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CONTENTS.

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CONTENTS

[1] Will be issued, when received, in a later number.

THE recent fire in the Temple Court building in New York offers another instructive lesson in the science of fireproof construction. The building was of brick and iron, the floors of iron beams, filled-in with terra-cotta flat arches, with a wood floor laid on top, and the partitions were of terra-cotta blocks. The doors and trim were of wood, and some of the partitions were of terra-cotta blocks in the lower portion, with wooden sash-work above. There was a small courtyard in the centre of the building. The windows opening on this court-yard were not protected by iron or tin-covered shutters, and, just as in the case of the fire in the Chicago Athletic Club, where the arrangement was similar, the fire, which originated in the seventh story, broke through the court-yard windows, and communicated itself to the sashes and window-frames in the stories below, as well as above; and these, in burning, set fire to the furniture and woodwork of the rooms, so that in a short time nearly all the combustible material in the building was blazing together. Another means of carrying fire from one story to the others was afforded by the wooden guides of the elevator, saturated with oil, and the wooden doors and casings of the pipe-shaft. Moreover, the terra-cotta partitions, which, with unaccountable carelessness, had been built on the wooden flooring boards, instead of being set on the terra-cotta arches, or the iron beams, settled, as soon as the wooden floor under them was burnt away, giving ample space for flames to spread from one room to the next above and below them. Practically, the building, although mainly of fireproof materials, was riddled with avenues of communication, by which all the wood and paper in it could be set burning at once.

THE consequence of this was that a very considerable fire was soon kindled. The brick walls and terra-cotta floors, with the iron beams buried in them, seem to have resisted the fire without difficulty, although some exposed channel-iron, used as long lintels over the court-yard windows, was more or less warped. The more delicate portions of the incombustible finish were, however, seriously injured. The earthenware plumbing fixtures were cracked, and the marble ruined by the flame and smoke; the tile pavement of the halls was lifted, probably by expansion, from its concrete bed, and nearly all the plastering fell off. The *Record and Guide* says that, while the structural parts are little injured, it will require an expenditure of thirty or forty thousand dollars to restore the building to its original condition, and it expresses surprise that so much damage could have been done in such a structure. Architects, who know how large a part of the cost of an office-building is in the delicate and perishable finish, will not share this surprise, under the circumstances, but they will probably permit themselves to observe that most of the loss might have been saved if the simplest precautions had been taken to confine a possible fire to the room in which it originated. The protection of the windows on the court-yard by fireproof shutters, although it is the first thing that would occur to an insurance man, would hardly have been practicable in an office-building, but the frames and sashes of those windows might easily have been made of iron, and the wooden casings might have been omitted, so that there would have been nothing near any of the windows to lead fire outward, or to be kindled by a vagrant flame which might burst in from the outside. If this had been done, and if the elevator-guides and pipe-casings had been of iron, as they should have been, it would have been difficult for the fire to spread either upward or downward from the place of its origin; and if the terra-cotta partitions had been set on the iron beams and arches in the usual way the most dangerous lateral communication would have been cut off. Although, strictly, the conflagration shows how far from fireproof a so-called fireproof building may be, the account shows clearly that our present methods of using iron and terra-cotta are correct and reliable, and that, if the principle of subdivision by impenetrable partitions, both vertical and horizontal, is applied with reasonable care, office-buildings of this kind may be made perfectly secure against anything but trifling losses by fire.

THE "organizers of labor" have never met with much comfort at the hands of the public south of Mason-and-Dixon's line, and the courts of that region have been the first to apply to labor-unions the doctrine laid down in what is known as the Sherman Anti-Trust law,— that all combinations in restraint of trade, whether entered into by employers or employed, are criminal. The first case decided in this sense was one in New Orleans, where a general strike was brought on about a year or so ago by the labor leaders, and an injunction against the concerted action of the unions was sought for. Although the strike was declared off at the first appeal to the courts, it was thought best to obtain a decision of Court on the general question of the lawfulness of combinations of workmen to prevent the operating of railroads, or in other ways to injure and annoy innocent persons. This decision, which comes from the United States Circuit Court for the District of Louisiana, was rendered a few days ago, and establishes the rule that action by organized bodies of men to interfere with the lawful occupations of other persons is a criminal offence against the laws of the United States, subjecting all persons guilty of it to severe penalties. A very similar decision, although, in this case, favorable to the request of a noted labor organization, the Brotherhood of Locomotive Engineers, was given in Alabama still more recently. It seems that the officers of the Georgia Central Railroad made an agreement with the Brotherhood, fixing the wages and times of employment of the engineers on the road. After this agreement was made, the road fell into difficulties and a receiver was appointed, who refused to carry out the agreement. Petition was made to the United States Circuit Court, at Macon, to compel him to do so, and the Court ordered that the petition should be granted and that the receiver should carry out the contract, including in its provisions all engineers employed on the road, whether members of the Brotherhood or not. The judge expressed the opinion that such contracts, or arrangements between employers and employed, were "praiseworthy and beneficial to both parties." He, however, took occasion to examine some rules of the Brotherhood which did not appear so commendable to him, and he warned the petitioners that it would be practically impossible for any body of men to combine to hinder and delay the work of a transportation company without making themselves liable to the severe penalties of the Anti-Trust law. If, he said, controversies should arise between the members of the Brotherhood, or similar organizations, and their employers, it would be the duty of the Courts to see that the statute was applied to combinations or agreements of railroad officials, or other representatives of capital, so that no unlawful encroachment upon the rights of those employed by them should be

attempted, and, at the same time, they would see that the public was spared the hardship which it had suffered from such conflicts in the past.

M. ÉMILE CACHEUX, the distinguished author of the *Economiste Pratique*, and perhaps the best authority in Europe on workingmen's dwellings, and matters connected with them, writes to *Le Génie Civil* an interesting letter, in which he says that in England and Belgium the life-insurance companies are beginning to do a large business in advancing money to workingmen for the purchase or construction of houses. In Belgium, the credit of inducing the insurance companies to make loans of this sort seems to be due to M. Parmentier, the president of the Société Coöperative of Ixelles, a suburb of Brussels. Several members of the society wishing to build houses for themselves, M. Parmentier applied to the Belgian Life Insurance Company, which agreed to make mortgage loans to the extent of sixty per cent of the value of the mortgaged estate, in the following manner: Supposing a loan of ten thousand francs to be asked for, the borrower gives his note, secured by mortgage on the property, agreeing to repay the money by fifteen annual instalments, each of which is equal to four per cent on the loan, plus the annual premium for a life-insurance policy, to an amount equal to the principal of the loan, which is made payable to the company. The premium rate varies, of course, with the age of the borrower, but, supposing him to be thirty years old when the loan is made, the annual premium on a policy of ten thousand francs would be 581 fr. 40. This, added to 400 francs for interest, makes 981 fr. 40, or something less than ten per cent on the principal of the loan. If the borrower dies before the expiration of the fifteen years, the principal of his debt is cancelled by the proceeds of the policy and the insurance compay discharges the mortgage, so that the heirs of the borrower inherit the property clear of incumbrance. If, on the contrary, he lives to the end of the fifteen-year term, the company then discharges the mortgage and cancels the policy, crediting the premiums paid on the policy as contributions to a sinking-fund, which, at the end of fifteen years, has extinguished the principal of the debt. As safe investments returning four-per-cent income are not easily found in Belgium, the insurance company is quite willing to make loans on these terms, which give borrowers just the security that they need against the failure of their prudent plans through their death. As the transaction is made directly between the borrower and the company, there is no insurance agent to claim a commission, and the commission on the regular rates which is usually allowed to agents is deducted from the borrower's first premium payment. In certain other cases in Belgium, where building-loans are made to workingmen, the borrower is obliged to take out a policy payable to the lender, but a direct transaction between the borrower and the company saves something to the former, and, as life-insurance companies usually have plenty of money to invest, they can afford to give the best terms. How such affairs are managed in England M. Cacheux does not say, but he gives us the curious information that he had often been approached by representatives of life-insurance companies in France, who had proposed to offer advantages to workingmen similar to those available in Belgium, but that he had declined to favor their propositions, for the reason that the cost of a dwelling-house is so great in France that workingmen would be unable to pay the annual sum required for interest and insurance premium.

WHETHER the Belgian plan could be put in practice here is doubtful, but for reasons very different from those which stand in its way in France. We have plenty of enormously rich life-insurance companies, which, at present, find very few investments that will net them more than four per cent income; and, at the same time, workingmen's dwellings are cheap, and wages are so high that four per cent interest on the cost of a house, with the premium on a life-insurance policy for the same amount, would be a light tax for an industrious young man of good habits, but our laws in regard to the taxation of real-estate are so badly drawn and administered as to create a serious discrimination against small borrowers. Under the present laws, it is quite easy for a rascally borrower, by fraudulent transfers to other parties, to allow his estate to be sold for taxes without the knowledge of the mortgagee, and conveyed, by an official warranty-deed, to innocent persons, from whom the mortgagee can reclaim it, if at all, only at an extravagant expense. It is true that, by employing a lawyer to watch the records, the mortgagee can protect himself against frauds of this sort, but, as it costs as much to watch the records to keep trace of a five-hundred-dollar mortgage as it does for one of five thousand, people who have five thousand dollars to spare naturally prefer to lend it all on one mortgage than to divide it up among ten, and will show their preference in the interest rate. The consequence is that small mortgages, which ought to be very popular investments among people of moderate means, are left to sharp money-lenders, who pay themselves well, in the rates they exact, for the extra trouble involved in looking out for them. This might easily be changed by legislation, greatly to the advantage of small borrowers, and, we might add, to the credit of our public honesty. Every year, in some, at least, of our States, many thousand dollars' worth of real-estate, belonging, as the official notice says, to "owners unknown," is sold by town collectors to the highest bidder, or, in other words, is coolly confiscated by a set of ignorant functionaries, to save themselves the trouble of finding out whom it belongs to. The innocent mortgagees of such estates are thus deprived of their property without any kind of notice or redress, unless they should happen to see and recognize the description of the estate, which would naturally be a rare occurrence; and it is not surprising that investors avoid lending money on the small parcels of land most subject to this sort of transfer. The first step in protecting small mortgagees, and, in consequence, of facilitating the raising of money on real-estate in small amounts, and at low rates of interest, should be to prohibit and declare void all tax-sales of land described as belonging to "owners unknown." Town officers who cannot find whom an estate belongs to ought not to be allowed to levy taxes on it, still less to sell it to some one else. The second step would be to provide that no tax-sale should be made without previous notice to the mortgagees. It is perfectly easy for assessors to ascertain from the records who the mortgagees of an estate are, while it is next to impossible for non-resident investors to know what antics town-collectors may be playing with estates mortgaged to them, and, until the law puts them in such a position that their property cannot be taken away from them without their knowledge, people who have money to lend on mortgage will either not lend it at all on small estates, or will do so only at rates proportionate to the trouble and risk.

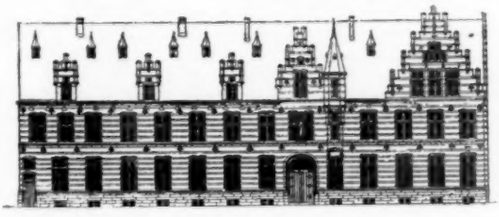
WE look forward with much curiosity and with not a little misgiving to the outcome of the Copley-Square competition, since, if the architects of Boston, to say nothing of architects in other parts of the country, rise to the level of their opportunity and manifest a really public-spirited interest in the problem offered for their solution, we have a feeling that, whether the designs submitted are or are not suitable and of real artistic worth, other municipalities will follow the example set by the Boston Society of Architects and seek advice under similar circumstances from those whose training ought to qualify them to offer it. The jury which will pass upon the merits of the designs is formed by Professors Ware and Chandler of Columbia College and the Massachusetts Institute of Technology respectively and Mr. Wheelwright the City Architect of Boston. The jury is to meet on April 29.

A NEW insurance company has been formed in France, partaking of the nature of our Employers' Liability and Guaranty and Indemnity companies, but with its operations limited entirely to real-estate. By its policies, owners and managers of real-estate are relieved of responsibility to third persons for accidents taking place in or in connection with their buildings, whether finished or in process of erection, and architects are, in the same manner, relieved of the ten-years' responsibility imposed upon them by the Code in regard to buildings erected or repaired under their direction. It will be curious to observe whether insurance of this sort will promote care in building operations, or the reverse. Probably the first feeling of an architect or owner holding such a policy would be that he need take less trouble in supervision than before; but, on the other hand, if the company should keep competent inspectors, charged with stimulating the vigilance of policy-holders by threats of cancelling policies as a punishment for carlessness, an improvement in the present condition of things might be brought about.

ARCHITECTURE OF THE LOW COUNTRIES.[1]—VII.

Fig. 30. Church of Bon-Secours, Péruwelz.

THOUGH the interpretation of the works of the Italian masters and of the founders of the Louis XVI style has bestowed several noteworthy monuments upon Belgium, the study of mediæval types has not been less fruitful in results. The Romanesque style appears in St. Mary's at Brussels and in the synagogue; in St. Joseph's, at Antwerp; in St. John's at Borgerhout, and in the original parish church of Tombes. We have already spoken of the Pointed edifices of Bruges; the reconstruction of the "Maison du Roi," at Brussels, will furnish an interesting example of the art of the early part of the sixteenth century; it is due to the researches of the architect Jamaer. It is the art of the same period that Beyaert interpreted in his design for the Petit Sablon, a most original square, unlike any other on the Continent. It is surrounded by forty-eight pillars of blue stone, the interspaces filled-in by wrought-iron grilles, varied in pairs; the pillars are differently decorated in the style of the period, and support small bronze



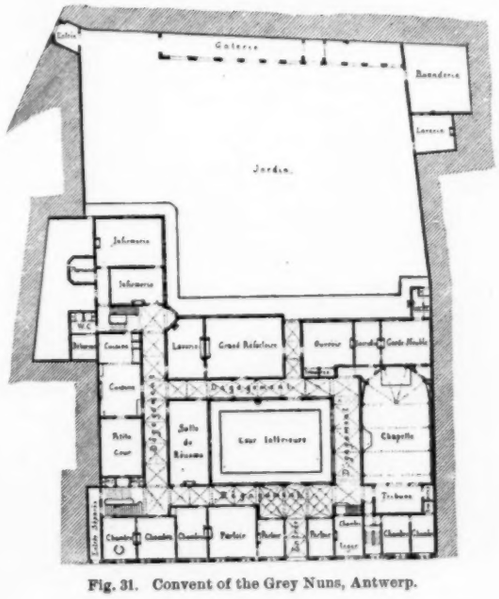


Fig. 31. Convent of the Grey Nuns, Antwerp.

figures personifying the old "trades" of Brussels,—fishmongers, tailors, bakers, carpenters, etc. At the upper end of the garden, in which we find reproduced the characteristic dispositions of the sixteenth-century parterres, there is a fountain surmounted by the figures of Counts Egmont and Hoorn represented as on their way to execution [see "Fountains," Fig. 29, *American Architect* for November 26, 1892;] on each side are statues, in white marble, of five historic characters. The church of Stuyvenberg-lez-Anvers and the parsonage are

Fig. 33. Communal Building of Anderlecht.

also in the Pointed style, as well as the original church of Notre-Dame-de-Bon-Secours, at Péruwelz (Fig. 30) and the convent of the Grey Nuns at Antwerp (Fig. 31), all three by the Baekelmans.

May not the present popularity of the Renaissance style in Belgium be attributed to the same causes that led so generally to its adoption in the Low Countries in the sixteenth and seventeenth centuries? Does not a study of contemporary architecture show, in fact, that its artists are always apt in picturesque combinations and quick to take advantage of the play of light and shade and of color effects? In proof of this, need we do more than recall the Belgian façade erected in the Champ de Mars at Paris, on the Rue des Nations, for the Universal Exposition of 1878 (Fig. 32)? The Communal building of Anderlecht-lez-Bruxelles (Fig. 33) was constructed at that time, after our plans, and, in 1887, that of Schaerbeck. We give in Figure 34 the arrangement of the Council Chamber in the latter. An important communal building was also erected at Borgerhout, a suburb of Antwerp. In Antwerp itself, the National Bank (Fig. 35) was built after the designs of Beyaert; in several different cities there are a good many private residences that embody in a striking way the Renaissance principles; as notable examples, let us cite several of the houses that obtained prizes in the competition opened at Brussels on the occasion of the construction of the Inner Boulevards [see "Modern Architecture," Figs. 55–59, *American Architect* for August 20, 1892]. A few large railway stations have also been built in the same general style,

Fig. 34. Communal Building of Schaerbeck.

[1] From the French of J. van Ysendyck, in Planat's *Encyclopédie de l'Architecture et de la Construction*. Continued from No. 903, page 36.

for example, the station of Mechlin and that of Tournai with its *entrepôt* and Custom House (Fig. 36) by the architect Beyaert. The masses of green and the unevenness of the ground add to the picturesque effects of the gables, dormer-windows, towers and turrets.

Several castles were also constructed in Belgium during the period which we are studying; the principal are those of Westpelaer, situated in the splendid park laid out by Le Nôtre; the castle of Jodoigne (Fig. 37) designed by Janlet, to whom we are likewise indebted for the construction and restoration of the castles of Fumal, Walzin, Wawlin, Bensdael and Merbemont.

Fig. 32. Belgian Exposition Building at the Paris Exposition of 1878.

Fig. 35. National Bank at Antwerp.

We close this brief sketch with a reference to the many important hospitals recently constructed in the Low Countries, among which may be distinguished that of Antwerp, with its isolated, circular pavilions, which have served as types for several other Continental establishments of the kind, and the

Fig. 36. Custom-House, at the Railway Station of Tournai.

hospitals of Tournai, Ghent, Brussels and Bruges; also to the great asylums and orphanages of Ghent, Froidmont, etc.

J. VAN YSENDYCK.

OFFICE-HELP FOR ARCHITECTS.[1]—IX.

Fig. 37. Castle of Jodoigne.

§ 190. Truss XI:—(Fig. 36,) *Hammer-Beam Truss:*—It is usual to assume that the points of support, *B* and *S*, furnish an inclined reaction that supplies both the horizontal and vertical elements necessary for stability. In practice this thrust comes from either the aisle roof or heavy buttresses.

This assumption is necessary because the truss is usually framed in such a way that the pieces *FA*, *HA*, *MA*, and *RA* are incapable of resisting tension, and, consequently, the thrust from the wall is necessary for equilibrium.

The analysis for Case I is based on this assumption. In

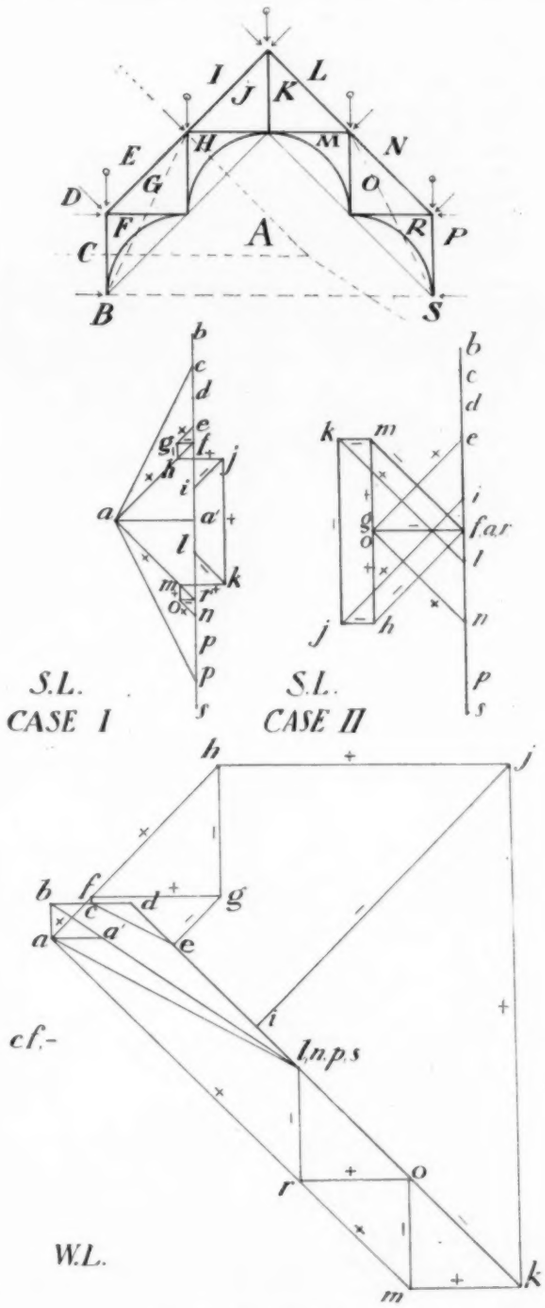


Fig. 36. Hammer-Beam Truss.

Case II these pieces are assumed to be so framed as to be able to resist tension.

In each of these cases the pieces are made of the curved form shown on the drawing, while the strain diagram is drawn as if they were straight; this is necessary because in all cases the strains pass in a straight line from joint to joint, and where the piece is made curved its section must be determined from the bending-moment, found by multiplying the strain by

[1] By George Hill, Consulting Engineer. Continued from No. 898, page 152.

ABBREVIATIONS AND SYMBOLS.

= equal to.	∴ therefore.
∥ parallel to.	□′ square feet.
÷ divided by.	□″ square inches.
× multiplied by.	8# read 8 pounds per lineal foot.
+ added to.	⊏ channel bar.
a^2 a multiplied by itself.	⌶ I-beam.
$a > b$: — a greater than b.	⊤ T-iron.
$a < b$: — a less than b.	∟ angle iron.
$\frac{a}{b}$: — a divided by b.	⊥ deck beam.
	● round section.

I ton = 2,000 pounds as this is the conventional ton, the legal ton is 2,240 pounds, but is rarely used.
l = the length between supports of any beam or girder or height of any column, always in feet.
b = breadth of any beam or girder, always in inches.
d = depth of any beam or girder, or the least transverse dimension of any column, always in inches.
L = total load uniformly distributed coming on any piece in pounds.
$L^{\square'}$ = " " " " per square foot in pounds.
W = concentrated load on any piece in pounds.
S = span of any arch or truss between centres of end pins in feet.
A = area of any section in square inches.
M = maximum bending-moment in inch pounds.
n = distance of centre of gravity of section from either top or bottom edge in inches.
I = moment of inertia, neutral axis through centre of gravity.
R = moment of resistance of section.
r = radius of gyration, in inches.
Sc = safe compressive strain in pounds per square inch.
St = " tensile " " " " " "
Ss = " shearing " " " " " "
S = strain per square inch in extreme fibre.

P_e = upward reaction of support at left-hand end of beam.
P_f = " " " " " right " " " "
e = distance of centre of gravity of load from left hand of beam.
f = " " " " " " right " "

the distance from the straight line to the curved one, where they are farthest apart.

Case I: — Assume that the truss is condensed into the form shown by the dotted lines running from *B* and *S* to the middle joints of the rafters, and a line connecting them, and assume all of the loads grouped at the joints; then the load-line would be: *bc* (½ of clerestory load going directly to abutment), *ca'*, *a'p*, *ps*, *ca* and *pa* drawn ‖ to the dotted lines would be the reactions of the abutments, and *aa'* would be the horizontal component.

Joint *B:* — *bc*, *cf*, *fa*, *ac*.
Joint *C E:* — *ce*, *eg*, *gf*, *fc*.
Joint *F H:* — *fg*, *gh*, *ha*, *af*.
Joint *E I:* — *ei*, *ij*, *jh*, *hg*, *ge*.
Joint *I L:* — *il*, *lk*, *kj*, *ji*.
Joint *H M:* — *jk*, *km*, *ma*, *ah*, *hj*.
Joint *L N:* — *ln*, *no*, *om*, *mk*, *kl*.
Joint *M R:* — *mo*, *or*, *ra*, *am*.
Joint *N P:* — *np*, *pr*, *ro*, *on*.
Joint *S:* — *rp*, *pa*, *ar*.

Case II: — In this case there is tension in both *H A* and *M A*, and as a consequence the pieces *C F* and *R P* carry

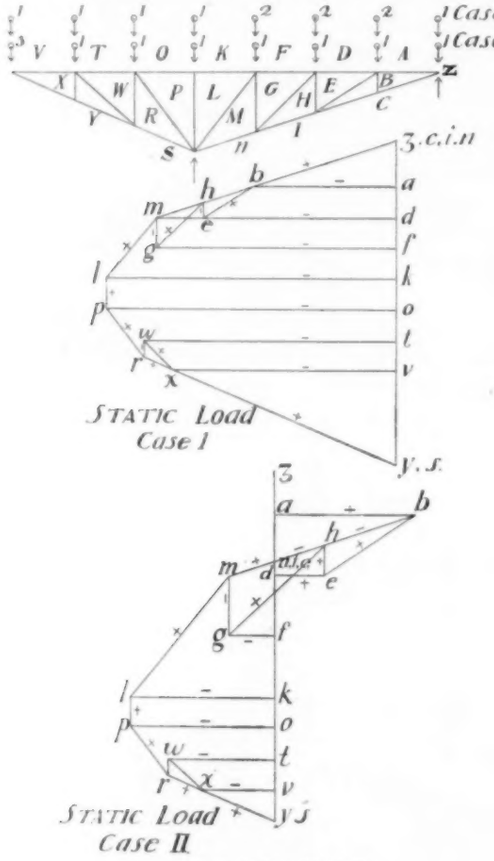


Fig. 37. Cantilever Truss.

each ½ of the total load, and there is no strain on the pieces *F A* and *R A*. Load-line: *bc* (½ of clerestory load going directly to abutment), *cd*, *de*, *ei*, *il*, *ln*, *np*, *ps*; *sa* and *ab*, the reaction.

Joint *B:* — *cf*, *fa* (coincident), *ac*.
Joint *C E:* — *ce*, *eg*, *gf*, *fc*.
Joint *F H:* — *fg*, *gh*, *ha*, *af* (coincident).
Joint *E I:* — *ei*, *ij*, *jh*, *hg*, *ge*.
Joint *I L:* — *il*, *lk*, *kj*, *ji*.
Joint *H M:* — *jk*, *km*, *ma*, *ah*, *hj*.

Note that *o* and *g* fall on the same point, then the balance of the diagram is symmetrical.

Wind-Left Diagram: — In all cases of wind-load we assume that the reaction of the support on the wind side is vertical and is inclined on the opposite side. For the load-line, plot first, *bc* ‖ to the wind acting normally to the post *C F*, then *cd* and *de*, or *ce*, their resultant, for the wind on the joint *C E*, then *ei* and *il* the remaining forces, normal to the rafter. Join *l* with *b*, the line *bl* is the resultant of this load-line. Now draw the dotted lines in the figure — one through the centre of the piece *C F*, and the other through the centre of the rafter or through the joint *E I* — until they intersect, and from the point of intersection draw the dotted line ‖ to the resultant of the load-line (*bl*), cutting the dotted line from *B* to *S*. Divide the resultant *bl* into two parts by the point *a'* proportional to the parts into which the line *B S* is divided by the resultant; then draw the horizontal line *a'a* and the vertical line *ab*: *sa* is the reaction of one abutment and *ab* that of the other.

Joint *B:* — *bc*, *cf*, *fa*, *ab*.
Joint *C E:* — *ce*, *eg*, *gf*, *fc*.
Joint *F H:* — *fg*, *gh*, *ha*, *af*.
Joint *E I:* — *ei*, *ij*, *jh*, *hg*, *ge*.
Joint *I L:* — *il*, *lk*, *kj*, *ji*.
Joint *H M:* — *jk*, *km*, *ma*, *ah*, *hj*.
Joint *L N:* — *ln* (coincident), *no*, *om*, *mk*, *kl*.
Joint *M R:* — *mo*, *or*, *ra*, *am*.
Joint *N P:* — *on*, *np* (coincident), *pr*, *ro*.

Note: *lk* is not necessarily the prolongation of *dl*.

§ 191. Truss XII: — (Fig. 37,) *Cantilever*.

Case I: — Load so distributed as to cause pull on abutment.

Load-line: — Assume that relative weights of loads are as shown by the figures nearest the top chord. Let *c* represent one panel length, then we would have for equilibrium around *L N*,

$$Z A = \frac{C(3YV+2VT+1TO)c-(1KF+2FD+3DA)c}{4c} \qquad (29)$$

substituting assumed values as above noted

$$C A = \frac{(3\times3+2\times1+1\times1)-(1\times1+2\times1+3\times1)}{4} = \frac{6}{4} = 1\tfrac{1}{2}$$

and as the load of *Z A* = 1 we have ½ as the pull upward on the abutment. Then we have the truss in equilibrium and the total load supported by *S N*. Now draw load-line, *ca* (= load + abutment pull = 1½), *ad*, *df*, *fk*, *ko*, *ot*, *tv*, *vy*.

sn = reaction = total load; *n*, *i*, *c*, *z* (coincident points).

Notice in this case that the load-line is started at the right-hand end of the truss and as a consequence the truss members are followed around in the reverse order from that used heretofore.

Joint *C A:* — *za*, *ab*, *bc*, *cz*.
Joint *D A:* — *ad*, *de*, *eb*, *ba*.
Joint *I C:* — *be*, *eh*, *hi*, *ic*, *cb*.
Joint *F D:* — *df*, *fg*, *gh*, *he*, *ed*.
Joint *N I:* — *hg*, *gm*, *mn*, *ni*, *ih*.
Joint *K F:* — *fk*, *kl*, *lm*, *mg*, *gf*.
Joint *O K:* — *ko*, *op*, *pl*, *lk*.
Joint *S N:* — *lp*, *pr*, *rs*, *sn*, *nm*, *ml*.
Joint *T O:* — *ot*, *tw*, *wr*, *rp*, *po*.
Joint *Y S:* — *rw*, *wx*, *xy*, *ys*, *sr*.
Joint *T V:* — *tv*, *vx*, *xw*, *wt*.
Joint *V Y:* — *vy*, *yx*, *xv*.

Case II: — In which the condition of load is such as to cause the abutment to support a portion of it.

Assume that the relative magnitudes of the loads are as shown by the upper row of figures; now, applying these values to equation (29), we have

$$C A = \frac{(1\times3+1\times2+1\times1)-(2\times1+2\times2+2\times3)}{4} = -1\tfrac{1}{2}$$

Since the load of *Z A* is 1, the total load supported by the abutment will be 2½.

Load-line *za*, *ad*, *df*, *fk*, *ko*, *ot*, *tv*, *vy*, *ys* (coincident), *sn*: *n*, *i*, *c* (coincident), *cz*, reaction of abutment (*sn* = total load = 2½).

Joint *Z:* — *za*, *ab*, *bc*, *cz*.
Joint *A D:* — *ad*, *de*, *eb*, *ba*.
Joint *I C:* — *eh*, *hi*, *ic*, *cb*, *be*.
Joint *D F:* — *df*, *fg*, *gh*, *he*, *ed*.
Joint *N I:* — *hg*, *gm*, *mn*, *ni*, *ih*.
Joint *K F:* — *fk*, *kl*, *lm*, *mg*, *gf*.
Joint *O K:* — *ko*, *op*, *pl*, *lk*.
Joint *S N:* — *lp*, *pr*, *rs*, *sn*, *nm*, *ml*.
Joint *O T:* — *ot*, *tw*, *wr*, *rp*, *po*.
Joint *Y S:* — *rw*, *wx*, *xy*, *ys*, *sr*.
Joint *T V:* — *tv*, *vx*, *xw*, *wt*.
Joint *V Y:* — *vy*, *yx*, *xv*.

§ 192. Truss XII: — (Fig. 38,) *Cantilever*, erect.

Static-Load Diagram: — Assume loads proportional to length of rafter, then substituting values in equation (29).

$$P\,A = \frac{(\frac{1}{2}\times 3+1\times 2+1\times 1)-(1\times 1+1\times 2+1\times 3)}{4} = -\frac{1\frac{1}{2}}{4}$$

$= -\frac{3}{8}$, to which is to be added $\frac{1}{2}$ from the rafter load, making $-\frac{7}{8}$ as the reaction, which is $\frac{7}{8}$ of the load at one joint.

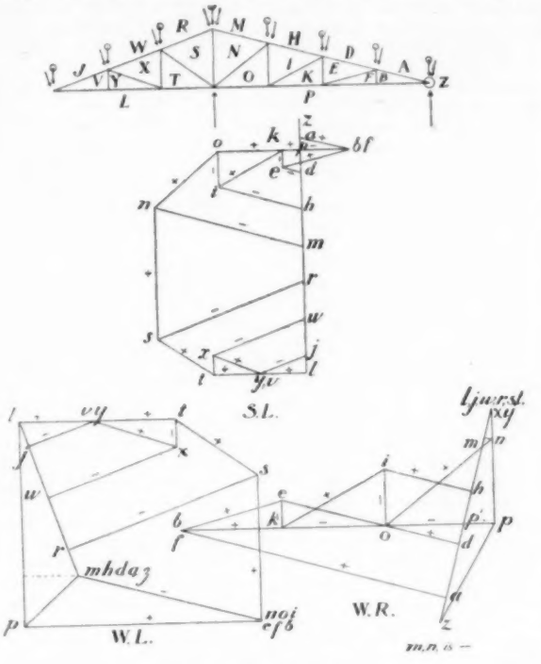


Fig. 38. Erect Cantilever.

Then we have, *za*, *ad*, *dh*, *hm*, *mr*, *rw*, *wy*, *j l*, *lp* (reaction = total load $-\frac{7}{8}$), *pz* (= reaction = $\frac{7}{8}$).

Joint *A*: — *za*, *ab*, *bp*, *pz* (note *f b* coincident).
Joint *A D*: — *ad*, *de*, *ef*, *f b*, *ba*.
Joint *K F*: — *fe*, *ek*, *kp*, *pf*.
Joint *D H*: — *dh*, *hi*, *ik*, *ke*, *ed*.
Joint *O K*: — *ki*, *io*, *op*, *pk*.
Joint *H M*: — *hm*, *mn*, *no*, *oi*, *ih*.
Joint *M R*: — *mr*, *rs*, *sn*, *nm*.
Joint *L P*: — *ns*, *st*, *tl*, *lp*, *po*, *on*.
Joint *R W*: — *rw*, *wx*, *xt*, *ts*, *sr*.
Joint *Y T*: — *tx*, *xy*, *yl*, *lt*.
Joint *W J*: — *wj*, *jv*, *vj* (coincident), *yx*, *xw*.
Joint *J L*: — *jl*, *lv*, *vj*.

In this case the reaction at the column *L P* is taken to be vertical and the wall at *Z* supplies all of the horizontal force needed for stability. The wind-force is perpendicular to the rafter, and the resultant acts through the centre of *W X*. Prolong the resultant until it intersects *Y L*. Take moments about *L P*, determining the vertical force at *Z A* necessary for equilibrium. Then we would have the load-line, *lj*, *jw*, *wr*, *rm* (*h*, *d*, *a*, *z*, coincident), *zp*, the inclined reaction at *z*, and *pl*, the vertical reaction at *P L*. Note that the dotted line divides *pl* into two parts, which are respectively the vertical components of the wind-pressure and of the wall-reaction.

Joint *J L*: — *lj*, *jv*, *vl*.
Joint *J W*: — *jw*, *wx*, *xy*, *yv*, *vj*.
Joint *Y T*: — *yx*, *xt*, *tl*, *ly*.
Joint *W R*: — *wr*, *rs*, *st*, *tx*, *xw*.
Joint *R M*: — *rm*, *mn* (applies to all of rafter to *z*), *ns*, *sr*.
Joint *L P*: — *sn*, *no* (coincident), *op* (applies to all of tie), *pl*, *lt*, *ts*.

Wind-Right Diagram: — In this case truss to left of column gets no load and does not appear, resultant divides tie into parts proportional to division of load-line, reaction of column under *L P* is vertical; we have then *lm*, *mh*, *hd*, *da*, *az*, *zp*, *pl*.

Joint *L M*: — *lm*, *mn*, *nl*.
Joint *L P*: — *ln*, *no*, *op*, *pl*.
Joint *M H*: — *mh*, *hi*, *io*, *on*, *nm*.
Joint *O K*: = *oi*, *ik*, *kp*, *po*.
Joint *H D*: — *hd*, *de*, *ek*, *ki*, *ih*.
Joint *K F*: — *ke*, *ef*, *fp*, *pk*.
Joint *D A*: — *da*, *ab*, *bf* (coincident), *fe*, *ed*.
Joint *A Z*: — *az*, *zp*, *pb*, *ba*.

§ 193. Towers: — (Fig. 39,) Towers will generally assume in plan the shapes shown in the figure at (*a*), (*b*) or (*c*), while the elevation will usually assume the triangular or trapezoidal forms or can be reduced to this form for the purpose of ascertaining the stresses. The static-loads will only cause compression in the column and horizontal members as shown. The wind-loads call into play the web-bracing. In computing the effects on the bracing observe the following:

(*a*) Wind acts against *ab*, leg at *c* takes total compression, legs at *a* and *b* ½ each of total tension, sway-bracing in the planes, *ac*, *bc* will each have as much of the strain shown by diagram as would be obtained by drawing from the ends of a line representing one of these strains lines ‖ respectively to *ac* and *bc*. Make all parts large enough to resist the heaviest stresses found.

(*b*) Wind acts against *ab*. If this pressure is taken against ½ of *ab*, then the stresses in columns at *b* and *c* and the web-bracing in *bc* are obtained directly.

(*c*) Wind acts against a surface equal to the diameter as shown. Take it as acting against ½ of this surface and as being resisted by the columns at *c* and *d* and the web-bracing in *cd* only. Make all pieces in the sides symmetrical.

(*Note*: It is possible so to construct an octagonal tower as to save a deal of metal for the same strength, but to do this it is indispensable that the interior of the tower should be given over to the bracing.)

Case I: — Triangular Towers.

Static-Load Diagram: — Self-explaining.

Wind Diagram: — Wind-Left: — Take moments around *A*. Multiply each pressure as concentrated at a joint by its lever

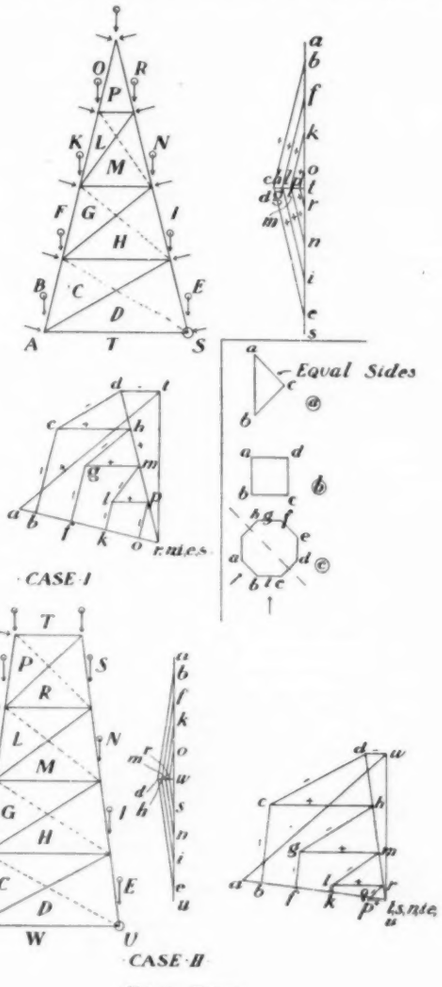


Fig. 39. Towers.

arm and then divide by *D T*, quotient = vertical reaction at *S*.

Then *ab*, *bf*, *fk*, *ko*, *or* (*n*, *i*, *e*, *s*, coincident). *st* (the vertical reaction just found), *ta* the reaction at *a* necessary to close.

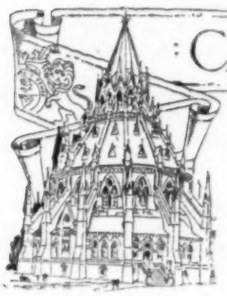
To obtain this, anchor-bolts of proper size must be used.

Analysis given for the diagonals as drawn in full lines. Dotted lines show diagonals that must be put in to make the strain tension in the diagonals when the wind reverses in direction.

Joint *O R*: — *or, rp, po.*
Joint *K O*: — *ko, op, pl, lk.*
Joint *R N*: — *pr, rn, nm, ml, lp.*
Joint *F K*: — *fk, kl, lm, mg, gf.*
Joint *N I*: — *mn, ni, ih, hg, gm.*
Joint *B F*: — *bf, fg, gh, hc, cb.*
Joint *I E*: — *hi, ie, ed, dc, ch.*
Joint *A B*: — *ab, bc, cd, dt, ta.*
Case II: — Trapezoidal Tower.

Reactions found as in Case I and diagram worked out in same way, taking joints thus: *O T, T S, K O, S N*, etc. *w* and *t* are coincident in the figure.

[To be continued.]



CANADA

THE PALETTE CLUB, ITS METHOD OF CONDUCTING EXHIBITIONS AND THE PICTURES RECENTLY EXHIBITED. — THE MONTREAL *Herald* VICTIMIZED BY FIRE. — PROPOSED GALLERY OF CANADIAN NATIONAL HISTORY PAINTINGS. — CANADIAN ARTISTS AND THE WORLD'S FAIR.

A VERY important and interesting movement has recently been inaugurated in Toronto in connection with the art of painting, a movement made necessary by the misfortunes of the times, which too often lead the artist to regard his talent merely as a means of earning a livelihood and cause him to lower his natural gift to the level of a trade, and to paint not for the sake of art but for the necessities of existence. A like consequence of the "hard times" makes itself apparent in various arts, but in none perhaps so conspicuously as in painting, and, in consequence, the public have continually put before them innumerable canvasses only a small percentage of which can be considered real works of art. The public is the loser, for, with little else before it, there is no training as to what is really good and beautiful, and it is soon unable to acknowledge real merit unless it happens that it is combined with something in the subject that attracts special attention, and then it is the subject rather than the work that receives the praise.

The movement we allude to has been started here, as similar ones have been in the countries of the Older World, for the purpose of the study of beauty of form and color for their own sakes apart from the subject and apart from the question of pecuniary value. No doubt subject has a great deal to do with form and color, but it is evident from the immense variety of subject that it need be only a secondary consideration. As talent varies, and one has a talent for figure-painting and another for landscapes, it is perfectly compatible with the study of form and color that all classes of subjects should be included. The main text is to be found in the thought that "beauty is the expression of the mind of God" seen through a material medium, and when once it is acknowledged that that which is beautiful has so lofty an origin, he who has the gift of reproducing on canvass beauty of form and color cannot rest content until he has, in his own line, trained his hand and eye to represent the beautiful true to nature.

The Palette Club is the immediate outcome of this movement here, and perhaps what we have been saying may be better comprehended if we turn to the methods of the working of this Club. Some few artists, it matters not who, having realized the necessity for the movement, have associated themselves for its development. The *personnel* of the Club is unknown to the public; no list of membership appears, and it does not by any means follow that because an artist's name appears in a catalogue of the Club's exhibition that he is a member; he may or may not be, but some particular painting of his is entitled to a place and *it*, therefore, is invited for exhibition, for itself, as a work of art, apart from its author.

The first exhibition of the Palette Club contained about nineteen oils, seventeen water-colors and a few pencil and crayon drawings, — a small collection, indeed, but one in which every picture was of undoubted merit, and it was, therefore, an exhibition such as has rarely, if ever, been held here.

A picture undoubtedly borrows a certain amount of interest, apart from its perfection of treatment, from its name or the associations its name may suggest; and, again, the name of the author gives a basis for criticism, for the memory of other works by the same artist and of criticisms they have already received lends a bias to the mind which hinders or stimulates admiration of the work under consideration. To obviate this, and that a picture might stand upon its own merits absolutely, there should be no catalogue, the name of the artist should, if possible, be concealed and the title of the picture unrevealed. But this would be an ideal state of things with regard to art that would not be possible in these prosaic days. People demand the title and will know the name of the artist, and certainly the artist who produces a really good or clever work is entitled to the credit of it; but one object of the Club is that no invidious distinctions should be made, and their method of procedure probably secures this object in the best way. We will proceed to notice some of the most prominent pictures. Among the oils, portraiture is represented by a couple of canvasses — life-size busts. In one we see a careful study of beauty of *color* in flesh-painting ("Portrait of S. V. Blake," by E. W. Grier), while in the other ("Anticipation," by Miss S. S. Tully), it is rather beauty of *form*, a study to reproduce *expression*, that has been the aim of the author. Each in its way exhibits a conception of the beauty of humanity — the highest form of natural beauty that an artist can aspire to reproduce, and they are, therefore, fit to rank as "high-grade" works, although, as no doubt the authors are themselves only too keenly aware, they are not perfect.

Perhaps the most striking painting among the oils is one which attracts immediate and concentrated attention, a clever piece of rich coloring, vigorous treatment and spirited idea. It represents a girl in rich silk walking-dress and Gainsborough hat, with outstretched arm (the hand grasping an ivory cane), standing on a polished floor, the background made up of polished furniture, and an oval mirror on the wall. The result is brilliant and luminous, but it was, unfortunately, hung too near the eye to receive that appreciation which is certainly its due. This is E. W. Grier's "La Canne d'Ivoire."

The reproduction of beauty in form and color in landscape-painting was exhibited in almost as many characters as there were pictures. "From early dawn to dewy eve," under a variety of skies and lights, woodland, moorland, waterpieces, figured landscapes and homely scenes defy comparison as to individual merits, but each one in its particular style of treatment was worthy of earnest attention, although we cannot pass on without a remark upon the somewhat strained tone of color which characterized one or two. Intense blue, for instance, employed in the coloring of water, so intense as to lend a hue to the whole picture, is hardly true to nature in a Canadian climate, although it may belong to the brilliant atmosphere under Italian skies, much as the marvellous red tints of the Arabian deserts belong exclusively to them. O. R. Jacobi's "Waterfall at Moisic" is the one that calls out these remarks, although the painting is meritorious in other respects.

The same variety of subject was to be observed among the water-colors, although in some of the latter were portrayed grander scenes. It is impossible to find in any other scenes the wonderful tints of the various levels of a pass among the "Rockies," from the deep blue-purple shades of the valleys to the ice-glare of the summits or the misty, indescribable color of the hovering clouds, and, although it seems like treason to mention railroads in such glorious surroundings, well does the author of one such picture realize how the grace and ease of nature is emphasized by the introduction of the contrast of the ridged lines of a trellised girder that spans the narrow gorge (L. R. O'Brien's "Kicking-Horse Pass"). Under various treatments was seen that appreciation of the poetic touches of nature that are noticeable only to the gifted eye.

Many people pass through beautiful scenes, but their fine points of beauty — the exquisite glinting of sunlight through the leaves, as exemplified by L. R. O'Brien's "Lime Walk, Clovelly," or the delicate tinting of the heather on the rolling moor, examples of which are to be found in C. W. Manly's "Midsummer Days" and "Shimmering Heat" — are lost upon unresponsive souls. In the pictures before us the artists have striven, some with more, some with less, success, faithfully to record those little details which are the life of nature and seem to make the canvas live. A danger seems to be the exaggeration of a tone or the failure to appreciate the exact shade of color. "A Sheep-pasture" by G. A. Reid exhibits this in the solidity of the gamboge field, and warns the artist that his sense of color is not quite fine enough. And, again, "A Catskill Village," by the same artist, suffers from too pronounced a depth of blue, laid on somewhat blotchily: his grasp of the picturesque is good, but his coloring is too strong. Space will not admit of our mentioning others that might well be included, except, casually. F. M. Bell-Smith exhibits two in oil and two in water-color, of which the best is his "London Bridge," in which the clouds of London smoke are cleverly reproduced. His "Tintern Abbey," a charming view of the well-known and lovely ruin, is somewhat injured by the lack of care taken with the grass on which the ruin stands — its solid green detracts from the beauty of the Abbey. But we cannot close this short review without an allusion to the masterly sketches of animal life in pencil by E. E. Thompson; the animated back of the wolf that is reproduced in his ghastly "Waiting in Vain" (not exhibited here) is perfect, while his spirited portrayal of less ferocious creatures, such as goats and dogs, shows that he has not studied them in vain.

This first exhibition of the Palette Club was held in the studio of Mr. L. R. O'Brien, and to this Club the public owes a debt of gratitude that perhaps, as yet, it will hardly acknowledge to be due; but time will show the importance of the movement that has thus been inaugurated, and tell how great a need there is for such a club *here*, as in every other place where, hitherto, artists have failed to realize the great importance of their gifts.

But let us pass on from art-criticism and the realm of theory.

Of unfortunate newspapers, the *Montreal Herald*, probably, may rank first. In eleven years, the premises occupied by its offices have been completely burned out three times, while on a fourth occasion fire did a considerable amount of damage without completely destroying the building. In 1881, premises occupied on St. James Street were destroyed, and in 1887, the building into which the proprietors had moved was gutted, and now a third building has been burned to the ground. The second conflagration was a notable one, as without it an immense improvement in the open space known as Victoria Square could not have taken place. The building then occupied by the *Herald* jutted out into the Square, a large, unsightly warehouse, but of far too great a value to be pulled down for the sake of "improvements"; but when opportunely burned down the corporation seized the occasion, bought the site and ruins, and had the obstruction removed. The offices were then set up in an old chapel building not far off, where they were attacked by fire two years ago, but, as we have said, only partially damaged. On the night of March 27th last fire broke out again, and shortly before eleven o'clock was found to be of such serious proportions that a general alarm was sounded. The building was occupied by other firms as well as by the *Herald*, all of whom have lost heavily, their insurance being only partial. The building is entirely destroyed.

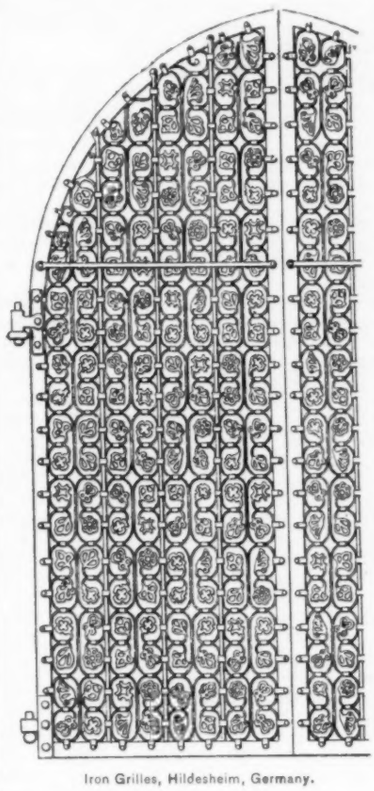
Dr. Sandford Fleming, a well-known Canadian *savant*, is advocating the establishment, in connection with the Canadian Institute, of a gallery of Canadian national historical paintings,— a very laudable idea, for, however young a country may be, it must possess a history of some kind or another. The history of Canada as a British possession dates from 1763, but it has a history which extends over a couple of hundred years prior to that date, and there are not wanting stirring incidents which might well form the subjects for such a gallery. The difficulty would be, not to find subjects, but which to select. The author of the suggestion proposes that, as July 22d next is the one hundredth anniversary of the arrival of a small party of Canadian voyagers, headed by Alexander Mackenzie, on the Pacific coast, artists should be invited to contribute sketches (the time being short) for a painting commemorative of the event, as a commencement towards this object. Dr. Fleming considers that it would not be too much to aim at if the Canadian Institute would endeavor to procure an average of one picture a year, and to this end he invites the members to attempt to raise the necessary funds. There can hardly be two opinions as to the value of such a collection of historical paintings, but it is very doubtful whether sufficient interest could be roused in the heart of the public to further this scheme. The Canadian Institute does not receive that support to which so valuable an institution is entitled, and which would, if given, enable it to do so much more than it already does.

The artists of Ontario are very justly excited over the decision of the final committee appointed to select paintings of Canadian artists for exhibition at the World's Fair, which amounts to the rejection of Mr. E. E. Thompson's picture, "Waiting in Vain," described in a recent letter. Their sole ground for its rejection is the unpleasantness of the subject, although, of course, it is said that the majority of the committee, being residents of the Province of Quebec, have taken an opportunity of slighting the minority from Ontario. However this may be, the committee, by their rejection of the picture, have made a very grave mistake, and have acted in a manner which lays them open to suspicion. The subject, it will be remembered, is a group of wolves feasting upon a gory skeleton in the snow, that being all that is left of a peasant, whose cottage is seen in the distance, where his wife waits in vain for his return. Ghastly as is the subject, as a piece of animal painting it is absolutely unsurpassed by any painting of a similar class heretofore executed by a Canadian, and, if that is thought to be scant praise or a doubtful compliment, it may be added that it is improbable any one could produce, the world over, such wolves, so thoroughly true to life. The author, having made a special study of wolves for this particular picture, might, under the circumstances, have been considered entitled to merit. The last has not been heard of the matter, as an appeal against the decision of the committee has been forwarded to the Government, the artist, however, taking no part towards vindicating himself. It would be well if the members of the committee in question had displayed something of the spirit of the Palette Club.

SHODDY BUILDING AT CHICAGO. — When Chicago papers call attention to the faulty and even dangerous construction of the new hotels that are being put up to house and entertain visitors to the World's Fair, the warning is impressive. The *Herald* of that city declares that some of these buildings are wholly insecure, and says that if fire should once get headway in them during the Fair "escape with life would be doubtful, and with property impossible." The building-laws, it adds, are good enough on paper, but enforcement of them has been a farce. The *Herald* advises the department, "now that the charter election is over," to pull down these World's Fair hotels, "that cannot possibly withstand the furious hot winds we are sure to have from the southwest during the summer, if they escape destruction by fire or tornado sooner." Some of the caravansaries are outside the building-limits, and it is suggested that, to meet this difficulty, they be posted by the city authorities as unsafe. — *New York Evening Post.*

THE FIRE-HAZARDS OF ELECTRICITY.[1]

CHAIRMAN AND GENTLEMEN OF THE SOCIETY OF ARTS: —



Iron Grilles, Hildesheim, Germany.

I HAVE been requested by your Secretary to prepare a short paper on the Fire-hazards of Electricity, in which I am to present the insurance side of the question. This I have attempted to do in as brief a manner as possible, as I understand the matter is to be fully discussed by gentlemen who, I have no doubt, will deal with this subject in a manner befitting its great importance.

On the introduction of the electric telegraph as a means of communication between distant points, the few wires stretched from pole to pole were not looked upon as a means of increasing the fire-hazard, as their number was so few as not to be a serious hindrance to the fire-department and the cases where atmospheric electricity followed the wires to the switch-board and instruments, causing small fires, were so rare as to hardly attract attention. By slow degrees, as the benefits of this great invention begun to be appreciated, the wires began to increase; still, while they proved a hindrance they were not looked on as a hazard to be seriously considered.

Later came the dial-telegraph for communicating between local points, and the stock-ticker for sending out market quotations; but these increased the number of wires only slightly.

But after the invention of the speaking-telephone and the perfection of the exchange system, the increase of aerial wires was enormous; every available spot on roof or front of buildings was eagerly seized on by the busy linemen, often without due regard to the rights of owners or occupants. Lines of poles sprang up at all points, sometimes during the hours of night, and met the astonished gaze of the law-abiding citizens for the first time as they wended their way to their places of business. The location of these intruders was not always selected with a view to the comfort or convenience of these same good people, and often their protests were met by that trite saying, "Well, what are you going to do about it?"

With this enormous increase of electric wires, the delays to the fire-department became more frequent and losses by fire were often greater than need be due to this cause; yet they did not endanger the lives of the firemen to any great extent and were handled without fear.

Later came that new form of electric energy, the electric arc-light. Gradually it worked its way into public favor and gradually its power for mischief to the fire-underwriters and owners of property became manifest by reaching the pockets of both. This was inevitable, owing to the first crude methods resorted to for the transmission of this new form of energy. The existing forms of insulation were not equal to the task of confining this greatly increased force within bounds, and in fact no other people in the world but our own would have permitted the introduction of an element fraught with such possibilities of danger to life and property, with no real means for keeping it under control. But we are ever ready to take chances and assume risks in order to gain time or secure some improvement that will contribute to our comfort or add to our wealth.

With the introduction of this class of wires came another obstruction to the efforts of the firemen in extinguishing and preventing the spread of fires, and also a certain amount of demoralization in their ranks. Men who would face the flames, inhale poisonous gases, and stand beneath tottering walls without flinching, stood in wholesome dread of the arc-light wires. The former elements of danger they were familiar with and could to some extent avoid, while the latter contained hidden and, to them, mysterious dangers that they knew very little of. To handle such wires or come in contact with them

[1] A paper read before the Society of Arts, Boston, Mass., April 13, 1893, by Capt. William Brophy, of the Cotton and Woollen Manufacturers' Mutual Insurance Company.

meant injury or death. In addition to this, they soon learned that the wires they had been accustomed to handle with impunity, and remove when an obstruction, were liable to become dangerous also, and as a matter of fact firemen are justified in refusing to handle electric wires in towns or cities where an arc-light plant is installed, unless during the hours when it is not in operation.

Next in order came the incandescent electric light, direct or low-tension system. While the wires for this system proved another obstruction, they were not dangerous to life or limb; yet firemen who are not expert electricians looked upon them with mistrust. Later still came the electric-power circuits. At first no greater than the usual 110-volt current was used, which is not dangerous to life or limb. Later this was increased to 220, in order to reduce the cost of conducting wire.

Next came the transformer system of electric lighting, where a current of 1,000 to 2,000 volts is used in the primary conductors from dynamo to transformers. These were another obstruction and dangerous to person.

About the same time came the electric street-railroads with their trolley-wires, feeders, span and guard wires. That these prove a serious obstruction at fires no sane man can deny. They, also, are a source of danger to the firemen and contact with them is studiously avoided by those brave guardians of our lives and properties.

I have thus far dealt with one feature of the fire-hazards due to overhead electric wires. I now come to another — their liability to become the direct cause of fires.

First is the liability to cause fires on the outside of buildings. Occurrences of this kind are rare, yet cases of this nature are not unknown. This is due, in most instances, to defective insulation at one or more points of the circuit, permitting a derived circuit through or on the surface of inflammable material and imperfect contact at binding-posts and cut-out switches.

Next, we come to the greatest fire-hazard from the overhead wires — the danger of electrical contact between the harmless low-tension and the dangerous electric-light and power wires. The arc, incandescent, power, railway and alternating wires are capable of doing great damage in this way by sending currents greatly in excess of the safe carrying-capacity of the smaller wires, and heating them sufficiently to cause the ignition of any inflammable substance in the immediate vicinity.

I will now consider the wires in the interior of buildings as a fire-hazard, and will begin with those of the arc-lighting system. For the sake of securing sufficient mechanical strength, the size of wire used for this system has a much greater amount of conductivity than is necessary for safely conducting the current, so that no danger need be apprehended from overheating them. Where an abnormal amount of heat is produced in one of these circuits, it is due to imperfect joints or connections, thus introducing an excessive amount of resistance at such points. There is also more or less danger from the arc-lamp, due to broken globes permitting pieces of hot carbon to drop onto inflammable goods, also from improperly-trimmed lamps, which permit the burning-out first of the carbons, and then the metal holders. This latter will surely cause trouble in many places.

Fortunately those engaged in the business of electric lighting recognize the wisdom of the practice of not concealing from view this class of wires, thus rendering the task of installing them with a reasonable amount of safety comparatively easy, and rendering their inspection less difficult.

Fire-hazards from the incandescent system are confined wholly to the wires or conductors. The danger from the lamp need not be considered. Trouble can and does arise at times from the lamp-socket.

I will not treat of the direct system — where a system of circuits, mains and branches are supplied from a central station from one or more dynamos delivering current into one common conductor and thence through a system of feeders to the distributing-mains. The electro-motive force necessary for the distribution of current in this system is not sufficient to cause serious injury by reason of shock to the nervous system, as it does not exceed 220 or 330 volts at the dynamo. But the quantity of current is sufficient to seriously burn a person under some circumstances, and would also, under favorable circumstances, cause serious loss by fire. The amount of current flowing from the generating-station is limited only by the capacity of the dynamos and the number of lamps in use. The potential or pressure is as nearly constant as it is possible to make it, but the amount of current is in proportion to the number of lamps. Whence, may be asked, comes the fire-hazard from this system? A very natural question, and one that suggests itself to a great many people. But the fire-hazard can be much greater from this than from the arc system. Hundreds of ampères of current are sent out over this system of feeders to supply lamps and motors, sufficient to melt down nearly if not all the interior wires in many buildings, if, by reason of one of the many causes that suggest themselves to those familiar with the subject, an abnormal flow of current takes place over them.

You may ask, How can this occur? Current flow is regulated by the electro-motive force or pressure and resistance, or, if you please, friction. To supply a given number of lamps or given size of motor, a given size of wire is necessary. The filament in the lamp affords a path of very high resistance for the current. As they are connected-up in multiple, the greater the number of these paths the less the total amount of resistance.

If, through ignorance or motives of economy, the supply-wire is too small, heat is generated in the wire, and if the number of lights is sufficiently in excess of the safe carrying-capacity of the wire, it can be brought to a white heat, or melted, even, — a dangerous process near inflammable material. If the wires are properly proportioned and, through any means, those of opposite polarity (positive and negative) are brought into metallic contact, a path of low resistance is then established and an excessive flow of current results, with the same consequences as before.

Derived circuits established to and through the earth, caused by defective insulation, even though the points of contact be widely separated, will bring about this same result.

It is true that safety-fuses are brought into play to prevent occurrences of this kind, but it is not an unusual thing to find fuse-wires at the junction of circuits and branches far in excess in carrying-capacity of the wires they are designed to protect, and it is not unusual, after the fuse-wire has performed its functions by melting, to find it replaced by one whose fusing-point is many times in excess of the original, and I have known cases where, after the failure of the largest fuse-wire to maintain the continuity of the circuit, copper wire was substituted therefor.

I next come to the fuse-blocks, or bases. The earlier types were of wood. Contact between wires and fuse secured under screw-heads, the inevitable shrinkage of the wood destroyed the contact, and heat or a series arc was the first result, and, later, a fire, insignificant or of considerable magnitude according to circumstances. Too often these devices were concealed from view, thus increasing the hazard.

Next come the switches for turning-on and cutting-off the supply of current. When mounted on wooden bases, they were capable of doing all the mischief ascribed to the wooden base cut-outs. In addition to this may be cited imperfect contacts, introducing an excessive amount of resistance and increasing the temperature to an unsafe point. The inexcusable practice of placing switches of insufficient capacity is sure to bring about the same results.

That undesirable trio — the combination fixture for gas and electric lights, the cheap insulating joint, and wood or fibre base cut-out, concealed under the metal canopy of the fixture — has been and is now another fruitful source of trouble and added fire-hazard. The heat from the gas-burners on a large fixture causes the fibre-insulation to shrink, permitting the gas to escape in small quantities at first, but steadily increasing in volume. The contact between screw-head and fuse is destroyed from the same cause, a slight arc established, the escaping gas ignited, the fibre in the joint burned, and a burning gas-flame limited only by the size of the pipe is the result.

Next in order comes that twin-brother in iniquity of the swinging gas-jet, the so-called flexible cord, to the ends of which are suspended so many incandescent lamps. The best of these are not safe in some locations, such as show-windows or any other place where they are in close proximity to inflammable goods, while the cheaper grades are positively dangerous in nearly all places. While the use of this flexible cord may be admissible for suspending lamps in the usual way in buildings which in themselves are of a slow-burning construction and contain little that is inflammable, the practice of fastening it to the walls or ceilings, either by means of cleats or staples, or concealing it between floors and partitions, cannot be too severely condemned. Such a practice adds another to the fire-hazards of electricity.

Next come the wires for incandescent electric-lighting, their character and the methods of installing them. It goes without saying that the very best of insulating covering is none too good for electric-light wires. It should be waterproof in many positions, while there are cases where this is not necessary. Another desirable quality it should possess is non-inflammability, but very little of the best grades of insulation for wires possesses this desirable feature. Wires covered with any known grade of insulation, held in place by wooden cleats, add to the fire-hazard to a greater or less degree, depending on their location, the distance between opposite poles, and the care with which they are placed in position. Wires that are concealed between floors, ceilings and partitions, where not supported on non-inflammable insulators, and where permitted to rest on gas, steam, water, hot-air pipes or other conductors, dependence being placed on the covering of the wire to prevent electrical contact, add to the fire-hazard. When wires of opposite polarity are run through a single hole in wooden joist, beam, stud or partition, and are laid side by side without a proper amount of separation, they add to the fire-hazard, due to the fact that the best form of insulation has a limited life, and to the other fact that the ever-present rodent finds some forms a dainty morsel, when nothing better can be had. As a result of the feast, an arc may be established, and, if the insulation is highly inflammable, a fire between the ceilings and partitions is rather apt to follow. Loose connections and poorly-made joints are other additions to the fire-hazard. Joints, when improperly made and not soldered, soon become a source of danger. Solder alone will not insure a perfect joint and immunity from excessive heat at this point.

The practice of enclosing two wires of a circuit covered with a high grade of insulation in an insulating tube that is itself highly inflammable is another addition to the fire-hazard.

All the causes assigned for increased fire-hazard to this system of

electric-lighting is applicable to the system known as the alternating or transformer system, with the exception of the fact that the amount of current it is possible to convey into a building is limited to the capacity of the transformer. The lamps used on this system are usually what are known as fifty volts, and the current necessary to bring them to a state of incandescence is about one ampère. A 75-light transformer, then, could deliver only about 75 ampères.

I have endeavored as far as possible, within the limits of this paper, to give most of the causes for increased fire-hazards due to electricity. It is due, however, to those engaged in the various branches of electric industries, and those who use electrical energy for light, power or the transmission of intelligence, to state that many of the devices I have condemned are not now manufactured — although many are still in use — and that many of the bad practices that I have condemned are not indulged in by reputable men and firms.

I firmly believe that electricity, in the service of man, can be rendered docile and harmless, but to point out the manner in which this desirable end can be attained is beyond the scope of this paper and the limit of the time allotted to me at this meeting. This, however, might be made the subject of another paper.

I will now close by saying that the man or firm who will take advantage of the limited knowledge of electricity possessed by the average citizen, and install electric wires in such a way as to increase the fire-hazard, should be deemed guilty of a misdemeanor, and, should fire result, should be deemed guilty of arson. The electric-lighting company who would connect its service-wires and furnish current to a building unsafely wired should be deemed an accessory before the fact, and punished accordingly.

It is within the power of those engaged in installing electric lights and wires and furnishing electricity for light and power to greatly reduce the fire-hazard and stop the complaints of underwriters of the increased number of fires due to electricity.

THE ILLUSTRATIONS

[Contributors are requested to send with their drawings full and adequate descriptions of the buildings, including a statement of cost.]

HOUSES OF THOMAS W. HINDE, ESQ., MR. D. S. PENTECOST, ARCHITECT, AND OF JOSEPH T. BOWEN, ESQ., MR. F. M. WHITEHOUSE, ARCHITECT, ON ASTOR ST., CHICAGO, ILL.

[Gelatine Print, issued with the International and Imperial Editions only.]

THE CANTORIA IN THE SISTINE CHAPEL, ROME, ITALY. MEASURED AND DRAWN BY MR. W. M. MACCAFFERTY, BROOKLYN, N. Y., *American Architect* TRAVELLING-SCHOLAR.

[Issued with the International and Imperial Editions only.]

WINDOW IN TUSCANELLA, ITALY. MEASURED AND DRAWN BY MR. W. M. MACCAFFERTY, BROOKLYN, N. Y., *American Architect* TRAVELLING-SCHOLAR.

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WINDOWS IN THE CANCELLERIA, ROME, ITALY. MEASURED AND DRAWN BY MR. W. M. MACCAFFERTY, BROOKLYN, N. Y., *American Architect* TRAVELLING-SCHOLAR.

[Issued with the International and Imperial Editions only.]

HOPKINS PLACE SAVINGS-BANK, BALTIMORE, MD. MESSRS. BALDWIN & PENNINGTON, ARCHITECTS, BALTIMORE, MD.

THIS building is being erected on Hopkins Place near Baltimore Street in this city, at the corner of an alley. The two exposed fronts are being built of granite, about fifty feet in height; a one-story-and-basement fireproof building. The interior will be finished in glazed bricks, mahogany and marble, with bronze grille-work for counters, etc. The area of the lot being small for the accommodation of the business of the bank, that portion of the basement not used for boilers and heating-apparatus will be handsomely fitted-up for the use of the clerks and employees of the bank; also, a Record Room will be arranged for filing papers not in constant use. The President's Room is as shown, and a Directors' Room will be built across the vaults, and will extend around one side of the room in the shape of a gallery. The ceiling will be finished in metal. The entire building will be built thoroughly fireproof and will cost about $60,000 without the vault-work. It is expected to be completed by next autumn.

ADDITIONS TO STEINWAYS SCHOOL, BROOKLYN, N. Y., AND THE GERMAN SETTLEMENT SCHOOL, BROOKLYN, N. Y. MR. GEORGE PALLISER, ARCHITECT, NEW YORK, N. Y.

UNION DEPOT AND FERRY-HOUSE, SAN FRANCISCO, CAL. MR. A. PAGE BROWN, ARCHITECT, SAN FRANCISCO, CAL.

HOUSE FOR JOHN PITCAIRN, ESQ., BETHAYRES, PA. MESSRS. CARRÈRE & HASTINGS, ARCHITECTS, NEW YORK, N. Y.

STORES ON BELLEVUE AVE., NEWPORT, R. I. MESSRS. PERKINS & BELTON, ARCHITECTS, BOSTON, MASS.

[Additional Illustrations in the International Edition.]

HADDON HALL, ENGLAND.

[Copper-plate Etching.]

THE MONTAUK CLUB-HOUSE, BROOKLYN, N. Y. MR. FRANCIS H. KIMBALL, ARCHITECT, NEW YORK, N. Y.

[Copper-plate Photogravure.]

DOORWAY, LYONS HOUSE, SURREY STREET, LONDON, ENG. MR. JOHN DUNN, ARCHITECT, LONDON, ENG.[1]

THE region between the Embankment and the Strand, which forms part of the property of the Duke of Norfolk, has during the last ten years undergone modifications which are remarkable. The old, commonplace houses have been succeeded by large blocks of buildings exemplifying later Gothic and Renaissance styles. Red brick and terra-cotta have been used, and the effect is enough to surprise any one who was acquainted with the property a dozen years ago. It is to be regretted, however, that, owing to the narrowness of some of the streets, the buildings cannot be as much admired as they deserve. It will be seen, from the illustration, that the detail of the buildings will bear a vigorous scrutiny.

ENTRANCE-HALL, ALTHORP, NORTHAMPTON, ENG.[1]

ALTHORP has gained renown from the library enshrined in the house, but, like many of the stately homes of England, it is not without architectural merit. The hall, as will be seen, is an example of a time when Italian prevailed, and is not without elegance in the detail, and the panels afford space for subjects which appealed to owners and visitors.

WAREHOUSE, 12-16 CLOTH FAIR, E. C., LONDON, ENG. MR. T. R. RICHARDS, ARCHITECT, LONDON, ENG.[1]

THIS building is situated on the south side of Cloth Fair, and immediately in the rear of it is the church of St. Bartholomew-the-Great. On the right of the view, next the old house shown (No. 11), is the new north transept and porch of the church opening out on this thoroughfare. The old building referred to is being taken down to improve the roadway; at present it projects beyond the new line of frontage. The other old house, to the left of the view, is No. 17, one of the few houses now remaining in the city having weather-boarded fronts.

The new building has four stories, and is exceptionally well lighted; there is a good basement extending over the whole of the site. Fire-proof floors are laid throughout, on Mr. Dawnay's system, and he has carried out the constructional ironwork. The fronts are in stocks, with red-brick arches, pilasters, mouldings and dressings; the carved work is in red rubbers, with some cut and moulded work; the ground-story is faced with salt-glazed bricks of a deep-brown color.

GARDENER'S HOUSE, LONGFORD CASTLE, SALISBURY, ENG. MR. G. HAMILTON-GORDON, A. R. I. B. A.[1]

THE illustration shows a house just built in the park at Longford Castle, by the Earl of Radnor, for Mr. Ward, the well-known head of the Longford Castle gardens. It is built of local bricks, and roofed with Staffordshire tiles. The gables are of cement. The cost has been 850*l.*

COMMUNICATIONS

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

BRICK-VENEERED BUILDINGS.

ST. PAUL, MINN., April 11, 1893.

TO THE EDITORS OF THE AMERICAN ARCHITECT: —

Dear Sirs, — In the issue of your magazine dated April 8, you publish a letter illustrating the construction of brick-veneered buildings, which states that "in Kansas, where high winds prevail, they are considered better able to withstand the devastating force of a cyclone than the less elastic solid brick structures." I have known of one case where the brick veneering of a building in St. Paul, for

[1] If omitted this week, these plates will be published with a later number.

an area of about twenty-five feet long by twenty feet high, fell out during a wind-storm of average severity, — by no means a cyclone.

The unequal shrinkage of the brickwork and of the timber-framing is a serious objection to this form of construction, and where warmth is necessary the studding must be sheathed before the brick is laid up. It is found very difficult to handle a fire in such a wall, for, if the fire once gets between the brick and the sheathing, it spreads rapidly and the brick walls become dangerous. Houses built in this way are not as warm nor as dry as well-built frame houses, and their cost brings the total cost of the building to within a comparatively slight percentage of that of a substantial brick wall.

Such construction is not economical in the real sense of the term, and it is not only insecure and unscientific, but it is a sham. I regret that the article in question was published in your magazine, for it will only act to confirm a bad practice of building which should be discouraged as far as possible.

Yours very truly, Cass Gilbert.

THE ANALYSIS OF A TRUSS.

Indianapolis, Ind., April 11, 1893.

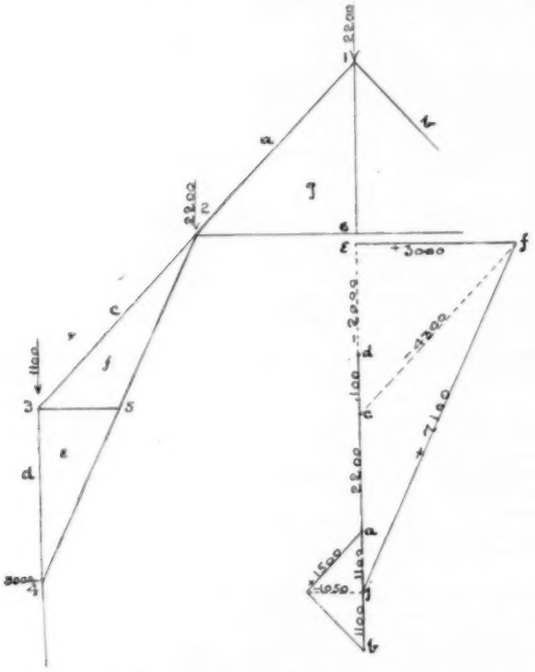
To the Editors of the American Architect: —

Dear Sirs, — Enclosed is solution of strains on structure, mentioned in your issue of April 8: —

The structure consists of two rafters tied across bottom and supported on two struts, (2-3-4-2) acting as a strut.

There is no strain on (1-6) except the weight of tie, there are then only three forces at (1), which are thus easily determined.

The diagram shows that the wall at (4) must offer a horizontal resistance of 3,000 lbs. and that at (3) the member (2-3) exerts a pull



of 4,300 lbs., whose vertical component must be taken up by proper anchoring, and the horizontal component must be resisted by the stability of the wall.

F. A. Sherrill.

NOTES & CLIPPINGS

Willow-wood as a Building-material. — The discussion upon the causes and effects of the late disastrous fire in Boston brought out the fact that stores supposed to be of first-class construction were sheathed with varnished pine. This had not been supposed to be a defect, but it certainly proved one; and the fact is that, in the diminishing supply of other woods, it is difficult to see where we can turn to a substitute for Georgia pine. At the South, they, in many cases, render it less combustible by washing it white with lime (whitewash), for instance in railroad bridges and other structures. This, however, would be objectionable in "inside finish," though it could be applied to good purpose in many parts of buildings where out of sight. In England they use the wood of the willow for flooring, in many cases, because it is of slow, or not ready, combustion. It contains no resin or essential oil, is fine-grained, and takes a smooth finish, and so is suitable for inside work and would make good sheathing. It may be said that it is not available here because we have but little willow. It is true that it is not indigenous and we have no native varieties of any size, but the best sorts of the English white willow are naturalized here and have spread all over the country. Very fine specimens may be seen all about Boston, and some, in early days, grew by the Frog Pond. It is easily propagated by cuttings and does not require a wet soil, as many suppose. There has been a prejudice against it owing to its supposed lack of durability when exposed to the weather, and because it is soft, and it was not needed when white pine was abundant. Now, however, as our forests are being rapidly cut off and we are looking for something to take their place, there can be nothing so good as the willow, and, for another excellent reason, that it is a rapid grower. It is a beautiful tree, also, to look at, and our foresters cannot do better than give it their attention as a most valuable tree. Incidentally it may be mentioned that it is highly prized to make charcoal for gunpowder, and is raised in Delaware for this purpose. — *Fire and Water.*

Dispute over a floating Island. — Several months ago a tornado struck Chautauqua Lake and broke off a corner of the Stoneman farm, at least an acre in area, with trees, and cattle grazing on it, and swept it out into the lake just above Lakewood. It floated down and lodged against the shore at Burtis Bay on the margin of C. D. Gifford's farm. Mr. Gifford sold what interest he might have in it to Chas. H. Wicks for $5.00. Three young real-estate men of this town, Jay Butler, John Prather and Charles Nerdhart, coveted the island and secured a quit-claim from the original owner. Meanwhile other parties applied to the State for a title, claiming that as soon as it became detached from the main-land the island became State property. Thus there were three parties claiming the island up to last week, now there are four. During the storm which swept across Western New York last Friday the waters of the lake rose, and bore the island away from Gifford's property, to which it had been moored, and carried it down still farther, this time landing it on Fred. A. Bentley's farm. Mr. Wicks claims that, as he bought the island and anchored it, it is his. The three real-estate men still hold that they have priority of title, while Mr. Bentley argues that possession is nine points of law, and he has anchored it tight to his farm until the matter of ownership is settled by the courts. — *New York Sun.*

TRADE SURVEYS

Unusual and unnecessary commotion prevails in financial and business circles over the possible encroachment on gold reserves. The discussion and the fear will only serve to emphasize the necessity for reorganization of financial systems, methods and, possibly, standards, throughout the world. Nothing but hard necessity will ever force a departure from existing ideas and practices. Circumstances are increasing the necessity. Great bank failures in various parts of the world, the scramble for gold, the presentation of demands from Government and commercial channels for immense loans of money, the depression in trade channels, the low level of prices, the greater mutual dependence of interest on interest, are all furnishing evidence that things are not right. Business itself, production, demand and supply, distribution, transportation, all these forces and agencies are in an active and healthy state. People are busy, jobbers are crowded with orders, manufacturers are expanding capacity here and there, and at every point there is evidence of commercial and manufacturing health at home. All this is true, yet there are certain danger-signals flying of late which shrewd business men see. Hence the continued stringency in money. In Great Britain, ship-building interests are again complaining. The iron trade is depressed. Labor troubles are assuming serious aspects in coal, iron, engineering and ship-yard interests. Relations between England and East India are, from the industrial standpoint, not encouraging. The national rather than the imperial spirit is growing. New centres of industrial activity are springing up. Commercial dependence is less observed. Ship-yards, iron-works and cotton-factories are springing up in far Eastern countries. Industrialism is secretly taking hold. The threatened changes are not serious, but powerful agencies are at work stimulating latent energies, which, in their fuller development, involve important modifications of policies and methods of the controlling spirits of Western Europe. While, on our side, industrial activity is expanding and more horse-power is at work than ever, and more new enterprises are projected, there is a lassitude which cannot be explained, except in this — that the nozzles on the pipes of business are too small for the rushing volume of trade behind. Within the past few days, a number of interesting developments have taken place. An immense combination of iron and steel manufacturers has been effected in Ohio. Steps have been taken to consolidate manufacturing interests in several directions. Mercantile interests have quietly agreed upon some better rule of action in the matter of retail traders' credits. Large orders for raw and finished material have been given out, among them orders for railroad and electrical equipments. One order for 18,000 tons of plates and angles will probably be placed by New York contractors next Monday. Builders are now crowding work in all quarters. Lumber is not higher in price than last year, but stronger. Mills have more orders on hand. All through New England manufacturers express more confidence. Throughout the West a sharp improvement is in progress. Stocks of merchandise are not heavy. Great improvements are being made at many Lake shipping-points. A large canal is projected in Minnesota, which, when built, it is figured out, will reduce the cost of delivering freight between Buffalo and Duluth seventy cents per ton. The newspapers seek to keep sensational paragraphs afloat concerning great labor strikes, but inside sources are not aware that serious commotions are at present contemplated, and labor organizations were never as thoroughly under centralized control as now. As measured by the production of steam-power, there never was greater activity. Nearly all the great and small machine-shops are overcrowded, and improvement and expansion is the order of the day. The cost of railway traffic is being gradually levelled down, rather than up. Three or four State legislatures have recently taken steps in that direction, and throughout the West the State legislatures seem more bent on repressive measures, as regards railroads, of questionable wisdom. In this connection, it is proper to observe that, while the demand for American securities abroad is increasing, the expansion is rather evidence of doubt than of confidence.

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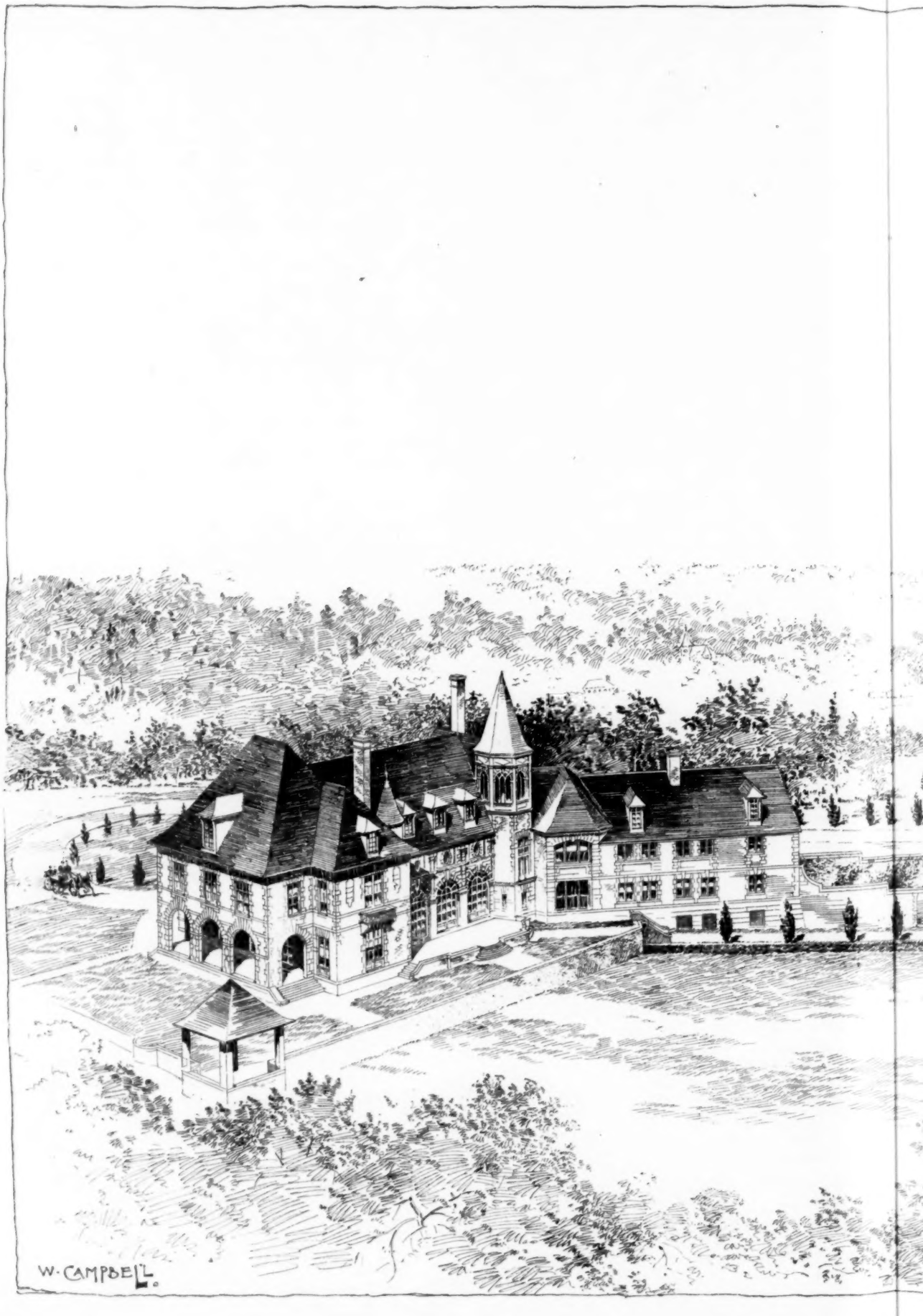

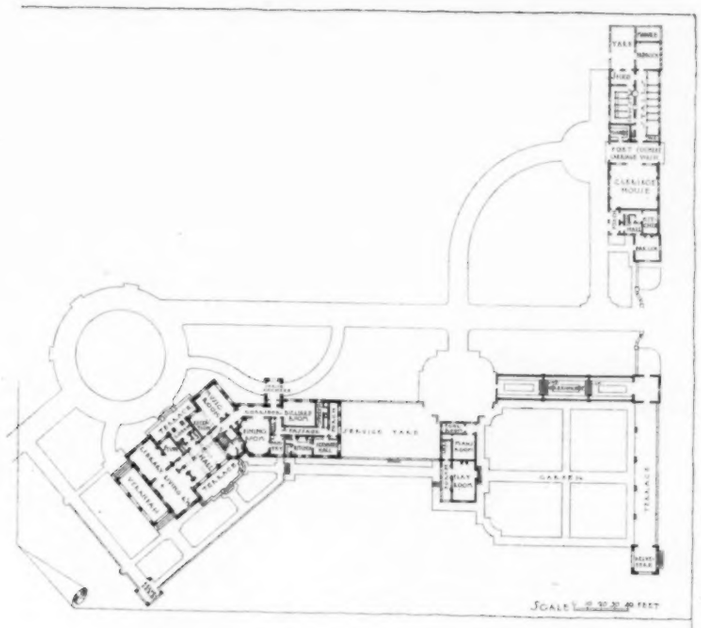

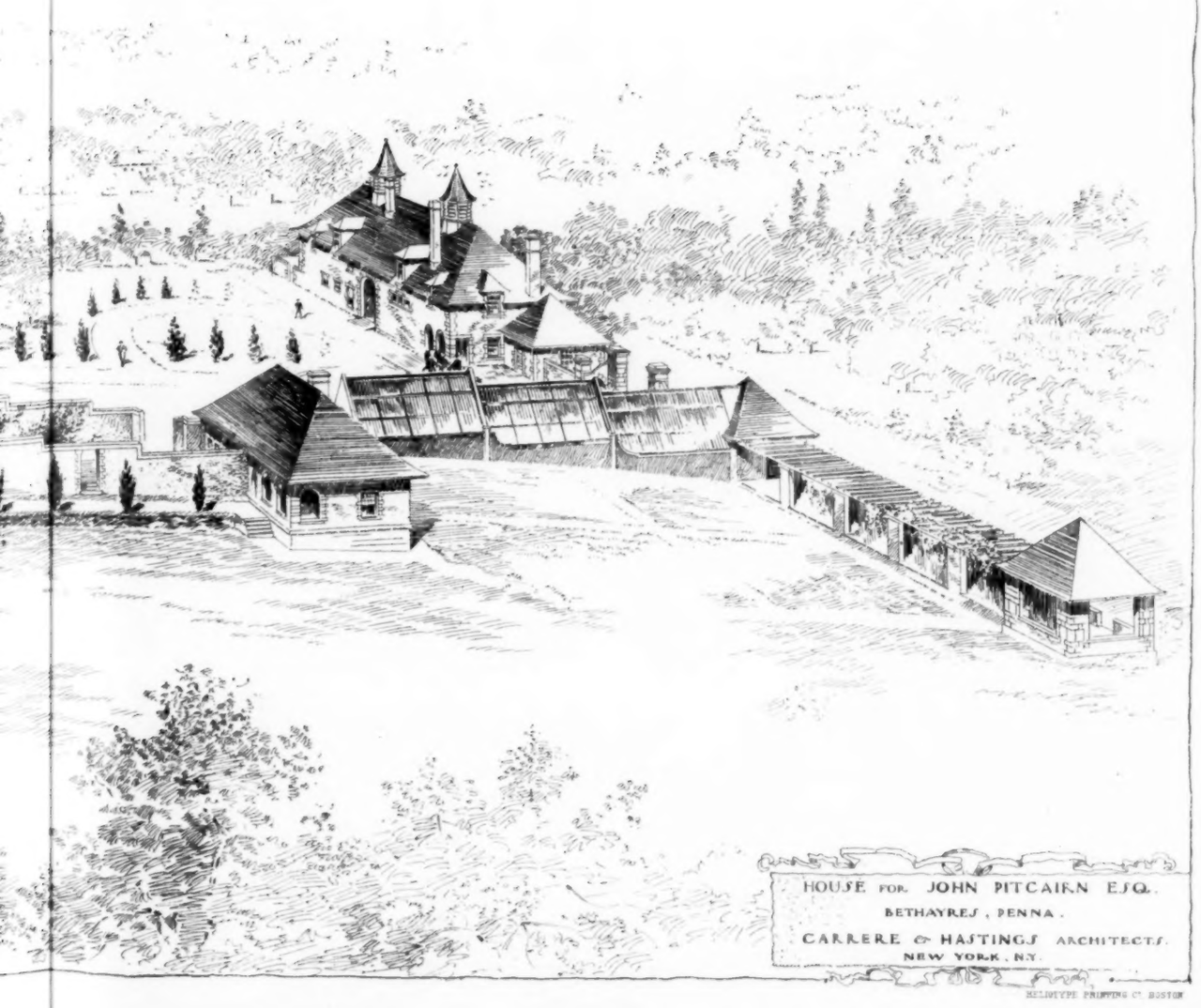

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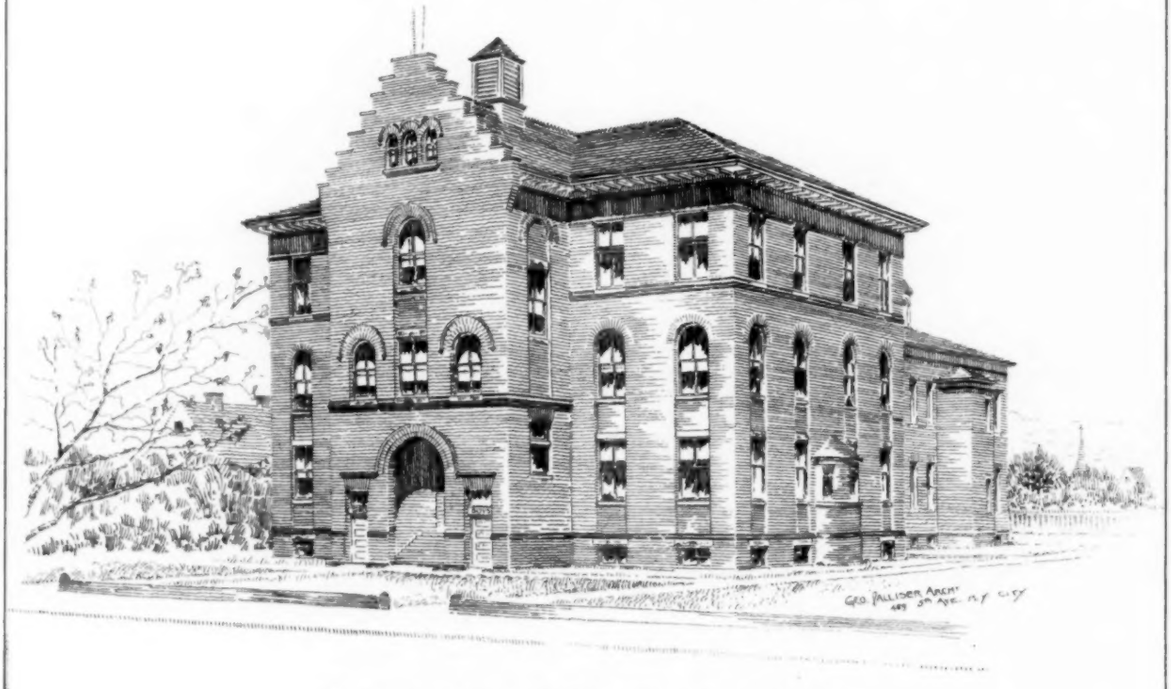

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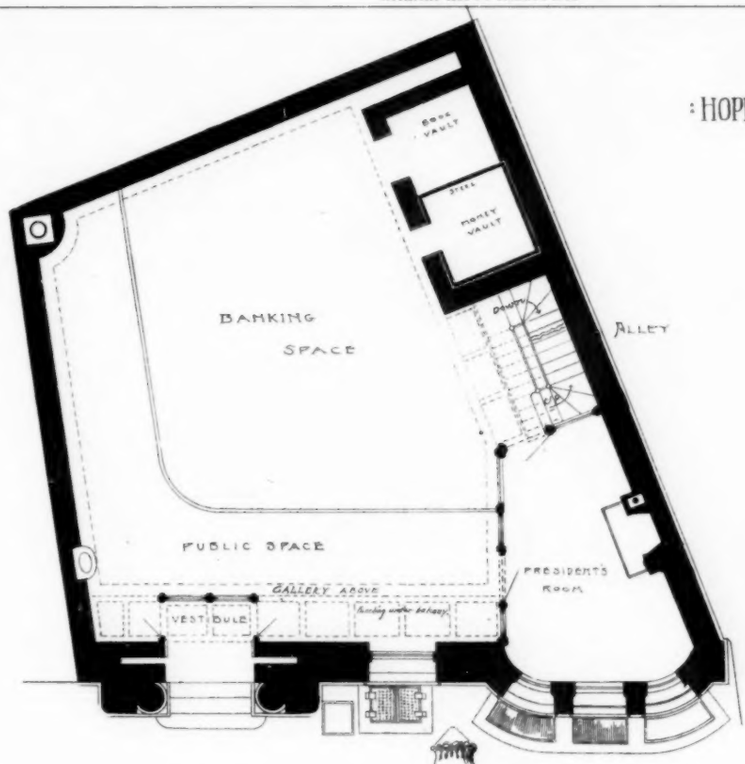

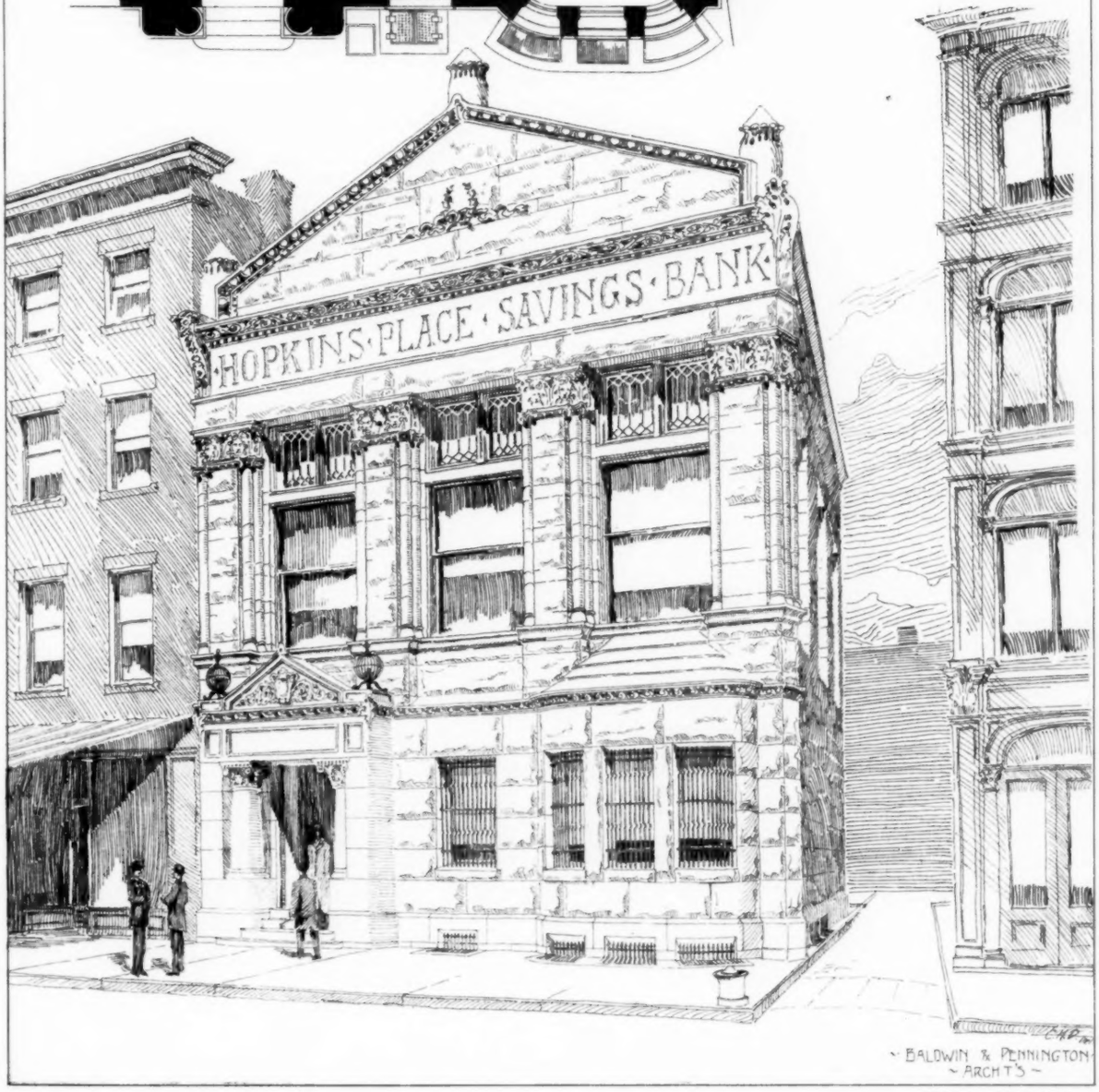

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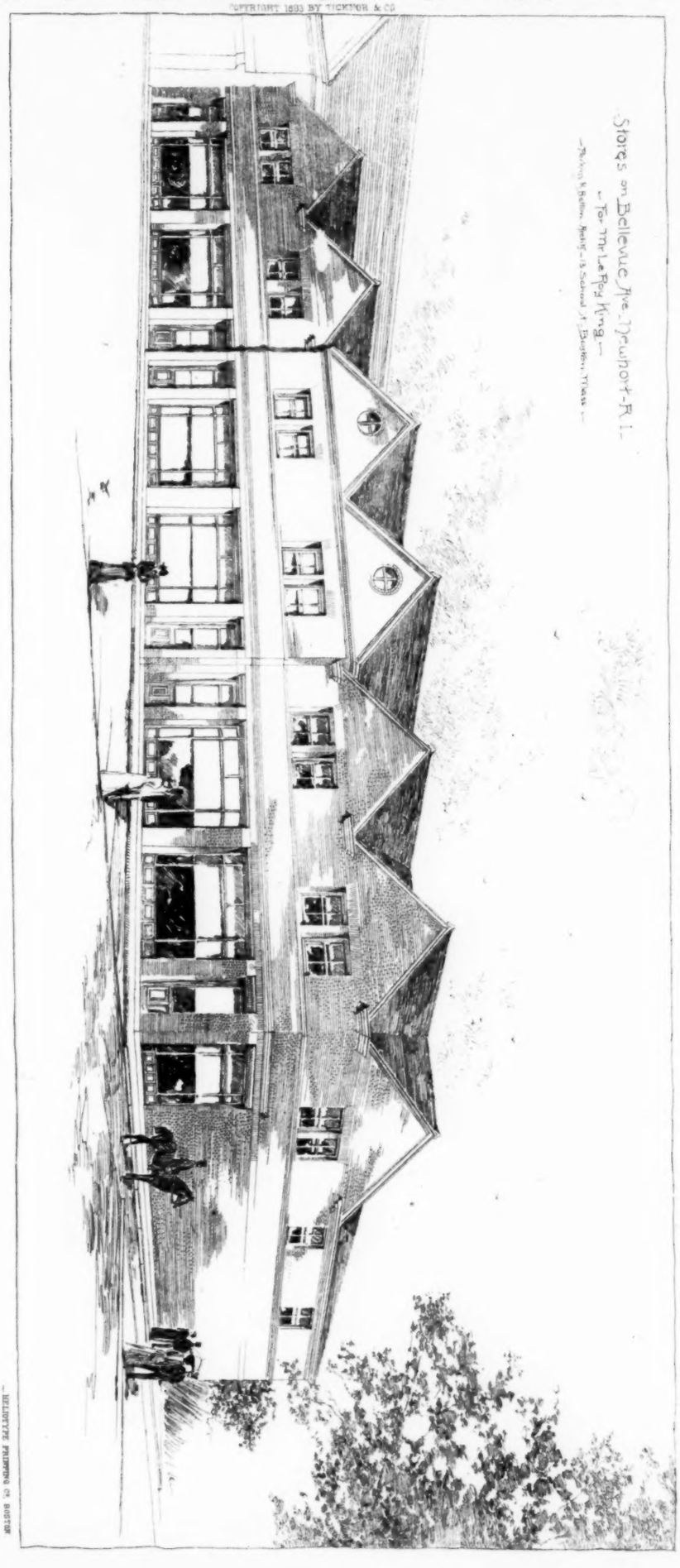

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