, should be three important buildings, a Bourse, a military club, and an artistic club, with gardens, porticos and so on; the open space itself being also adorned with statues and monuments. The whole composition, including the three buildings, was required to be contained in a space, the longest dimension of which should not exceed three hundred and fifty metres. Although floor-plans of the three buildings were required, the scale of them was small, and, as it proved, they did not count for much in the award. The problem was so similar to those which are at this moment agitating municipal authorities in this country that the publication of the competing plans will be awaited with much interest.

LE GÉNIE CIVIL gives an interesting description of the new turbine steamer just placed on the route between England and France, between Dover and Calais. Every one remembers the ill-fated torpedo boats, the "*Viper*" and the "*Cobra*," constructed on the turbine system for the British Government, which, after showing a speed of forty-two miles an hour, in several trial trips, broke in two, while at sea, and were lost with all on board. In the new Channel steamers the defects in strength of the naval vessels have been avoided, and the speed required is much less, an average of twenty-five miles an hour being sufficient for the service; but, on special occasions, much greater swiftness can be attained, the most recent boat, the "*Queen*," having crossed from Dover to Calais, a distance of nearly thirty miles, in fifty-one minutes. As in all modern turbine steamers, the same shaft is used for two or more propellers, the three shafts of the "*Queen*" carrying five propellers for forward movement, and three for backing, the latter being so arranged that they can be connected to the shaft, and the others thrown out of action, without stopping or changing the rotation of the shaft. Whether this is accomplished by Mr. John Jacob Astor's invention or not we cannot say, but the system appears to be very effective, the "*Queen*" being easily stopped in two and one-half lengths, while running at twenty knots an hour. This is a much better result than is usual with reciprocating engines, so that the old reproach of turbine steamers, that their movement could not be reversed, is more than removed.

IT may surprise some of our readers, as it has us, to learn from the French papers that a new cathedral is now being constructed in New York which is to have a dome sixteen feet higher than that of St. Peter's, in Rome. This dome is to have at its base four half-domes, and ten smaller half-domes are attached to the latter. This cathedral is dedicated to Saint Sophia, and is, we are told, for the use of the Catholics, whether Roman Catholics or Greek Catholics is not mentioned. The cost of the structure is estimated at ten million dollars. Where it is situated we are not informed, but it certainly seems destined to be one of the architectural wonders of the city.

NOTES ON IRON AND STEEL CONSTRUCTION.[1]—XVIII.

THE stresses in framed structures are readily determined by applying the geometrical and analytical methods given in the previous articles. It remains for the designer to work out the sizes of the various members, and the details of the connections from the stresses so determined. The making of such working-drawings as is necessary for the execution of the structure is not accomplished by any fixed rules or methods. The efficiency of the design by which the rigidity of the structure is insured under all conditions of loading, and the economical production of the work accomplished, depends to a decided degree upon the judgment and experience of the designer.

Before the truss or frame can be properly designed the exact distance between supports must be known, and if the work has already been erected it is advisable in all cases to take careful measurements of these distances rather than to depend upon the dimensions given on plans. Frequently buildings, though carefully constructed, are some few inches out on their principal dimensions, and if the exact span of the truss can be determined a better bearing upon the cap-stone is insured.

Where the truss or frame has been designed on an economical basis and the wall assumed to provide a certain amount of lateral support, its stability should be carefully calculated. In order to fix the determination of stress and that accurate stress-diagrams may be drawn, rigid ribs of steel are usually pin-connected at the heel and apex, and the design so arranged that the stresses in the several members are transmitted through the centre of the pins. In this manner the line of resistance in the rigid rib is known, for it must pass through the pin connections at either end and at the apex.

Where trusses are supported upon corbels the centre of effort of their reaction must be found, and the moment of this reaction upon the corbel considered about some point adjacent to the edge of the wall. It is usual in designing corbels supporting important frames to consider the centre of moment at least 1 inch inside of the wall. This precaution is taken from the fact that the masonry beneath the corbel has little bearing value so near the edge, as under great pressure it would chip and spall. The corbel must extend into the wall a sufficient length, and the weight of the superimposed wall above the corbel must be capable of exerting a moment about the centre of moments that will more than equal the moment created by the reaction of the truss. Not only must these several points be considered, but the transverse strength of the corbel must be analyzed in order to determine whether it is likely to fail by rupture, and besides, the shear of the corbel at the edge of the wall must be investigated.

The purlins supported upon steel frames which carry the roof construction are of either timber or of steel; when of the former they are commonly supported upon the top member of the frame and held in place with angle-iron clips, the ends of the purlins being commonly bolted to the clips in order to furnish some lateral support for the truss, and to prevent them from being displaced. When the purlins are of steel, light I-beams, or, more frequently, Z-bars, are used. These are either butted against the cheek of the top member and held in place with angle-iron clips, or else are bolted to the top flange of the chord member. Upon the purlins light common rafters are laid and not uncommonly the sheathing is laid diagonally and nailed to these rafters. The preference for a diagonal sheathing is that it adds considerable to the rigidity of the roof. Buildings of ordinary size over which the roof is supported upon steel trusses usually have end walls or gables, in which case no lateral bracing between the trusses need be provided. In large buildings, and particularly in open sheds such as are used for stations and depots, a carefully designed system of bracing should be provided. In most roofs of long span several systems of bracing will be employed. There will commonly be deep latticed trusses between the principal supporting columns, and probably several secondary latticed braces connecting vertical or diagonal members of adjacent trusses. To further stiffen the structure square tension-bars provided with turn-buckles run from corner to corner of the panels formed by the trusses and the latticed bracing. Large end-trusses of train-sheds must be wind-braced by providing a horizontal truss system—that is, trusses are built out horizontally from the vertical plane of the roof-truss, these being securely held in place by hangers and braces.

After the several stress-diagrams have been drawn for the frame it will be found that the combined stress is not always the maximum, for frequently a member will be in compression from the dead-load and in tension from the wind-load. Each member in the truss must, however, be always designed for the maximum stress, and where steel members are subjected to alternate compressive and tensile stresses, the allowable unit-stress for both compression and tension should be about 25 per cent less than the usual unit working-stress. In designing steel tension-members in buildings, unit-stresses as high as 18,000 or 20,000 are allowable. The member must, however, be carefully investigated, and its net section accurately determined by deducting all of the metal cut away for rivet-holes in any plane. It is not advisable, where a tension-member consists of two angles back to back, to employ greater unit tensile stress than 12,000 or 15,000 pounds from the fact that these members are usually connected to a gusset-plate through one leg of the angle only. This design does not permit a stress to be conveyed in a line axial with the centre of the rolled section; so that, the side pull tends to produce a tearing effect rather than a direct stress.

[1] Continued from No. 1432, page 78.

Where a tension-member is connected to a gusset-plate and sufficient rivets cannot be placed in a single line without greatly increasing the size of the gusset-plate, angle clips may be employed in the method shown in Figure 126. In this way the resistance of the connection at the end of the member may be greatly increased, and the strength of the net section realized. All tension-members in composite-trusses—that is, trusses in which heavy timbers are used for the rafter and compression members, and steel or wrought iron for the tension-members, are most conveniently made of round or square bars. When the tension-members are pin-connected through castings which support upon a square bearing the timber-members, it is preferable to make the tension-members of square bars, for with these bars an eye or loop is most conveniently turned, and a good bearing secured on the pin. It is most economical where round or square bars are used for tension-members, and a threaded end is required, to upset the end of the bar. In no instance should the upset end of the bar be a separate end welded to the principal piece; the upset should be formed directly upon the rolled bar. All tension-bars in composite trusses should be provided with turn-buckles, for only by this means is the exact distance from centre to centre of eye obtained, and besides, it is pertinent that some method of adjustment should be provided in order to take up sag, slack or shrinkage in the timber-members. Angle bars connecting, back to back, as a tension-member, when of greater length than 10 times the shortest leg of the angle, should be provided with separators, the separator consisting of either a piece of bar iron, or washers secured between the adjacent leg of the angles by rivets. If these separators are not provided at frequent intervals in long tension-members, the angles are apt to strike one against the other from vibration in the frame which will cause disagreeable chattering. Roof-trusses constructed of rolled steel-members are usually formed of rolled shapes placed back to back so that all of the stresses will be distributed symmetrically in a vertical plane. In the construction of such trusses economy of workmanship supplants economy of material; and though the stresses, from the diagrams,

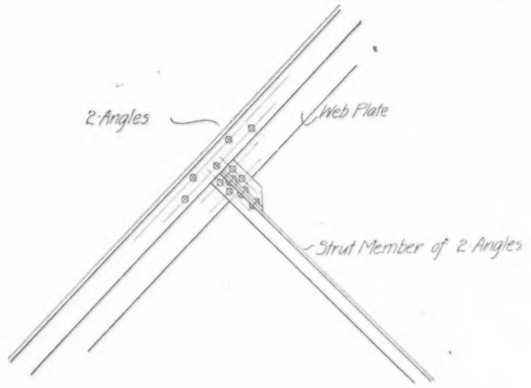


Fig. 126.

would indicate that $\frac{5}{8}$-inch rivets could be used in one place, while $\frac{3}{4}$-inch were required in another, such practice would necessitate the changing of the dies in the punches and riveters, and would cause considerable confusion and movement of work about the shop. It is therefore good practice to adhere to one size of rivet throughout one piece of structural work.

In connecting the several members at their junctions gusset-plates are used. Where the truss is exposed, some consideration should be paid to appearance in designing these plates, and in large arched trusses the gusset-plates are sometimes so cut as to form neat panels with rounded corners. This care in design, however, causes considerable additional expense and is only employed in first-class work. Gusset-plates for small trusses may be $\frac{1}{4}$-inch in thickness, but it is best practice to use gusset-plates not less than $\frac{5}{16}$-inch, and they are seldom more than $\frac{1}{2}$-inch thick. All gusset-plates should be cut neatly to size, and though they may be sheared to shape the shearing should be neatly executed, without jagged edges showing in the work.

In designing the strut-members of a structural frame the usual formulas for structural steel columns should be employed. All such struts should have an unsupported length not exceeding 45 times the least dimension. In considering compression-members it is not necessary to deduct for rivet-holes, and to use the net section, in the calculations, for when the rivets are well upset they fill the hole completely and furnish any required degree of resistance to compression. The rivets connecting the ends of struts must be analyzed for shear and for bearing on the gusset-plate.

Engineering practice in some instances, dictates that all connections, including those for struts and compression-members, shall be designed to realize the full strength of the member so connected. Frequently, however, it is found convenient to use members having a great excess of strength, and the practice just proposed would, in consequence, be far from economical. At least the connection must be designed to realize the full amount of the stress obtained from the frame-diagrams, and if the riveting of the connection under consideration is to be executed in the field, the connection should be designed

so that it will have at least 25 per cent excess of strength over that required. Where struts are composed of several rolled shapes they must be securely tied together, either with separators, tie-plates or lattice-bars. If the several rolled shapes are connected with separators or tie-plates, the distance from centre to centre of separator or plate should not exceed 6 times the smallest diameter of the rolled shapes connected. Where the elements of the strut are tied together with lattice-bars, the standard spacing for such bars should be used, and in designing such members the following table will be found of use.

USUAL SPACING AND SIZE OF LATTICE BARS.

ALL DIMENSIONS IN INCHES.

Depth of Channel or Dimension of Side of Member.	Dimensions of Latttice Bars		Weight of Bars	Distance from Centre of Hole to End of Bar.	Distance from Centre to Centre of Rivets Measured Parallel with Member	
	Width.	Thickness.	Pounds.		Minimum.	Maximum.
6	$1\frac{1}{2}$	$\frac{1}{2}$	1.28	$1\frac{1}{8}$	$11\frac{1}{2}$	$6\frac{5}{8}$
7	$1\frac{1}{2}$	$\frac{1}{2}$	1.49	$1\frac{1}{8}$	$13\frac{1}{2}$	$7\frac{5}{8}$
8	2	$\frac{1}{2}$	2.12	$1\frac{1}{2}$	15	$8\frac{11}{16}$
9	2	$\frac{1}{2}$	2 12	$1\frac{1}{2}$	$16\frac{1}{2}$	$9\frac{3}{4}$
10	2	$\frac{5}{8}$	2.55	$1\frac{1}{2}$	$18\frac{1}{2}$	$10\frac{11}{16}$
12	$2\frac{1}{2}$	$\frac{5}{8}$	2.87	$1\frac{5}{8}$	$22\frac{1}{2}$	13
15	$2\frac{1}{2}$	$\frac{5}{8}$	3.19	$1\frac{5}{8}$	$26\frac{1}{2}$	$15\frac{5}{16}$

Rafter members are frequently subjected not only to compressive stress, but as well to transverse stress. This occurs where secondary roof-members are supported at other positions along the rafter-members than at the panel-points. The maximum direct compressive stress to which the member is subjected can be determined from the stress-diagram, and from this the sectional-area required in the member may be calculated. The greatest transverse-stress may be calculated by the principle of moments. When the moment of inertia of the rafter-member and its section-modulus has been determined, the maximum unit-stress at the extreme fibre can then be figured, and if, when the unit compressive-stress has been added to this maximum unit transverse-stress the same does not exceed the allowable working-stress of the metal, the member may be considered as safe against failure.

In designing steel trusses consideration must be paid to the shipment size of the several parts. If the work is to be sent to a distant point by rail, it must be in such sized pieces as can be accommodated by the car and the size of the tunnels or overhead bridges along the line of the road. In shipment, thin gusset-plates if attached to the heavy members are likely to be badly bent and twisted by the time the work reaches its destination, so that it is usually better to do an additional amount of field-work than to run the chance of having difficulty with the fitting-up. All structural steel-work should be painted in the shop before shipment so that initial rust and corrosion shall be avoided. There is a great difference of opinion regarding the character of paint that should be used on structural steel-work. Experience, however, has shown pretty conclusively that for durability a mixture of red and white lead and good linseed oil is a preferable coating. All plates and angles connected in the shop should have the scale, rust or dirt removed, and be given a good coat of linseed oil; this is preferable to using heavy body-paint from the fact that the paint dries out, and being so thick is apt to scale off and drop out of the connections.

In conjunction with the design of roof-trusses it is interesting to note the conditions which must be complied with in the construction of such work in large cities. The New York building-laws having been carefully revised and being thoroughly up-to-date, are quoted herewith :

"All iron or steel trimmer-beams, headers and tail-beams shall be suitably framed and connected together, and the iron or steel girders, columns, beams, trusses and all other iron-work of all floors and roofs shall be strapped, bolted, anchored and connected together and to the walls.

"All beams framed into and supported by other beams or girders, shall be connected thereto by angles or knees of a proper size and thickness, and have sufficient bolts or rivets in both legs of each connecting angle to transmit the entire weight, or load coming on the beam to the supporting beam or girder.

"In no case shall the shearing value of the bolts or rivets or the bearing value of the connection angles exceed those given herewith :

Rolled steel, direct compression	16,000 pounds.
Steel pins and rivets, bearing	20,000 pounds.
Wrought-iron pins and rivets, bearing	15,000 pounds.
Steel web-plates, in shear	9,000 pounds.
Steel shop rivets and pins, in shear	10,000 pounds.
Steel field rivets, in shear	8,000 pounds.
Steel field bolts, in shear	7,000 pounds.
Wrought-iron web-plates, in shear	6,000 pounds.
Wrought-iron shop rivets and pins, in shear	7,500 pounds.
Wrought-iron field rivets, in shear	6,000 pounds.
Wrought-iron field bolts, in shear	5,500 pounds.

"The distance from centre to centre of a rivet-hole to the edge of the material shall be not less than $\frac{7}{8}$ of an inch for $\frac{1}{2}$-inch rivets; $\frac{7}{8}$ of an inch for $\frac{5}{8}$ inch rivets; $1\frac{1}{8}$ inches for $\frac{3}{4}$-inch rivets; $1\frac{1}{4}$ inches for 1 inch rivets.

"Wherever possible, however, the distance shall be equal to 2 diameters. All rivets, wherever practicable, shall be machine-driven. The rivets in connection shall be proportioned and placed to suit the stresses. The pitch of rivets shall never be less than 3 diameters of the rivet, nor more than 6 inches. In the direction of the stress it shall not exceed 16 times the least thickness of the outside member.

"At right angles to the stress it shall not exceed thirty-two times the least thickness of the outside member. All holes shall be punched accurately, so that upon assembling a cold rivet will enter the hole without straining the material by drifting. Occasional slight errors shall be corrected by reaming. The rivets shall fill the holes completely; the heads shall be hemispherical and concentric with the axis of the rivet.

"Gussets shall be provided wherever required, of sufficient thickness and size to accommodate the number of rivets necessary to make a connection.

"Where riveting is not made mandatory, connections may be effected by bolts. These bolts shall be of wrought-iron or mild steel and they shall have United States Standard threads. The threads shall be full and clean, the nut shall be truly concentric with the bolt, and the thread shall be of sufficient length to allow the nut to be screwed up tightly. When bolts go through level flanges, bevel washers to match shall be used so that head and nut of bolt are parallel.

"When bolts are used for suspenders, the working-stresses shall be reduced for wrought-iron to 10,000 pounds, and for steel to 14,000 pounds per square inch of net area, and the load shall be transmitted to the head or nut by strong washers distributing the pressure evenly over the entire surface of the same. Turned bolts in reamed holes shall be deemed a substitute for field rivets.

"Trusses shall be of such design that the stresses in each member can be calculated. All trusses shall be held rigidly in position by efficient systems of lateral and sway bracing, struts being spaced so that the maximum limit of strength to least radius of gyration of the parts connected does not exceed forty. In considering the length, the distance between the nearest rivets of two stay-plates shall be considered.

"For tension members of riveted steel and wrought-iron trusses the actual net area only, after deducting rivet-holes, $\frac{1}{8}$ inch larger than the rivets, shall be considered as resisting the stress. If tension-members are made of angle-irons riveted through one flange only, only that flange shall be considered in proportioning areas. Rivets to be proportioned as prescribed heretofore.

"If the axis of two adjoining web members do not intersect within the line of the chords, sufficient area shall be added to the chord to take up the bending-strains. No bolts shall be used in the connections of riveted trusses, excepting when riveting is impracticable, and then the holes shall be drilled or reamed.

"The bending-stresses on pins, in pin-connected trusses, shall be limited to 20,000 pounds for steel and 15,000 pounds for iron. All compression members in pin-connected trusses shall be proportioned, using 75 per cent of the permissible working-stress for columns. The heads of all eye-bars shall be made by upsetting or forging. No weld will be allowed in the body of the bar. Steel eye-bars shall be annealed. Bars shall be straight before boring. All pin-holes shall be bored true, and at right angles to the axis of the members, and must fit the pin within $\frac{1}{32}$ of an inch. The distances of pin-holes from centre to centre for corresponding members shall be alike, so that, when piled one upon another, pins will pass through both ends without forcing. Eyes and screw ends shall be so proportioned that upon test to destruction, fracture will take place in the body of the member. All pins shall be accurately turned. Pin-plates shall be provided wherever necessary to reduce the stresses on pins to the working-stresses given, as follows: —

Rolled steel pins, rivets and bolts, for bending	20,000 pounds.
Rolled wrought-iron pins, rivets and bolts, for bending	15,000 pounds.

"These pin-plates shall be connected to the members by rivets of sufficient size and number to transmit the stresses without exceeding working-stresses.

"All rivets in members of pin-connected trusses shall be machine-driven. All rivets in pin-plates which are necessary to transmit stress shall be also machine-driven. The main connections of members shall be made by pins. Other connections may be made by bolts.

"If there is a combination of rivetted and pin-connected members in one truss, these members shall comply with the requirements for pin-connected trusses; but the riveting shall comply with the following requirements.

"For tension members the actual net area only, after deducting rivet-holes $\frac{1}{8}$ inch larger than the rivets, shall be considered as resisting the stress. If the members are made of angle-irons riveted through one flange only, the flange shall be considered in proportioning the areas.

"If the axes of two adjoining web members do not intersect with the line of the chords, sufficient area shall be added to the chord to take the bending-strains. No bolts shall be used in the connections of riveted trusses excepting when riveting is impracticable, and then the holes shall be drilled or reamed."

In order to more clearly explain the principle and methods employed in the design of details for roof-trusses, the problem illustrated in Figure 127 [See Illustrations] will be discussed. This frame consists of an A-shaped truss, supporting purlins at several points along

the rafter-member, and carrying an attic-floor load on the tie member, which is composed of two 12-inch 20-pound channels.

The member marked *A* is in tension, while *B* is a strut which is subjected to compression. The rafter-member *C* sustains not only considerable compression, but is likewise subjected to transverse-stress from the purlin-loads. In the tie-member *D* is created both tension and transverse stress, while in the leg of the truss, from the fact that it is considered that its foot is not rigidly secured to the masonry abutment or wall, there exists great transverse-stress and considerable compressive-stress. It is evident by inspection that the ratio between the resistance of the member and the bending-moment is greatest at the splice-joint marked *f*, and in considering the strength of the member, the section at this point must be analyzed. In discussing the problem a survey of the work will be discussed, rather than the actual design — that is, it will be considered that the truss has been constructed, and the problem is to determine the resistance of the several members.

Member A.— The maximum resistance of this tension-member is the strength of its net-section. In economical design the entire net-section of the member could be taken, but if the frame is subjected to the requirements of City Laws, it is probable that they would compel a certain percentage of reduction in the net-section, from the fact that the effort of the stress is applied axially along only one member of the angles. The sectional-area of one $2\frac{1}{2}'' \times 2\frac{1}{2}'' \times \frac{3}{8}''$ angle is 1.78 square inches, so that the gross area of the member is equal to 3.56 square inches; at no place throughout the member is there more than one rivet-hole on a line at right angles to the axis of the member; the rivets are $\frac{3}{4}$ inch in diameter, and the rivet-holes should be considered as $\frac{1}{8}$ inch larger; the sectional-area removed from the member is therefore equal to $2 \times .875 \times .375 = .656$ square inches. In this multiplication is included the number of rivets, which is two, the diameter of the rivet-hole, .875, and the thickness of leg of the angle through which the hole is punched, or .375. The net section of the member is equal to the gross section from which has been deducted the metal cut away, so that since the gross sectional-area is equal to 3.56, and the area cut away is equal to .656, the remaining area is equal to 2.9 square inches. Providing that a unit tensile resistance of 15,000 pounds is assumed for this member, the strength of the member will equal $2.9 \times 15{,}000 = 43{,}500$ pounds.

It is probable, however, that the connection of this member with the gusset-plate at the apex and in conjunction with the lower tie-member, does not realize the full strength of the member; this, however, may be determined by considering the strength of the five rivets in these connections. The rivets are evidently in double shear and web-bearing, and it remains to determine which element is the weakest. In proportioning riveted connections for bridges and buildings it is usual to allow on steel rivets 9,000 pounds for shearing and 18,000 pounds for bearing. Working on this basis, the value of the $\frac{3}{4}$-inch rivet in double shear, and a unit shearing stress of 9,000 pounds, is equal to $3{,}970 \times 2 = 7{,}940$ pounds. For a bearing of 18,000 a $\frac{3}{4}$-inch plate, which is the thickness of the gusset-plate, is equal, for a $\frac{3}{4}$-inch diameter rivet, to 5,050 pounds; it is evident, therefore, that the rivets in double shear are somewhat in excess of the allowable bearing value for the gusset-plate, so that the latter value of 5,050 pounds will be employed; there are five rivets, and in consequence the allowable strength of the connection is equal to 5,050 pounds $\times 5 =$ 25,250 pounds. Throughout the practice of steel-construction it is constantly in evidence that the judgment of the designer and his individuality greatly influence the design. Some would consider an allowable unit-stress for the metal in this tension-member at 18,000 pounds, and would likewise take the bearing value of the gusset-plate considerably higher, from the fact that it is in web-bearing. On the other hand some would be more conservative and use much smaller working-stresses.

Member B.— By inspection of this member it is known that its connections are not adequate to provide a resistance equal to the allowable strength of the member, from the fact that the member is composed of two heavy angles, back to back, and is of comparatively short length. Referring to the following table, it may be ascertained that a compression-member composed of two $4'' \times 4'' \times \frac{5}{16}''$ angles 8 feet long will safely sustain 23 tons, or 46,000 pounds.

The values in this table for columns under 30 radii of gyration have been calculated from a unit-stress of 12,000 pounds; for columns over 30 radii of gyration in length the following formula has been employed: —

$$s = 13{,}500 - 50\,\frac{l}{r}.$$

In this formula s equals the allowable unit-stress for the section of the member, l equals the length of the column in inches, and r equals the least radius of gyration for the combined section. The value of 23 tons selected from the table for a column having an

SAFE LOADS IN TONS FOR STEEL ANGLES USED AS STRUTS OR COLUMNS, PLACED BACK TO BACK $\frac{1}{4}$ INCH APART.

EQUAL LEGS.

Size of Angles, in inches.	Thickness of Angles, inches.	Least Radius of Gyration, inches.	Area of Section, sq inches.	Unsupported length of Column, in feet.												
				2	3	4	5	6	8	10	12	14	16	18	20	22	24
6 × 6	$\frac{7}{8}$	1.87	20.06				119	116	109	103	96 6	90.2	83.8	77.4	71.0	64.6	58.2
6 × 6	$\frac{5}{8}$	1.88	8.72				51.9	50.5	47.7	45.0	42.2	39 4	36.6	33.8	31.0	28.2	25.4
5 × 5	$\frac{3}{4}$	1.55	14.22			85 0	82.2	79.5	74.0	68 5	63 0	57.4	51.9	46.4	40.9		
5 × 5	$\frac{5}{8}$	1 56	7.22			43.2	41.9	40.5	37.7	34 9	32 1	29.3	26 6	23.8	21.0		
4 × 4	$\frac{13}{16}$	1.24	12.22		73 3	70.7	67.8	64.9	59.0	53.0	47.1	41.1	35.2				
4 × 4	$\frac{5}{16}$	1.24	4.80		28.8	27.7	26.6	25.4	23.1	20.8	18.4	16.1	13 8				
3½ × 3½	$\frac{1}{2}$	1.04	7.96		46.9	44.4	42.2	39.9	35 3	30.8	26.2						
3½ × 3½	$\frac{5}{16}$	1.08	4.18		24.7	23.7	22.5	21.3	19.0	16.6	14.3						
3 × 3	$\frac{1}{2}$	.94	7.12	42.7	41.2	38 9	36.7	34.4	29 9	25.3	20 8						
3 × 3	$\frac{1}{4}$	.93	2 88	17.2	16.7	15.8	14.8	13.9	12 0	10.2	8.3						
2½ × 2½	$\frac{1}{2}$	.76	4.62	27.5	25.7	23.9	22 0	20.2	16.6	12 9							
2½ × 2½	$\frac{1}{4}$	.77	2.38	14.2	13.2	12.3	11.4	10.5	8 7	6.8							
2½ × 2½	$\frac{1}{2}$	.70	4.22	24.9	23.1	21.3	19.5	17.6	14 0								
2½ × 2½	$\frac{3}{16}$	.69	1.62	9.5	8.8	8.1	7.4	6.7	5 3								
2 × 2	$\frac{1}{2}$	.62	3.72	21.5	19.7	17.9	16.1	14.3	10.7								
2 × 2	$\frac{3}{16}$	.62	1.42	8.2	7.5	6.8	6.1	5.4	4.1								

UNEQUAL LEGS.

Size of Angles, in inches.	Thickness of Angles, inches	Least Radius of Gyration, inches.	Area of Section, sq. inches	Unsupported length of Column, in feet.												
				2	3	4	5	6	8	10	12	14	16	18	20	22
6 × 4	$\frac{7}{8}$	1.87	16.68				99.2	96.5	91.2	85 8	80.5	75.2	69.8	64 5	59.1	53.8
6 × 4	$\frac{5}{8}$	1.67	7.22			43.4	42.2	40.9	38.3	35 7	33.1	30.6	28.0	25.4	22.8	
5 × 3½	$\frac{3}{4}$	1.59	11.96			71.8	69.5	67.3	62.8	58.3	53.8	49.2	44.7	40.2	35 7	
5 × 3½	$\frac{5}{8}$	1.51	6.10			36.3	35.1	33 9	31.5	29.1	26.6	24.2	21.8	19.4		
5 × 3	$\frac{3}{4}$	1.42	11.36			67.1	64.7	62 3	57.5	52.7	47.8	43.0	38 2	33.4		
5 × 3	$\frac{5}{16}$	1.26	4.80		28.8	27.8	26.7	25.5	23.2	21.0	18.7	16.4	14.1			
4½ × 3	$\frac{3}{4}$	1.43	10.46		62.8	61.8	59.6	57.4	53.0	48.6	44.2	39.8	35 4			
4½ × 3	$\frac{5}{16}$	1.31	4.50		27.0	26 2	25.2	24.2	22.1	20.1	18.0	16.0	13.9			
4 × 3½	$\frac{3}{4}$	1.24	10.46		62.8	60.5	58.0	55 4	50.4	45.3	40.2	35 2	30.1			
4 × 3½	$\frac{5}{16}$	1.26	4.50		27.0	26.1	25.0	24.0	21.8	19.7	17.5	15.4	13.2			
4 × 3	$\frac{5}{8}$	1.23	7.96		47.8	46.0	44.1	42.1	38.2	34.3	30.4	26.5	22.6			
4 × 3	$\frac{5}{16}$	1.27	4.18		25.1	24.3	23.3	22.3	20.3	18.4	16.4	14.4	12.4			
3½ × 3	$\frac{5}{8}$	1.06	7.34		43.3	41 2	39.1	37.1	32.9	28.7	24.6	20.4				
3½ × 3	$\frac{5}{16}$	1.10	3.86		22.9	21.9	20.8	19.7	17.6	15.5	13.4	11.3				
3½ × 2½	$\frac{5}{16}$	1.10	6.26		37.1	35 4	33.7	32.0	28 6	25.1	21.7	18.3				
3½ × 2½	$\frac{1}{4}$	1.12	2.88		17.1	16.4	15.6	14.8	13.2	11.7	10.1	8.6				
3 × 2½	$\frac{5}{16}$	.93	5.68	34 2	32.9	31.1	29.2	27.4	23.7	20.1	16 4					
3 × 2½	$\frac{1}{4}$	.95	2.62	15.7	15.2	14.4	13.6	12.7	11.1	9.4	7.8					
3 × 2	$\frac{1}{4}$	.92	4.50	27.0	25.9	24.4	23.0	21.5	18 6	15.7	12.8					
3 × 2	$\frac{1}{4}$	.93	2.38	14.3	13.9	13 1	12.3	11.5	10.0	8.4	6.9					
2½ × 1½	$\frac{5}{16}$	.70	2.14	12.6	11.6	10.6	9.7	8.8	7.1							
2½ × 1½	$\frac{3}{16}$	.72	1.34	7.9	7.4	6.8	6.3	5 7	4.6							

unsupported length of 8 feet is evidently obtained from this formula, and to check the value the following calculation may be made: —

$$s = 13{,}500 - 50 \times \frac{96}{124} = 23.1$$

In proportioning compression-members it is not necessary to consider the net section from the fact that the strength of the member is not materially destroyed by punching for rivet-holes; in fact, in compression-members as usually constructed there is a superfluity of material at the extremes, so that cutting at these points does not effect any practical reduction of strength. The connections for this compression-member may be figured in the same manner as those for the tension-member marked *A*. Each rivet may be considered as having a bearing value upon the $\frac{3}{8}$-inch gusset-plate at the foot of the member and the web-plate of similar thickness at the top, of 5,050 pounds. There being four rivets, it is evident that the strength of the connection is only 20,000 pounds, or 5 tons, while the member is capable of carrying at least 23 tons.

Member C. — The next member to consider is that marked *C*, which is the rafter-member of the frame. This member is composed of two 3½″ x 3½″ x ⅜″ angles placed back to back along one edge of the 10″ x ⅜″ web-plate. Not only is this member subjected to direct compressive stress, but from the fact that the purlins are located at other positions than the panel points it must sustain considerable transverse stress. Upon deciding the amount of direct compressive stress this member will safely carry, it is necessary to determine the extreme fibre-stress produced by the transverse loads. In order to determine this stress the loads upon the truss should be investigated. The reactions from the ends of the purlins consist of those due to the vertical loads, which is the weight of the roofing material, and the normal loads, or those due to the wind-pressure upon the roof. The trusses are considered as being spaced 12 feet from centre to centre, and, in consequence, the area supported by the purlin at *g* will, according to information given in Figure 127, equal $4.375 \times 12 = 52.5$ square feet, while the area of roof supported at the point *h* is equal to $4.75 \times 12 = 57$ square feet. It is considered that the effective vertical load due to the weight of the roofing materials is equal to 25 pounds per square foot of surface on the slope, so that the vertical load at the point *g* will equal $52.5 \times 25 = 1{,}312$ pounds, while the load supported at the point *H* will equal $57 \times 25 = 1{,}425$ pounds. These two results may, for convenience in figuring, be taken respectively at 1,400 and 1,500 pounds. The wind-loads sustained at the points *g* and *h*, which are calculated for the same areas and for a pressure of 30 pounds per square foot, are equal respectively to 1,575 pounds and 1,710 pounds, which for convenience may be increased to 1,600 and 1,800 pounds. To determine the greatest bending-moment upon the upper portion of the rafter-member between points *x* and x_1, it is advisable to calculate the reactions at the point *i* for both the vertical and normal loads, to figure separately the bending-moment for each of those loads, and to determine the maximum moment by taking their sum. A diagrammatical representation of the loads upon the upper portion of the rafter-member is shown at (*a*) and (*b*) in Figure 128. At (*a*) is shown a diagram for the vertical loads, all dimensions being horizontal measurements, while at (*b*) is shown a diagram for the wind-loads, or the forces acting normal to the slope of the roof. The dimensions in this diagram are taken parallel with the slope of the roof. It is now required to calculate in each case the right-hand reaction; considering the diagram at (*a*), the tabulation will be as follows: —

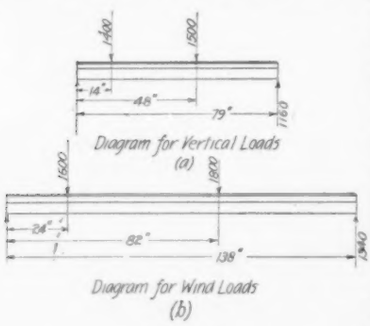


Fig. 128.

Moment for vertical load $g = 1{,}400 \times 14 =$	19,600 inch-pounds
Moment for vertical load $h = 1{,}500 \times 48 =$	72,000 inch-pounds
Total moment ..... =	91,600 inch-pounds

The right-hand reaction will, in consequence, be found by dividing $91{,}600 \times 79$, which gives 1,160 pounds, or the amount of the reaction at *i* due to the dead or vertical load upon the upper portion of the rafter member. Considering the diagram marked (*b*), the calculations are as follows: —

Moment for wind load $g = 1{,}600 \times 24 =$	38,400 inch-pounds
Moment for wind load $h = 1{,}800 \times 82 =$	147,600 inch-pounds
Total moment..... =	186,000 inch-pounds

and the reaction at the right equals $186{,}000 \div 138 = 1{,}340$ pounds. The bending-moment at the point *h* in each case may now be determined by multiplying the amount of each of the reactions just determined by their respective distances from the right-hand end of the rafter-member to the point *h*. The bending-moment due to the dead-load is equal to $1{,}160 \times 31 = 35{,}960$ inch-pounds, while the bending-moment due to the wind-load is equal to $1{,}340 \times 56 = 75{,}040$ inch-pounds; the total bending-moment existing at the point *h* is equal to the sum of these two moments, or $75{,}040 + 35{,}960$, which gives 111,000 inch-pounds, this being the greatest bending-moment upon the upper portion of the rafter-member. In considering this bending-moment the rafter-member was not considered as a continuous beam, for in the design of all framed structures it is necessary to assume that the several panel points or connections throughout the frame are hinged, or pin-connected; therefore in considering the upper portion of the rafter-member as a simple beam, and thus disregarding its continuity from the heel of the truss to the apex, any results that might be determined will tend towards a greater factor of safety. This is readily explained by the fact that a continuous beam possesses greater resistance than a number of simple beams having combined the same span.

Now that the greatest bending-moment has been found, it is next required that the resistance of the section shall be calculated. A diagram of the section is given in Figure 129 and it is necessary to determine its properties, that is, the location of the neutral axis, the moment of inertia, the section modulus and the radius of gyration. The location of the neutral axis is found by dividing by the total area of the section the sum of the moments obtained by multiplying the area of each element of the section by the distance from its centre of gravity to the line of origin of moments. The distance from the centre of gravity of the two angles to the line of origin of moments is 1 inch, and the distance from the

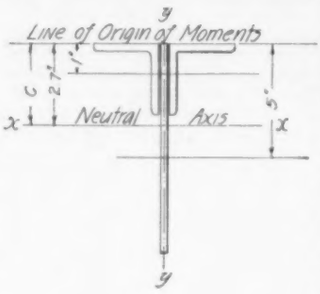


Fig. 129.

centre of gravity of the web-plate to the same line is 5 inches; the area of each angle is 2.53 square inches, while the area of the web-plate is 3.75 square inches. The calculation for the moments may then be arranged as follows: —

Two angles $= 2.53 \times 2 \times 1 =$	5.06
One plate $= 3.75 \times 5 =$	18.75
Sum of moments..... =	23.81

The total area of the section is 8.81 square inches and the total moment, as obtained, is 23.81, so that the distance *c* is equal to $23.81 \div 8.81 = 2.7$ inches. The formula for calculating the moment of inertia is $I = \Sigma\, a\, d^2 + i$; in this formula *a* equals the area of each elementary section; *d* equals the distance from the centre of gravity of the section to the neutral axis, and *i* equals the moment of inertia of the section; the calculation for the section shown will then be as follows: —

Two angles $= 5.06 \times 1.7^2 + 6 =$	20.62
One plate $= 3.75 \times 2.3^3 + 31.2 =$	51.03
Moment of inertia of section =	71.65

When the moment of inertia has been found in this manner both the section modulus and the radius of gyration may readily be determined. The former may be represented by *Q*, and is equal to $\frac{I}{c}$, while the latter is designated by *R*, and equals $\sqrt{\frac{I}{A}}$. In the first formula *c* is the greatest distance from the neutral axis of the section to the outside fibre, which since the entire depth of the section is equal to 10 inches, and the least distance from this axis to the outside fibre is 2.7 inches, as previously found by calculation, is equal to $10 - 2.7 = 7.3$ inches. By substituting, therefore, the value and the amount of the moment of inertia or *I* in the formula $Q = \frac{I}{c}$, $Q = \frac{71.65}{7.3} = 9.8$, and by substituting in the other formula, or, $R = \sqrt{\frac{I}{A}}$ the value of $R = \sqrt{\frac{71.65}{8.81}}$ or 2.83.

In all beams in equilibrium the bending-moment must equal the resisting-moment, or, as it may be expressed by a very familiar formula, $M = M_1$; consequently if $M_1 = Q\,s$, *M* must likewise equal $Q\,s$. By transposition of the formula $M = Q\,s$, $S = \frac{M}{Q}$, in which, as is sufficiently clear by the subject matter, *M* equals the maximum bending-moment existing in the upper portion of the rafter-member of the frame under consideration, which is 111,000 inch-pounds, *Q* equals the modulus of the section, which, as just obtained, is equal to 9.8, and *s* is the maximum unit-stress occurring in the extreme fibre of the section which it is desirable to find. Again substituting, therefore, $s = \frac{111{,}000}{9.8}$ or 11,300 pounds. In such a frame as this truss an allowable extreme fibre-stress of 16,000 pounds per square inch may be adopted with safety. The difference, therefore, between the allowable unit-stress and the extreme stress due to the transverse action of the purlin reactions or roof-loads, will be the amount of unit-stress allowable for the direct compressive stress exerted through this member of the frame. The unit-stress that may then be considered for the direct stress is equal to $18{,}000 - 11{,}300 = 6{,}700$ pounds.

As a compression-member the upper portion of the rafter-member

has a length greater than 30 radii of gyration, so that this stress cannot be considered for its full amount, but must be reduced in the proportion required, by the usual column formula for a strut of this length. It is permissible therefore to employ the formula $s = s_1 - 50\frac{l}{r}$, and to reduce the residuum allowable stress by the proportion of s to s_1, which is equivalent to taking a percentage of the residuum stress equal to $\frac{s_1}{s}$. The value of s_1 as given before is 13,500, and the length of the member in inches, or l, may be taken at 138, where as the purlins are considered as being securely bolted to the clips riveted to the angles of the rafter-member r, may be taken about the axis $x\,x$, Figure 129, instead of, as ordinarily, about the axis $y\,y$, which would give the least value of r. The value of r in the formula will then be taken at 2.83, while the value of s, which is found by substituting in the formula $s = s_1 - 50\frac{l}{r}$, equals 11,065; then applying the proportion $\frac{s_1}{s}$, the percentage of the residuum-stress which may be considered in determining the strength of the upper rafter-member is equal to $\frac{11,065}{13,500}$, or 82 per cent. The residuum-stress remaining after the extreme fiber-stress instituted by the transverse-stress has been deducted from the allowable unit working-stress is 6,700 pounds, and 82 per cent of this unit is 5,495 pounds. Since the sectional area of the member under consideration is 9.8 square inches, the total amount of compression allowable in the member is $5{,}495 \times 9.8 = 53{,}851$ pounds. The connections of this member at the apex and at the foot should be considered, to determine whether the vertical reactions due to the purlin-loads and the direct stresses instituted in the frame are amply provided for by the shearing and bearing values of the rivets.

As previously stated, the weakest point in the leg of the truss is probably at F, for around this point there exists the greatest moments due to the vertical-load and wind reactions. The leverage of these forces about a point higher up on the member is greater, but the depth of the member is increased in a far greater ratio, so that the section modulus, in proportion to the bending-moment, is greater.

Referring to Figure 130, it is observed that the right-hand leg of the truss, under the conditions of loading shown in the diagram, is subjected to bending moment by the reaction R_1 acting with the lever-arm x, while R_2 acts about the same point with a lever-arm of y. At this point, however, the greatest moment may not exist, for reference to the right-hand foot of the truss reveals the fact that while the reaction R_2 is of the same amount, and acts with the same lever-arm as R_1, the reaction R_4 is greatly increased, though its lever arm is not as great as at the right-hand foot of the truss. It is necessary, therefore, to determine the amount of the greatest bending-moment, and then adopting an allowable unit-stress, determine the section modulus required. When this has been done, and the member proportioned for the transverse-stress, sufficient material must be added by thickening the rolled shapes or by providing additional flange plates in order to provide resistance for the direct compressive-stress. In a truss of this character the strength of the legs of the truss is greatly increased, and the stresses throughout the truss diminished by providing horizontal thrusts at the foot of the truss. This is accomplished by the use of heavy walls, and anchor-bolts through the foot of the truss, secured into the stonework. The tie-member supports, besides a direct tensile-stress, a transverse-load and the greatest bending-moment for a continuous beam provided with two intermediate supports, should be calculated. From this result the section modulus required may be obtained, and the additional material added for providing the necessary tensile-resistance. In all cases where there are two stresses acting upon a member the greatest unit fibre-stress from both stresses should not exceed the allowable stress, and when the stresses are intermittent or alternating, the safe allowable unit fibre-stress should be reduced at least 25 per cent.

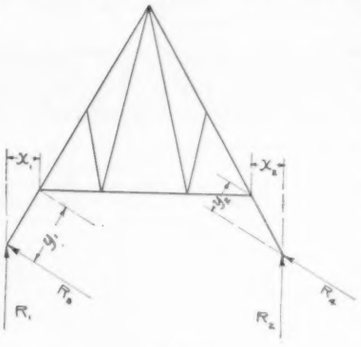


Fig. 130.

M. M. Sloan.

[The end.]

ILLUSTRATIONS

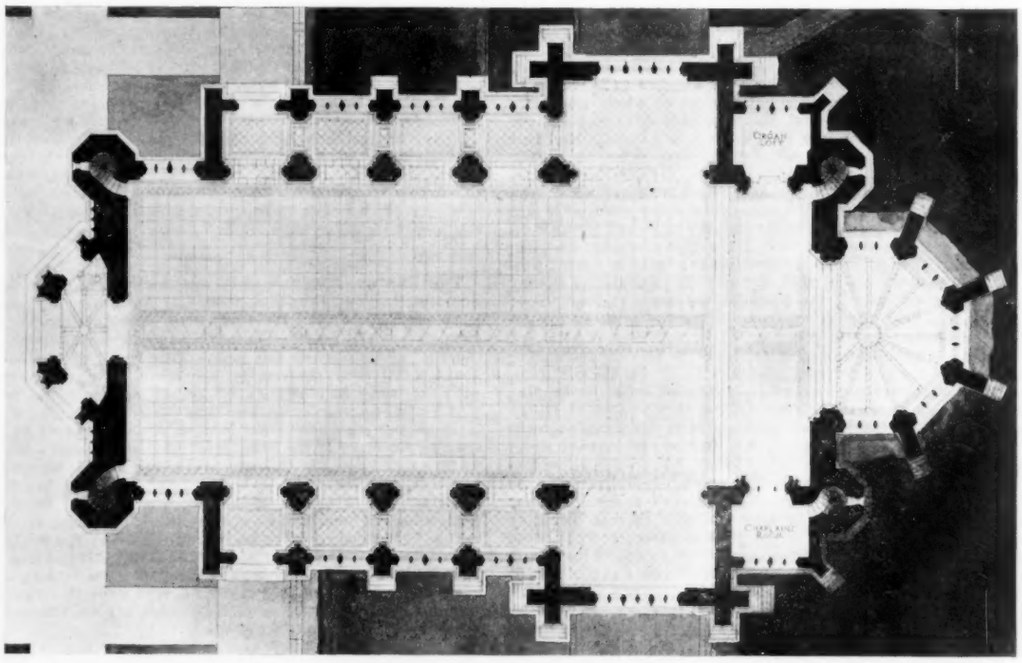
[Contributors of drawings are requested to send also plans and a full and adequate description of the buildings, including a statement of cost.]

STATUE OF WILLIAM ELLERY CHANNING, D.D., PUBLIC GARDEN, BOSTON, MASS. MR. HERBERT ADAMS, SCULPTOR.

SUGGESTED ALTERATIONS OF THE CITY-HALL, BRIDGEPORT, CONN. MR. J. W. NORTHROP, ARCHITECT, BRIDGEPORT, CONN.

FIG. 127: NOTES ON IRON AND STEEL CONSTRUCTION. MR. M. M. SLOAN, ENGINEER, SCRANTON, PA.

A COMPETITIVE DESIGN FOR THE NATIONAL COMMERCIAL BANK BUILDING, ALBANY, N. Y. BRUCE PRICE, ARCHITECT.



Plan of Chapel: U. S. Military Academy, West Point, N. Y. Cope & Stewardson, Architects.

Additional Illustrations in the International Edition.

MONUMENT TO WILLIAM ELLERY CHANNING, D.D., BOSTON, MASS. MR. HERBERT ADAMS, SCULPTOR; MR. V. C. GRIFFITH, ARCHITECT.

COMPETITIVE DESIGN FOR CHAPEL: U. S. MILITARY ACADEMY, WEST POINT, N. Y. MESSRS. FROST & GRANGER, ARCHITECTS, CHICAGO, ILL.: TWO PLATES.

COMPETITIVE DESIGN FOR CHAPEL: U. S. MILITARY ACADEMY, WEST POINT, N. Y. MESSRS. COPE & STEWARDSON, ARCHITECTS, PHILADELPHIA, PA.: DOUBLE PLATE.

NOTES & CLIPPINGS

WHISTLER'S QUARRELSOMENESS. — The quarrelsomeness of Whistler began with a combination of nervous fastidiousness and temperamental gayety of disposition. That spring, that elasticity of mind which kept his hand so full of craftsmanship was the source of his eternal youth, his quips and cranks and love of teasing. In time the habit became fixed and Whistler developed a Mephistophelean dexterity in touching the raw, ever losing thereby one friend after another. Like the dog that has a reputation for biting, the genial master made a desert about his den, but consoled himself with noting how efficacious this reputation was in holding off bores. The slow and ponderous nature of some of our British cousins lured him on, until what had been at first amusing made very often a close approach to tediousness. The ready applause won by Whistler's bright, stiletto-like remarks engaged him inevitably in the blind alley where a clever talker is found to talk too much — about himself. All this was mere surface. Underneath was a deep and discerning mind making play with peacock rooms and butterfly signatures to baffle and irritate those who could not understand. It will always be remembered that he was the greatest etcher of his age and the most profound colorist. He led the way from the easel to the decoration of interiors, brushing aside the absurd idea that painters of the easel picture form a superior caste. — *N. Y. Times.*

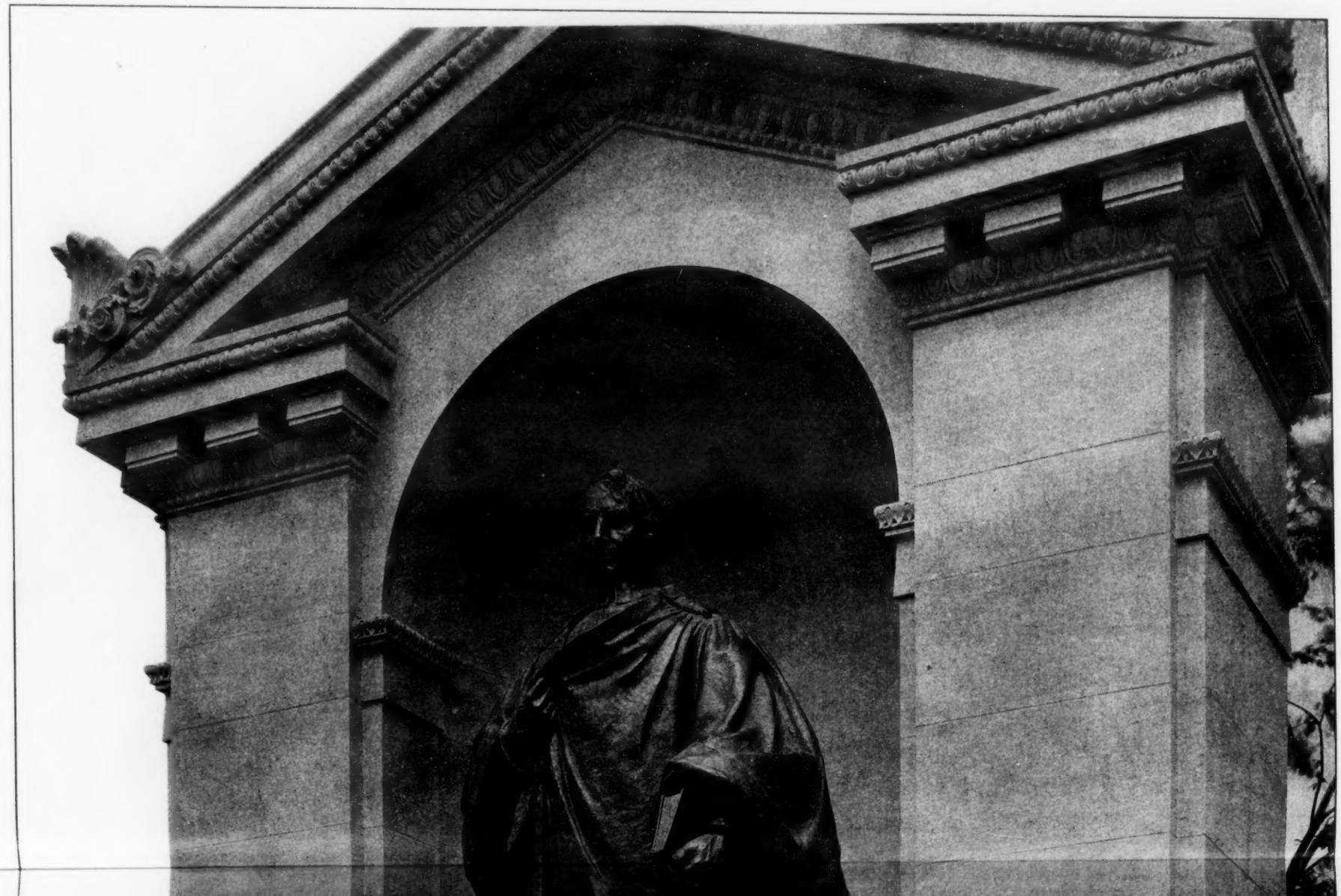
LITTLE ELECTROLYSIS IN PHILADELPHIA. — At the recent annual convention of the American Waterworks Association at Detroit Mr. Rowe said that there is no electrolysis in Philadelphia. In that city there are some 27,000 man-holes along the conduits that carry the large cables of the street railways back to the negative buss-bars of their dynamos at their eight or ten power-stations. The city electrician stated that, whenever his department found a difference of potential between the pipes and the rails they would immediately notify the manager of the car company who would rebond the rails or make some changes in them to take off this current. Where there is a difference of potential there must be some current, and this is a condition that must be remedied, even if it is necessary to open up the street and make another conduit connection from the large cables to the rail. But even in Philadelphia, with all these additional precautions, current is going on to the pipe; so that the aërial metallic circuit is possibly the only means which is entirely reliable. The argument in the Dayton suit has just been closed in the appeal to the Circuit court, and it is now submitted to that court. There are some cities that say they have not got electrolysis, and there may be more politics in that city than necessary; but, if they have the single trolley system, unquestionably it is only a matter of time until they will have to cope with electrolysis, and when that sets in simply cleaning out the pipe will not suffice. In a 6-inch line that burst at Dayton last year, the iron had been removed, and had left something like a plug of carbon 2 inches to 2½ inches in diameter. When that plug was taken out, it exposed a hole there like a flicker's hole in a telegraph pole. The superintendent had cut out about 4 or 5 feet of pipe to replace pipe where it had burst. He cut it out at the bell end and put on a sleeve at the other. When he went to caulk the pipe or cut off the gate lid, the chisel went right through that pipe into the other side, and there was a soft spot there which you could not have detected. You could not see anything wrong, yet that was so soft that the chisel went right through it and he had to cut it off to get the chisel out. On the under side of the pipe where the lead had been poured was noticed a suspicious appearance; he took out his penknife and just pushed the blade right through the pipe almost as easy as through a piece of cheese; the pipe did not burst at that place; probably the earth held the carbon in place till the pressure on the inside got a certain amount of purchase on it, and then it blew out. So, where there is a single trolley in existence in any city, whenever the pipe is exposed for any purpose, especially along the electric lines, they could not be too careful in examining that pipe either for tapping or making some side street connection. It was very important all the time to make a close inspection and not wait until the pipes begin to burst before attention is given to them. Mr. Knudson said it took about four years, with a difference of potential of four or five volts, other conditions of course being favorable, to destroy a pipe. In Philadelphia the electrical bureau has power to compel the railway company to put down such an amount of copper as they pleased. In that way they have received a very fine return for the railway current. That is the main reason why the city of Philadelphia is so well equipped for returning the current and shows so little damage upon the lines at the present time. At the same time there is more or less electrolysis going on in Philadelphia. He had himself seen in one case service pipe burst on that account. He made the test and found the conditions favorable for that very thing. So that city is not entirely exempt, although the conditions there probably are the best in the United States owing to the fact that railway companies are compelled by the electrical bureau to put down a large return copper feeder in conduits. — *Exchange.*

HOW AN OLD VIRGINIA CLOCK WAS PAID FOR. — Perhaps no clock in America has a more interesting story than the one in the steeple of the City-hall and market-house at Alexandria, Va. Back in the days before the war Alexandria was one of the Southern cities which was known as a pretty rapid place for the sporting fraternity, but in those days it was a square game, and no cheating — a gentleman's game from start to finish. On one occasion the town had been visited by several gamblers from the Southwest who had come hither "seeking whom they might devour." At length a respectable citizen, who occasionally took a flyer with cards, fell into a snare which was set for him, and after a series of games, carried on on different nights, he found himself fleeced out of something like $2,500. As a "true Southerner" he had to make good, and this he did without bickering, but with the determination to get even. He was too honorable not to stand the hazard of the die. A lucky thought enabled him to bring about his revenge on the blackleg. He had knowledge that there was an old law in Virginia — and a similar law is now on the statute books — established while she was yet a colony, in which it was "made and provided" that if any man could not show that he was pursuing some "lawful means of obtaining a livelihood" he should be sold or hired out at auction to prevent, by his labor, his becoming chargeable to the town. Going before a justice of the peace he immediately entered complaint against the gamester. The man was arrested, tried and condemned to be sold at auction. Here was a dilemma. The gambler was at first disposed to treat the whole matter as a joke. But he soon found out his mistake. He was taken to a public stand, "put up" for sale, and the bidding began — the sale "peremptory." His victim started the bid with "one hundred dollars." "Two hundred," said the blackleg. And so the gambler and his victim went on bidding until the amount reached $2,000, when the former begged to be let off, pleading poverty, but all his pleadings would not cause the cheated man to relinquish his determination to make him pay dear for what he had done. There was no alternative, the gambler must either be forced into a service of degrading labor, under the supervision of a man who had small cause to love him, or he must go on bidding for himself, which he was actually compelled to do until the sum had reached $3,500, when he was permitted to pay over the amount and depart from the town, a crowd of hooting, yelling men and boys following him to the wharf, where he took the steamer. The citizen then gave the proceeds of the "man sale" to the city to be used in putting up a clock and steeple on the town-hall and market-house, which building was torn down a few years ago to make room for a larger and more modern structure. Not a great many of the citizens know the history of the old steeple and clock, but Capt. Edward Dangerfield told the Building Committee that he was particularly desirous of seeing the steeple and clock preserved and that he wished to defray all expense of having the clock repaired and "modernized" for the new building. This proposition was accepted and to-day the people of the good old city have practically the same steeple and clock their old-time citizen made a gambler pay for. — *Richmond Times-Despatch.*

ELECTROLYSIS OF A BIG PIPE. — As a result of the bursting of a six-inch water-main in the Brooklyn Navy Yard an investigation is being made by the authorities there to determine whether electricity escaping from the wires of the Brooklyn Rapid Transit Company is responsible for the corrosion of pipes in the yard. It is said that if this theory is found to be correct a suit for damages may be brought against the railroad company by the Government. Engineers at the yard believe that the corroded condition of the many water and other pipes laid there is due to electrolysis. The theory is that a part of the heavy electric current concentrated at the Brooklyn terminal of the Brooklyn Bridge escapes from the wires and finds its way back to the power-house on Kent Avenue, Williamsburg, passing through the navy yard, where the water pipes act as conductors. It is asserted that the escape of much of this electricity could be prevented by the use of improved appliances. There have been several investigations of this matter from time to time, but nothing has come of any of them. The present investigation is being conducted by the Chief of the Yards and Docks Department. — *N. Y. Times.*

THE END OF PULLMAN. — It was nearly five years ago that the Supreme Court of Illinois decided that the Pullman Palace Car Company was holding land for other than purely corporate purposes contrary to law, and ordered the company to dispose of its holdings before the end of October of this year. This order compelled the sale of about 4,000 acres underlying the model town of Pullman, together with the many buildings owned by the company and rented to employés or devoted to other uses than the manufacturing of cars. Very little of the land has so far been sold, but there is no intention of evading the order of the court, and much of the town of Pullman will be forced through the Chicago real-estate market within a short time, where it is certain to bring high prices. This will doubtless mean an extra division of profits on the company's stock. Such is the end of Mr. Pullman's fond plan of settling the labor problem. He acted sincerely, but mistakenly, for instead of improving the relations of labor and capital the town of Pullman scheme was instrumental in bringing on one of the sharpest conflicts between the two factors in production ever known. Out of that strike of 1894 grew the legal proceedings which ended in securing against the company an order of sale of the model town. — *Springfield Republican.*

S. J. PARKHILL & CO., Printers, Boston, U. S. A.



STATUE OF WILLIAM ELLERY CHANNING, D. D. PUBLIC GARDEN, BOSTON, MASS.

HERBERT ADAMS, SCULPTOR,

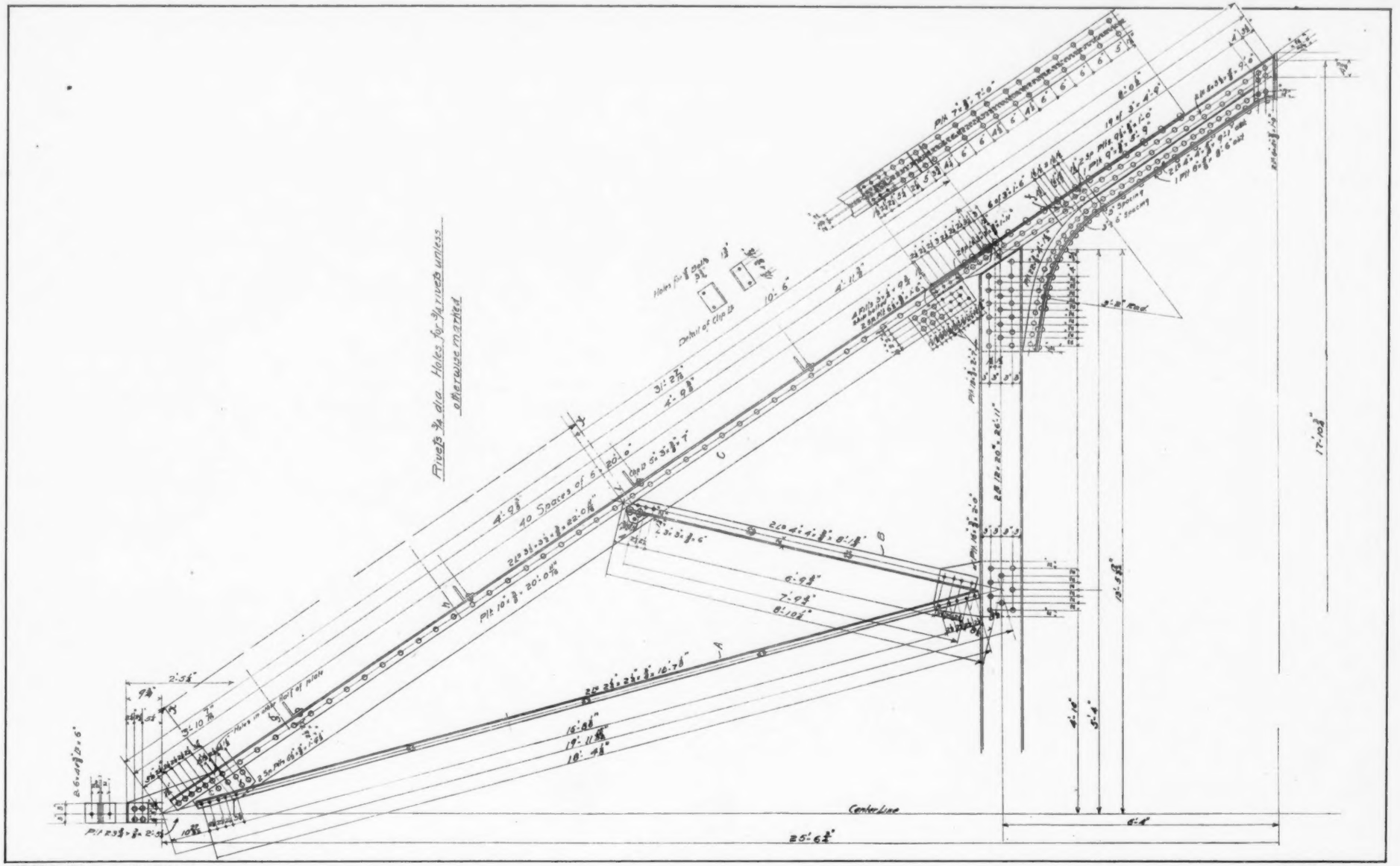
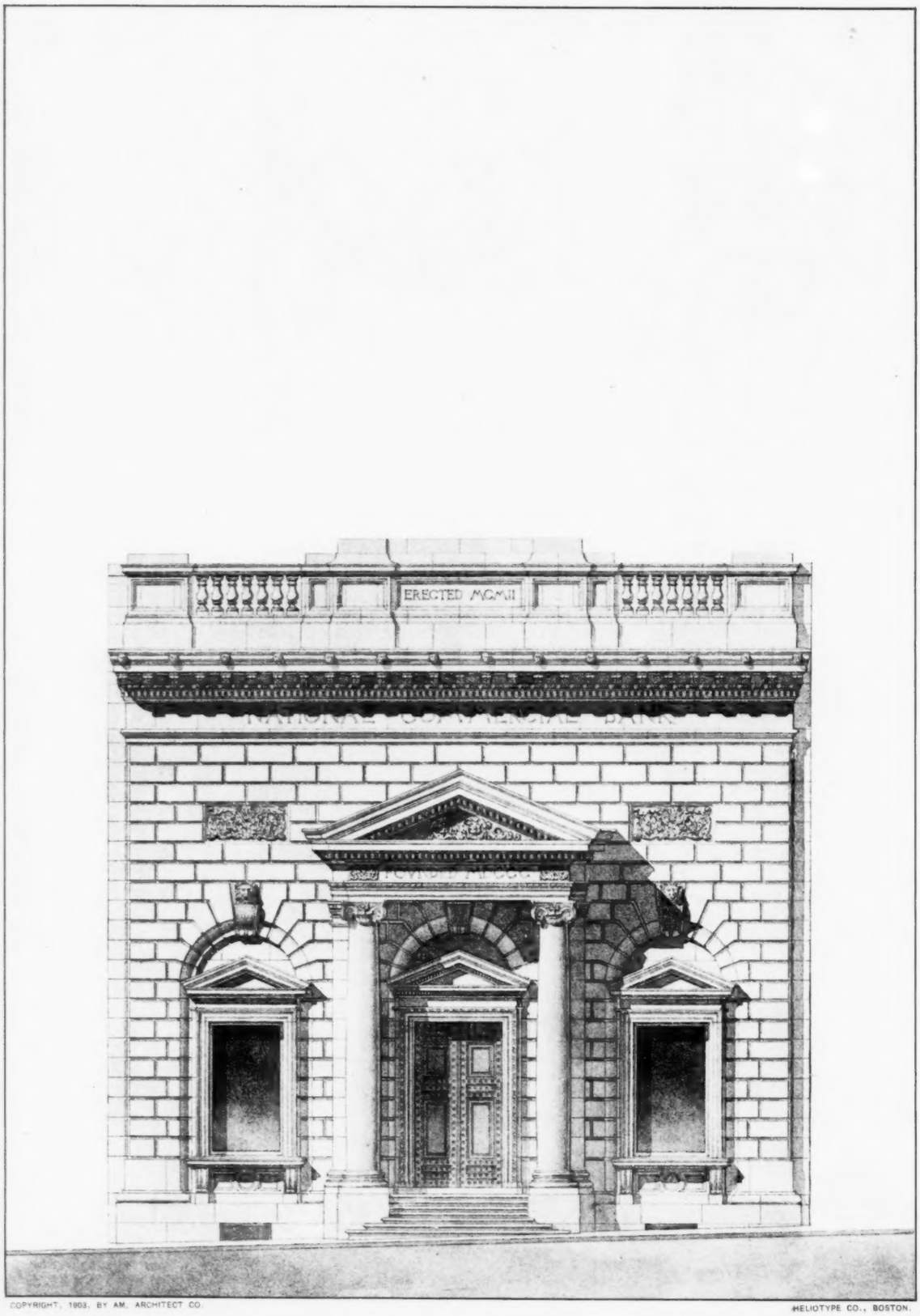


FIG. 127. NOTES ON IRON AND STEEL CONSTRUCTION.
M. M. SLOAN, ENGINEER.

The American Architect
Aug. 29, 1903.
No. 1444.



HELIOTYPE CO., BOSTON.

A COMPETITIVE DESIGN FOR THE NATIONAL COMMERCIAL BANK, ALBANY, N. Y.

BRUCE PRICE, ARCHITECT.

The American Architect
Aug. 29, 1903.
No. 1444.

SUGGESTED REMODELLING OF THE CITY HALL, BRIDGEPORT, CONN.

J. W. NORTHROP, ARCHITECT.

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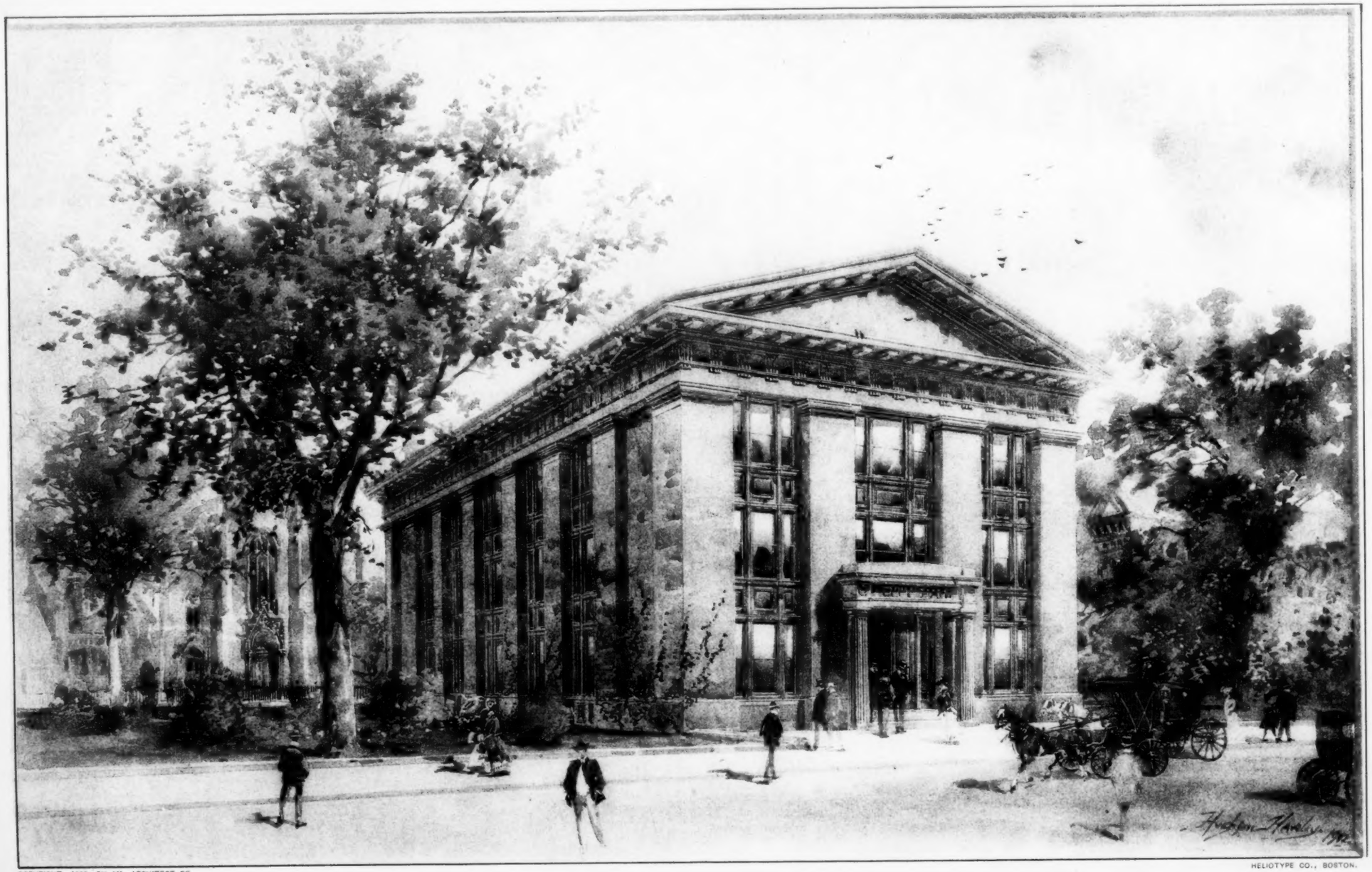

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The American Architect and Building News

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Topographical Index of Advertisers.

[*For pagination, see Alphabetical Index on Cover* 2.]

CODE OF PRACTICE
FOR SUB-ESTIMATING AND SUB-CONTRACTING

Adopted by the Master Builders' Association of the City of Boston, Aug. 2, 1894.

ARTICLE I.

Obligation of Principal Contractor to Sub-Contractor.

A principal contractor is under obligation to treat upon an equal basis all estimates which he "receives" prior to putting in his own bid. Estimates must be considered as "received" when they come into a principal contractor's possession, either by his direct solicitation or by being accepted by him. *The opening of a bid, knowing it to be such, constitutes receipt of the same.*

A principal contractor is under no obligation to use a bid which he has not solicited, accepted, or received, but if he does not wish to use the estimate of a sub-bidder he should decline it, if proffered personally, or should return it unopened if sent to him by mail or otherwise. The retention of a bid should be construed as a receipt of the same.

* * * * * * * * * * * *

A principal contractor, when making up his estimate, is not entitled to receive bids from sub-contractors if he is at the same time making himself their competitor by figuring their portion of the contemplated work. It is legitimate for a principal contractor to figure all portions of work, depending upon no one for what are usually known as sub-estimates, but it is not legitimate for him to receive bids from others for sub-work if he is himself figuring those portions independently.

ARTICLE II.

Award of Sub-Contracts.

The principal contractor having been awarded a general contract should immediately award the sub-contracts to the lowest bidder in each branch.

ARTICLE III.

Penalty for not Awarding Contract to Lowest Sub-Bidder.

A principal contractor failing to award a sub-contract to the lowest sub-bidder to whom he is under obligation as previously provided should be liable to pay damages to the said lowest bidder, in amount not less than ten per cent of the amount of the estimate.

Payment of such damages will not relieve the principal contractor from liability to discipline under provisions of Article X of the By-Laws of this Association.

* * * * * * * * * * * *

ARTICLE V.

Payments to Sub-Contractors.

Unless the contracts made with sub-contractors otherwise provide, payments during the progress of the work should be made by the principal contractor to the sub-contractors upon the same basis of payment, in relation to amount of work performed, as is prescribed in the contract made by the principal contractor with the owner.

Final payment to a sub-contractor should be considered as *due* at the expiration of thirty days after the completion of his work and its approval by the architect or owner, unless otherwise provided by the sub-contract or agreement.

* * * * * * * * * * * *

ARTICLE VII.

Obligation of Sub-Contractor to Principal Contractor.

Should a sub-contractor refuse to contract at the amount of the estimate he has given to a principal contractor who has used the said estimate in good faith, he then should be liable to the said principal contractor for damages in amount not less than the difference between the amount of the estimate which was submitted by him and the amount at which the principal contractor may be obliged to contract the work.

Payment of such damages will not relieve the sub-contractor from liability to discipline under provisions of Article X of the By-Laws of this Association.

* * * * * * * * * * * *

ARTICLE X.

Bids to Architects or Owners.

When bids for separate departments of work on a building are solicited by the architect or the owner, they should be submitted with the understanding that they are direct estimates, for which direct contracts are to be made by the owner with the lowest bidder, and no other disposition of such bids should be permitted without consent of the bidder submitting the same.

Sub-bids should be given only to the principal contractors who are estimating the work in question, and should not be left with architects or owners for the inspection and information of principal contractors. Sub-contractors must understand that bids thus left with architects or owners are in great danger of losing their confidential character, and that if they so leave them they cannot claim protection or redress under the first article of this Code.

SUGGESTIONS.

Members of this Association having sub-contracts to let, or material to buy, should, as far as may be consistent with business principles, deal only with members of the Association, or at all events give their fellow-members an opportunity to compete, and then give them the preference, other things being equal.

All bidders should take cognizance of the danger they may be subjected to through the practice, so prevalent in some architects' offices, of making change in plans or specifications, or in both, during the progress of estimating. Correction of this pernicious practice can only be obtained through refusal by contractors to estimate under such conditions.

A true copy.

Attest: WM. H. SAYWARD,
Secretary, M. B. A.

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BUILDING INTELLIGENCE.

(Reported for the American Architect and Building News.)

[Although a large portion of the building intelligence is provided by their regular correspondents, the editors greatly desire to receive voluntary information, especially from the smaller and outlying towns.]

ADVANCE RUMORS.

Bayonne, N. J.—Hodgson Bros., 7 E. 47th St., New York City, have received the contract for erecting the $50,000 Carnegie Library here.

Belvidere, Ill.—Katherine Rhinehart has donated $25,000 towards the erection of a library for this place.

Rumor states that the South Baptist Society will expend $20,000 in remodelling the church.

Berkeley, Cal.—Plans have been accepted for the Carnegie Library that is to be erected here, at a cost of $36,000.

Brooklyn, N. Y.—Plans for a new Y. M. C. A. Building to be erected at the corner of Monroe and Bedford Sts., have been prepared by Architects Jackson & Rosecrans, 3 Union Sq., New York City. Cost, $300,000.

Burlington, N. J.—The contract for erecting the Masonic Orphanage building has been awarded to J. D. Lippincott, 165 W. Broad St., for $21,675.

BUILDING INTELLIGENCE.

(Advance Rumors Continued.)

Cambridge, Mass.—A six-apartment house will be erected on Dana St., Dana Hill, by Ross & Morash for Mrs. M. Scott. It will be 58′ x 60′ in dimensions and will cost $20,000.

Chicago, Ill.—Ernest A. Mayo has let contracts for a three-story residence which is to be built at 4319 Grand Boulevard for R. G. Sykes at a cost of $35,000. The exterior will be of terra-cotta and glazed brick.

Contracts have been let by E. R. Krause for a high-grade apartment-house to be built for the E. J. Lehmann estate at 1749-57 Sherman Pl. at a cost of $50,000. The building will occupy a site 125′ x 130′, and will be four stories high.

William A. Nicholson has let contracts for a three-story apartment-building containing six flats, to be built in Woodlawn at a cost of $20,000.

A four-story apartment-house, 25′ x 90′, partly of fireproof construction, to be built on Indiana Ave., near 31st St., at a cost of $20,000. Zachary T. Davis, architect.

The congregation of the Metropolitan Church of Christ will erect an edifice at Oakley Boulevard and Van Buren St. Estimated cost, $50,000.

Davenport, Ia.—The Ficke Improvement Co. will begin at an early date the erection of a new warehouse for the Ewert & Richter Co. on the north side of 4th St., near Iowa St. The building will cost about $18,000 and will be four stories high.

Des Moines, Ia.—W. F. Mitchell has secured the contract for the erection of the Iowa Drug Company's building for $28,000. The new building will be 66′ x 126′, four stories high with a high basement. The contract calls for the building to be completed by December 1.

Easton, Pa.—Ochs & Gangemere, of Allentown, have received the contract for erecting Berks Hall for the Muhlenberg College. Cost, $31,781.

Everett, Mass.—The plans of Aaron H. Gould, of Boston, have been accepted for the new grammar school to be built on Glendale St., in this city. The building will be of brick, with a granite base and

BUILDING INTELLIGENCE.

(Advance Rumors Continued.)

brownstone trimmings, and slate roof. Cost, $75,000.

Guthrie, Okla.—The Guthrie Lodge of Odd Fellows have begun work on the erection of a three-story brick building at the corner of Harrison Ave. and Broad St. The building will be three stories high, and cost $25,000.

Hannibal, Mo.—The plans of Haynes & Burnett, of St. Louis, have been accepted for the high school to be erected here at a cost of $25,000.

Hartford, Conn.—The contract for the erection on the Ætna Insurance Company's new building of Main St. has been awarded to Dawson & Archer, of 150 Fifth Ave., New York City. The front walls of the building, which is to be five stories high, will be of limestone, and the side and rear walls will be in light creamy-colored brick. The interior finish will be in marble, mahogany and oak. The contract calls for the completion of the work November 1, 1904.

Daniel D. Bidwell, of East Hartford, is soon to erect a brick block on Allyn St., the cost of which will be $20,000. Architects Bailey & Goodrich have prepared the plans.

Plans are being prepared by Architect Isaac A. Allen for a new fire-engine house to be erected in the 10th Ward.

Holyoke, Mass.—The contract for the new St. Paul's Church has been let to F. H. Dibble, the price being about $40,000. It will be built of seamed-face granite with gray sandstone trimmings.

Hot Springs, S. D.—Reynard & Oak, of Omaha, have been awarded the contract for the erection of the Battle Mountain Sanitarium, at a cost of $336,244. It includes twelve buildings.

Jersey City, N. J.—The City Hospital Bd. has accepted the plans of C. F. Long, 91 Montgomery St., for erecting a brick building at Montgomery St. and Baldwin Ave. Cost, $200,000.

Kansas City, Mo.—Plans for the Church of the Annunciation have been designed by Henry J. Schlacks, of Chicago. The structure will be 88′ x 150′, entirely of stone, and will cost $75,000.

BUILDING INTELLIGENCE.

(Advance Rumors Continued.)

The plans for a big packing plant, for Nelson Morris & Co., are now ready. The new plant will consist of twelve separate buildings with an aggregate floor-space of 228,000 square feet. The cost will be $1,500,000.

L. G. Middaugh, 517 Mass. Bldg., has prepared plans for a warehouse to be erected at 1315 W. 10th St., for J. W. Mercer. Cost, $30,000.

Luverne, Minn.—Plans for the Carnegie Library building by W. E. E. Green, architect, of this city, have been adopted. Cost, $10,000.

Lynn, Mass.—The contract for erecting an 8-room brick school has been awarded to Edw. T. Reynolds, 604 Washington St., for $24,890, not including ventilating and heating.

Macon, Ga.—Architect P. E. Dennis, 568 Cherry St., has prepared plans for a science hall and gymnasium to be erected at Mercer University, to cost about $30,000.

Manchester, N. H.—The trustees of Pine Grove Cemetery have invited architects to submit plans for a $15,000 granite chapel.

A site has been purchased on Market St. for the Hillsborough Co. Court-house to be erected at a cost of $45,000.

Milwaukee, Wis.—The Milwaukee Gas Light Co. has purchased eight acres of land at North Milwaukee where they will erect a large plant for the manufacture of tar. The buildings will be of brick and steel, and they will cost $50,000, including machinery.

Minneapolis, Minn.—Rumor states that the Northwestern National Life Insurance Co. are having plans prepared for an office-building to be erected at Nicollet Ave. and 11th St. Cost, $150,000.

Nashville, Tenn.—A permit has been issued to J. S. Reeves & Co. to build their new six-story factory to be located at 419 N. Market St. Cost, $25,000.

New Britain, Conn.—A factory is to be built for Rackliffe Bros. at the rear of Park St. The building will be of brick, 40′ x 60′, and three stories high.

BUILDING INTELLIGENCE.

(Advance Rumors Continued.)

New York, N. Y.—Plans have been filed for a six-story brick office-building to be erected at 62 and 64 Cedar St. The building will be of white marble. The Mutual Life Insurance Co. is the owner. Clinton & Russell are the architects. The cost is placed at $140,000.

The contract for the erection of the Festival Hall, the giant, dome-crowned structure which will occupy the centre of the cascade gardens, was awarded to Strehlow & Phelps.

The plans for the new theatre to be erected for Felix Isman, of Philadelphia, on the site of the vacant Parker House in W. 39th St., opposite the Casino, have been filed with Building Superintendent Henry S. Thompson. The main building will be of ornamental brick, three stories high, and will cost $215,000. The architects are Wm. Steele & Son, of Philadelphia.

Plans have been filed for the new building which the trustees of the Woman's Hospital in Lexington Ave., are going to build near Amsterdam Ave., between 109th and 110th Sts. It is to be six stories high, with basement and attic, and will be erected at a cost of $610,000. The new hospital will have a frontage of 188 feet and be 40 feet deep. It will have façades of granite, limestone and terra-cotta.

Plans have been approved by the Sinking Fund Com. for the police-station to be erected at Centre and Grand Sts. Cost, $500,000.

Plans have been filed at the Bureau of Buildings for an eight-story addition to the *Tribune* Building, at the northeast corner of Spruce and Nassau Sts. When rebuilt the *Tribune* Building will be eighteen stories high. D'Oench, Yoe & Thonvard are the architects, and the cost is estimated at $350,000.

Jos. Pulitzer has given $2,000,000 to the Columbia University for establishing a School of Journalism. A structure will be erected at Morningside Heights, at a cost of $500,000.

Omaha, Neb.—Plans have been completed for the Monmouth Park School by Architect Kimball. The building will cost $30,000.

Pasadena, Cal.—The plans of Stone & Smith, of San Francisco, have been accepted for the high

BUILDING INTELLIGENCE.

(Advance Rumors Continued.)

school to be erected at El Molino Ave. and Centre St. Cost, $35,000.

Pawtucket, R. I.—The Y. M. C. A. Committee have in charge the preparations of plans and specifications for their new building to be built on Summer St., the cost of which will be from $75,000 to $90,000.

Philadelphia, Pa.—Plans have been completed by Geo. E. Savage, Witherspoon Building, for the M. E. Church to be erected at 52d and Parrish Sts., at a cost of $35,000.

William Steele & Sons, builders, are to erect a warehouse at 3d St. and Sedgley Ave., in this city, for the Northeastern Warehouse Co. Plans provide for a five-story building, 157′ x 194′, of brick, stone and iron, to cost about $150,000.

Pittsburgh, Pa.—Bids are being taken by Architect M. Nirdlinger for the erection of a three-story brick building for the Pittsburgh Label Co. on Liberty Ave., near 40th St. The dimensions are 80′ x 153′ and the structure will cost $35,000.

A new edifice of the First Church of Christ Scientists, will be erected on Craig St., near 5th Ave. The church will be of brick and stone, and will cost from $50,000 to $100,000. A Sunday-school addition is also included.

M. Nirdlinger has prepared plans for a four-story brick warehouse for Hansman & Wemmer, to be erected on Locust and Grist Sts., at a cost of $50,000.

Raleigh, N. C.—Mr. Frank P. Milburn, of Columbia, S. C., has presented his plan for enlarging and modernizing the present State Capitol. This work, according to Mr. Milburn's specifications, can be done at a cost of only $300,000.

Seattle, Wash.—Plans have been filed for the erection of the new Stewart & Holmes Building, at 207 Third Ave. S. The structure will be six stories high, 60 feet wide, facing on the avenue, and extending back 120 feet. It will be of brick, stone and steel and will cost about $68,000.

Talbot & Walker are to erect a stone and brick

BUILDING INTELLIGENCE.

(Advance Rumors Continued.)

warehouse, 111′ x 120′, at a cost of $95,000. Architects, Boone & Corner.

St. Paul, Minn.—Plans have been filed by Chris Hansen for a three-story apartment-house to be located on Rice St. The building will be of brick and cost $20,000.

The Sisters of St. Joseph have filed plans with the city building inspector for their new boarding school, to be located at Cleveland Ave. and Randolph. The administration building only will be built this year. The cost will be $55,000.

Tacoma, Wash.—The Tacoma Ry. & Power Co. have had plans prepared for a brick car-barn to be erected here, at a cost of $35,000.

Wahoo, Neb.—The citizens of Saunders Co. have voted to issue $85,000 bonds for a court-house.

Washington, Pa.—Plans have been accepted for the addition to the Washington Hospital. Cost, $20,000.

Wenatchee, Wash.—Elliot & West, architects, of Seattle and Wenatchee, have plans for an opera-house and lodge building for the Odd Fellows. It will be a three-story building, 50′ x 120′, of brick and stone. Cost, $18,000.

Worcester, Mass.—J. P. Kingston, 518 Main St., have prepared plans for the new block which is to be built at Water and Harrison Sts. for Nathan Kumlin. The building will be of brick and stone, and will cost $45,000.

Youngstown, O.—Architect A. F. Judd has completed plans for Max Shagrin's new building, to be erected on the northwest corner of Federal and Watt Sts. The plans provide for a three-story building of pressed brick with stone trimmings. The measurements will be 79′ x 80′. The architecture will be of the French Renaissance style, and the cost of the building will be $30,000.

APARTMENT-HOUSES.

Salt Lake City, Utah.—*N. Temple St.*, 6 apart., 50′ x 83′; $26,000; o., E. D. Miller; a., J. A. Headlund & Co.

HOTELS.

New York, N. Y.—*Columbia Heights*, w s, 350′ s Pierrepont St., twelve-st'y bk. hotel, 75′ x 88′, gravel roof, steam heat; $300,000; o., Standish Arms Realty Co., 110 Montague St.; a., Thompson-Starrett Co., 49 Wall St., Manhattan.

STORES.

Chicago, Ill.—*Lincoln Ave., Nos.* 1054-62, two-st'y bk. store & loft, 97′ x 175′; $50,000; o., Streger & Franke, 439 W. Chicago Ave.; a., Henry Worthmann, 625 W. Chicago Ave.; b., Charles Kophamer, 977 N. Sawyer Ave.

Ogden Ave., Nos. 1621-23, 2 three-st'y bk. stores & lofts, each 22′ x 52′; $20,000; o., David Clohesey, 88 Fifth Ave.; a., James Burns, 112 Clark St.; b., P. C. Stadler, 860 Clifton Park Ave.

BUILDING INTELLIGENCE.

WAREHOUSES.

Chicago, Ill.—*Michigan Ave., Nos.* 1407-9, six-st'y bk. warehouse, 50′ x 160′; $60,000; o., T. R. Lyon, 204 Dearborn St.; a., Fritz Foltz, 69 Dearborn St.; b., Wm. Adams Co., 514 Roanoke Building.

MISCELLANEOUS.

New York, N. Y.—*First Ave.*, w s, bet. 51st & 52d Sts., three-st'y bk. armory, 200′ 4″ x 312′ 6″, cement roof, steam heat; $295,000; o., City of New York.

Third Ave., s w cor. 37th St., 8 one-st'y bk. carsheds, 52′ x 262′, gravel roofs; total cost, $100,000; o., South Brooklyn R. R. Terminal Co., 168 Montague St.

Fifteenth St., s w cor. Railroad Crossing, one-st'y bk. station, 36′ x 81′, gravel roof; $16,000; o., Brooklyn Union Elevated R. R. Co.

COMPETITIONS.

COURT-HOUSE. [At Jackson, Minn.]

At 9 o'clock September 30, 1903, the Board of County Commissioners of Jackson County, Minn., will receive plans and specifications at the office of County Auditor at Jackson, Minn., for a $60,000 fireproof court-house. P. D. McKELLAR, County Auditor. 1444

PROPOSALS.

BUILDINGS. [At New Orleans, La.]

Sealed proposals will be received by the Board of Commissioners of the Port of New Orleans at their office, No. 337 Carondelet St., New Orleans, until September 15, 1903, for the construction of the Celeste Street Steel Shed. Plans, specifications, proposal forms, etc., are on file at the office of the engineers, Coleman, Malochee & Villere, No. 1109 Hennen Building, New Orleans. HUGH McCLOSKEY, President. 1446

Treasury Department, Office of the Supervising Architect, Washington, D. C., August 22, 1903. Sealed proposals will be received at this office until 3 o'clock P. M. on the 28th day of September, 1903, and then opened, for the low pressure steam heating apparatus, complete in place for the U. S. Court-house and Post-office building at Fergus Falls, Minn., in accordance with drawings and specification, copies of which may be had at this office or at the office of the Superintendent at Fergus Falls, Minn., at the discretion of the Supervising Architect. JAMES KNOX TAYLOR, Supervising Architect. 1445

PROPOSALS.

PAVING. [At Salem, N. J.]

Sealed proposals will be received by the Road Committee of the Board of Chosen Freeholders of the County of Salem, **on Friday, September 4, 1903,** at the Court-house, Salem, N. J., for grading and placing bitulithic pavement on about 5 miles, and oyster-shell surface on practically 1 mile of the Salem and Pennsville Road, in the Township of Lower Penns Neck, Salem County, N. J. Specifications and profiles may be seen at the office of Josiah Miller, County Engineer, No. 51 Market St., Salem, N. J., at the office of *Engineering News*, New York, and also at the office of Henry I. Budd, State Commissioner of Public Roads, State-house, Trenton, N. J. WM. J. FREAS, Director. 1444

SCHOOL. [At Cleveland, O.]

Sealed proposals will be received at the office of the Clerk of the Board of Education, Rose Building, Cleveland, O., **until 12 o'clock noon, September 8, 1903,** for furnishing all the materials and for doing all the work necessary to complete the school-building on the property owned by the Board of Education between Willson Ave. and Arlington St., and to be known as the annex to Central High School, in accordance with the plans and specifications on file in the office of the Superintendent of Buildings, Rose Building, and as determined by the Board of Education. STARR CADWALLADER, School Director. 1444

Treasury Department, Office of the Supervising Architect, Washington, D. C., August 25, 1903. Sealed proposals will be received at this office until 3 o'clock P. M. on the 29th day of September, 1903, and then opened, for the installation of a conduit and electric wiring system for the U. S. Court-house, Post-office and Custom-house at Tampa, Florida, in accordance with the drawings and specification, copies of which may be obtained at this office, or at the office of the Superintendent of Construction, at the discretion of the Supervising Architect. JAMES KNOX TAYLOR, Supervising Architect. 1445

Treasury Department, Office of the Supervising Architect, Washington, D. C., August 20, 1903. Sealed proposals will be received at this office until 3 o'clock P. M. on the 23d day of September, 1903, and then opened, for the installation of a conduit and electric wiring system for the U. S. Post-office at Joplin, Mo., in accordance with the drawings and specifications, copies of which may be obtained at this office or at the office of the Superintendent of Construction at Joplin, Mo., at the discretion of the Supervising Architect. JAMES KNOX TAYLOR, Supervising Architect. 1446

PUBLIC LIBRARY. [At Cleveland, O.]

Sealed proposals will be received at the office of the Secretary of the Public Library Board of the city of Cleveland, Public Library Building, Wood St., Cleveland, O., **until September 14, 1903,** for furnishing all the material and doing all the work necessary to complete a public library building near the intersection of Willson Ave. and Broadway, in accordance with plans and specifications being prepared by Charles Morris, architect. Said plans are on file at the office of the said Charles Morris, architect, 625 Garfield Building. C. D. WILLIAMS, President. HARRY DIXON, Secretary. 1446

PROPOSALS.

Treasury Department, Office of the Supervising Architect, Washington, D. C., August 22, 1903. Sealed proposals will be received at this office until 3 o'clock P. M. on the 8th day of September, 1903, and then opened, for the installation of an elevator plant in the U. S. Court-house and Post-office at Minneapolis, Minn., in accordance with the drawings and specification, copies of which may be had at this office at the discretion of the Supervising Architect. JAMES KNOX TAYLOR, Supervising Architect. 1445

SCHOOL. [At Manchester, N. H.]

Sealed proposals will be received by the trustees of the Industrial School for the erection of an isolation hospital upon the grounds of the school in Manchester, N. H., **until September 17, 1903.** Plans and specifications may be obtained of the Superintendent at the school and all proposals may be left with him. JOHN C. LINEHAN, President for Board of Trustees, Industrial School. 1445

PAVING. [At Wilmington, Del.]

Sealed proposals will be received by the Delaware State Highway Commission, at its office, No. 1011 Market St., Wilmington, Del., **until September 8, 1903,** and then publicly opened, for building a macadam or gravel road in New Castle County and State of Delaware, and known as the Middletown and Odessa Road. Plans and specifications can be seen at the office of the Delaware State Highway Commission, No. 1011 Market St., Wilmington, Del. C. J. HORRIGAN, Chairman. 1445

SCHOOL-BUILDING. [At Lehigh, Ia.]

Sealed proposals will be received by the School Board of the Independent School District of Lehigh, Ia., to be sent to J. C. Retallick, President of the Board, Lehigh, Ia., **until September 26, 1903,** for the erection and completion of a school-building at Lehigh, Ia., in accordance with plans and specifications which will be on file on and after August 26, 1903, at J. C. Retallick's office in Lehigh, Ia., and at the office of Murphy & Ralston, architects, Waterloo, Ia. Sealed proposals will be received at the same time and under the same conditions for the construction and installation of a hot air heating plant and also for all necessary plumbing for such proposed school-buildings as per specifications. J. C. RETALLICK, President. N. J. WILLIAMS. 1447

PROPOSALS.

SCHOOL-BUILDING. [At Penacook, N. H.]

Sealed proposals will be received **on or before September 7, 1903,** for the erection of a four-room wooden school-building at Penacook, N. H. Plans and specifications may be seen at 26 Cresent St., Penacook, N. H. HENRY A. BROWN, Clerk of Com. 1445

Treasury Department, Office of the Supervising Architect, Washington, D. C., August 15, 1903. Sealed proposals will be received at this office until 3 o'clock P. M. on the 22d day of September, 1903, and then opened, for the construction (including heating apparatus, electric wiring and conduits) of the U. S. Post-office at Martinsville, Virginia, in accordance with the drawings and specification, copies of which may be had at this office, or the office of the Postmaster at Martinsville, Virginia, at the discretion of the Supervising Architect. JAMES KNOX TAYLOR, Supervising Architect. 1444

Treasury Department, Office of the Supervising Architect, Washington, D. C., August 15, 1903. Sealed proposals will be received at this office until 3 o'clock P. M. on the 21st day of September, 1903, and then opened, for the alterations to the U. S. Custom-house at St. Paul, Minn., in accordance with the drawings and specification, copies of which may be had at this office or at the office of the Custodian at St. Paul, Minn., at the discretion of the Supervising Architect. JAMES KNOX TAYLOR, Supervising Architect. 1444

Treasury Department, Office of the Supervising Architect, Washington, D. C., August 12, 1903. Sealed proposals will be received at this office until 3 o'clock P. M. on the 17th day of September, 1903, and then opened, for the low pressure steam heating apparatus, complete in place, for the U. S. Post-office at Aberdeen, South Dakota, in accordance with drawings and specification, copies of which may be had at this office or at the office of the Superintendent at Aberdeen, South Dakota, at the discretion of the Supervising Architect. JAMES KNOX TAYLOR, Supervising Architect. 1444

BUILDINGS. [At Key West Barracks, Fla.]

Sealed proposals for constructing 3 sets officers' quarters, set N. C. staff quarters, Q. M. storehouse and band barrack will be received here **until September 2, 1903.** Information furnished on application. 1444

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Prepared in Conformity with the Best Standards of Practice, and Recommended to its Members by the Boston Society of Architects, was . . . . . .

ADOPTED BY THE SOCIETY, FEBRUARY 1, . . 1895. . .

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SECTION 2. A Member having any ownership in any building material, device or invention, proposed to be used on work for which he is architect, should inform his employer of the fact of such ownership.

SECTION 3. No Member should be a party to a building contract except as "owner."

SECTION 4. No Member should guarantee an estimate or contract by personal bond.

SECTION 5. It is unprofessional to offer drawings or other services "on approval" and without adequate pecuniary compensation.

SECTION 6. It is unprofessional to advertise in any other way than by a notice giving name, address, profession, and office hours, and special branch (if such) of practice.

SECTION 7. It is unprofessional to make alterations of a building designed by another architect, within ten years of its completion, without ascertaining that the owner refuses to employ the original designer, or, in event of the property having changed hands, without due notice to the said designer.

SECTION 8. It is unprofessional to attempt to supplant an architect after definite steps have been taken toward his employment.

SECTION 9. It is unprofessional for a Member to criticise in the public prints the professional conduct or work of another architect except over his own name or under the authority of a professional journal.

SECTION 10. It is unprofessional to furnish designs in competition for private work or for public work, unless for proper compensation, and unless a competent professional adviser is employed to draw up the "conditions" and assist in the award.

SECTION 11. No Member should submit drawings except as an original contributor in any duly instituted competition, or attempt to secure any work for which such a competition remains undecided.

SECTION 12. The American Institute of Architects' "schedule of charges" represents minimum rates for full, faithful and competent service. It is the duty of every architect to charge higher rates whenever the demand for his services will justify the increase, rather than to accept work to which he cannot give proper personal attention.

SECTION 13. No Member shall compete in amount of commission, or offer to work for less than another, in order to secure the work.

SECTION 14. It is unprofessional to enter into competition with or to consult with an architect who has been dishonorably expelled from the "Institute" or "Society."

SECTION 15. The assumption of the title of "Architect" should be held to mean that the bearer has the professional knowledge and natural ability needed for the proper invention, illustration and supervision of all building operations which he may undertake.

SECTION 16. A Member should so conduct his practice as to forward the cause of professional education and render all possible help to juniors, draughtsmen and students.

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[Advertisers can be indexed only under a single head free of charge.]