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CONTENTS.

THE *Engineering News*, several years ago, attacked the subject of formulas for bearing piles, and proposed a simple formula for safe load, which is commended by Mr. Foster Crowell in the *Transactions* of the American Society of Civil Engineers for August, 1892, as being the most convenient and reliable yet suggested. Every architect knows that the subject of the safe load on piles has been in a most muddled condition for many years. The older books of reference give formulas founded on *à priori* considerations, which, unfortunately, do not bear much resemblance to practical conditions. For example, nearly all the treatises of construction of twenty-five years ago base their formulas for the loading of piles on the number of blows required to drive them to "refusal"; that is, to a point at which they can be driven no farther. In practice, most of the pile foundations in this country are in a soft soil, where the pile never "refuses" to go farther, and, in some soils, it will go on so long as the blows are kept up continuously, but, if they are suspended for a few hours, will then "refuse" to start again. Obviously, therefore, the "refusal" formulas are not applicable to such circumstances. Trautwine's "*Pocket-book*" did much to disseminate the knowledge of Weisbach's, or, as he called it, Sanders's formula, which has been shown by many years of experience to answer well for our filled land, and is probably more employed by architects than any other. The *Engineering News* simplifies the formula, and makes it more generally applicable, in the equation $L = \frac{2\,w\,h}{s+1}$, in which L is the safe load, w the weight of the hammer, h the fall of the hammer in feet, and s the "set," or small sinking of the pile, at the last blow. L will be expressed in the same terms, whether tons, pounds or kilograms, as w.

WE do not know that any scientific observations have yet been published on a kind of pile-driving which is becoming very common in our cities, and which may be so managed as to promote the most dangerous frauds. So far as we know, all the formulas yet proposed assume that the hammer drops freely on the head of the pile, so that its velocity, and the force of its impact, can be readily calculated, allowing a trifling margin for the friction on the guides. Now, however, pile-driving contractors use very commonly a machine in which the hammer is not, as in the old ones, released entirely from the rope at the top of the frame, and allowed to fall without resistance, but remains always attached to the rope, the fall being given by throwing the pawl out of the ratchet of the winding drum, so that the drum is allowed to revolve backwards as the hammer descends. Evidently, this arrangement introduces a considerable amount of friction to be subtracted from the real force of the blow, and the amount is rendered entirely indeterminate by the employment of a brake, the handle of which is held by a workman, who can control the descent of the hammer at will, and can stop it entirely at any point in its course. We have heard a workman offer to put his watch on top of the pile he was driving, and undertake to drop the hammer so as to touch it without breaking it; and the men often attain a considerable skill, which is, we regret to say, capable of being exercised in such a way as to delude young architects. The manner in which the deception is practised, is, of course, to drive the piles without using the brake until they are sunk nearly to the head. Then the pile, which, it is unnecessary to say, has been chosen of a length suited to the exigencies of the contractor's purse, rather than the character of the subsoil, begins to show signs of reaching a hard bottom. The sinking at each blow, from six, eight or ten inches, is reduced to one or two, and the confiding architect, delighted at these evidences that the point of the pile has brought up in a firm stratum, gives the order to stop driving. So long as any critical person is looking on, the other piles are driven in the same manner, and the architect goes back to his office, reckons up the safe loads, and revises his foundation-plans, charmed to think that his building is to rest on so firm and uniform a subsoil, and oblivious of the fact that the piles do not really extend to within a dozen feet of any resisting stratum, and that the apparent "bringing-up" at the end of the driving was produced solely by the skilful hand on the brake. As mechanics almost universally believe that architects are ridiculously fussy about the load to be placed on piles, and that they will really bear about a thousand pounds per square inch of section, the contractor reconciles the jingling in his pockets of the money which he has saved by his smartness, with the reproaches of such conscience as he may possess, by saying that the foundation is strong enough anyway; and it is usually not until several years have elapsed that the effects of the fraud become visible. Occasionally, an architect more suspicious than his fellows insists on seeing the hammer rebound from the head of the pile, as an evidence that it has descended upon it with full force, but a skilful man at the brake can cause a lively rebound of the hammer by a sudden catch of the rope, almost without touching the pile, so that no reliance can be placed upon this indication. So far as we know, there is no way in which an architect or engineer can obtain any reliable results with a machine of this sort if the contractor or his men are allowed to manage the brake, and, even if the brake is not touched at all, there is a good deal of uncertainty about the operation. Our own practice is, in such cases, at short intervals, as the driving machine moves about over the ground, to drive a pile by detaching the hammer by hand, as a check upon the results of the machine-driving; but this does not give the precise data for each pile which it is so desirable to have with such foundations.

THE *Bautechnische Zeitschrift* continues its studies of trades-union life in Germany in years past, and quotes, from a paper published by the Hamburg Historical Society, some curious details of the Hamburg Carpenters' Union during the early part of the present century. At that time, the Carpenters' Union, like all the others, consisted of two parts, the division of the masters and that of the journeymen. The masters had their own place of meeting, known as the Masters' Hall, while the men met in the "Herberge," or Refuge. Two of the masters were appointed by their fellows to supervise the meetings of the journeymen, and, if necessary, present their complaints or requests, but otherwise the two bodies had not much official connection with each other. Occasionally, indeed, they came in conflict. There were two classes of journeymen;

the "Natives," including both those born in Hamburg and those adopted by the Union, and the Strangers, who were permitted to work only under certain restrictions. As the natives, or "*einheimisch*," were mostly married, and often rather advanced in years, as compared with the strangers, the masters were disposed to prefer the latter, and the native journeymen, who were in a great majority in the Union, interfered repeatedly to prevent them from doing so. About 1809 trade was dull, so that the natives could not all get work, while several of the masters kept strangers in their employ. The native journeymen conspired to prevent this, and served notice on the masters that if any more strangers were admitted to work in the Hamburg shops for two years they would desert all the shops in which any stranger was employed. This threat proved effectual, and the strangers in the shops were dismissed.

IT was necessary, also, for any strange carpenter, before he could work at his trade in the city, to obtain authorizations from the chiefs of the Union. This rule was strictly enforced. Even one of the native Hamburgers, if he had been away from the city for a time, was obliged to go at once to the Altgesell, or Old Companion, the chief magnate of the journeymen's part of the Union, and get leave to work, before proceeding to his own home; and, if he was found working without this license, he was put out of the city by force, and not allowed to return until he had paid a fine and complied with the regulation. Even when armed with their permit to work, for which they had to pay a round price, the strangers did not always enjoy equal rights with others. In the autumn of 1809, when business was nearly paralyzed by the Napoleonic commotions, the natives, who had a large majority in the Union, procured the adoption of a rule by which every master was obliged to employ at least three married native journeymen before he could hire any stranger. The "Herberge," or journeymen's quarters, had two rooms, the Trade-hall and the Beer-counter. In the former of these the meetings of the journeymen were held monthly and quarterly, and here strangers, on arrival, were obliged to pay their respects to the Old Companion, show him their credentials, pay their dues, and get a license to work in the city. As soon as a newcomer found an engagement, he was obliged to take his papers to the chief of the master's division for approval, and was then an accepted member of the Union. If any member desired to leave the city, it was necessary for him, in order to get employment elsewhere, to have proper papers of dismissal to show to the Union officials of the next place he might settle in. These papers were not always easy to get. They were absolutely refused to any man who had unpaid bills in the town, and, if an aspirant wished for proper credentials, it was necessary for him to pay all his debts first. If he failed to do so, and departed without a settlement, he was warned three times, at intervals of about a month, and, if he was still unrepentant, his name was put on the Black Tablet, with a list of his debts, and other information of a personal character. Before any journeyman could be inscribed on the Union lists, he must prove that he had been taught his trade by union rules, in a union town and by a union master. Without these qualifications he could not be received, and, in 1815, a journeyman carpenter who had been trained in a distant place was expelled from the Hamburg Union because a fellow-townsman betrayed that he had not been taught his trade in the prescribed manner.

A PLAN is seriously discussed for supplying the city of Paris with water from the Lake of Geneva. It was some time ago proposed to take a supply from the Lake of Neuchâtel, which is nearer, but the Neuchâtel water is not very pure, the inhabitants of the region not drinking it themselves, and the lake is entirely in Swiss territory, which is politically objectionable. Although the Lake of Geneva is more than three hundred miles from Paris, and the cost of bringing the water is estimated at a hundréd million dollars, nearly half of its shore is in French territory, so that no treaty need be made for the use of it, and the water is beautifully clear and pure. The supply is practically unlimited, as the river Rhone is fed from the overflow of the lake; but it is proposed to take only two million cubic metres per day, which is about three times the present maximum consumption of Paris, and is likely to be amply sufficient for centuries to come; while, as the lake is nearly surrounded by high mountains, the purity of its waters is not likely to be interfered with.

THE inspection we recently enjoyed of the extraordinarily interesting group of World's Fair buildings at Chicago made one thing very clear to us, and that was that the subscribers to our International edition would have a right to complain did we not give them, at least, a fairly full and adequate illustration of the several buildings and their many interesting details. Accordingly during the coming year we shall devote a considerable number of our gelatine plates to this one group which so signalizes the present ability of our architects and gives such happy presage of what their successors may hope to accomplish in designing the many future buildings of this mighty nation. More than this, we have always regretted that the sequence of development we have followed has brought about the incorporation in the Imperial edition of the helio-chrome prints which, rightly or wrongly, we hold to be the highest form of architectural illustration which science has yet perfected and which consequently should be one of the exclusive features of our most expensive edition rather than be shared with a less expensive one. In view of the facts and opportunities we have decided, therefore, to add during and for the "exhibition year" of '93 an extra helio-chrome print once a month to the illustrations of the International edition and to confine the subjects of these prints more or less closely to the exhibition buildings which promise to furnish abundant and interesting studies in color decoration.

A NEW sort of roofing has been patented in Germany, and in several other countries, which seems to have good qualities. The history of the invention is rather interesting. Herr Siebel, of Düsseldorf, remembering, what all architects know, that the best protection against damp rising from the ground into walls is a sheet of lead, and remembering, also, that, on account of the great expense of a lead damp-course of sufficient thickness to support the weight of the superstructure without tearing, it is quite common in these days to use as a substitute a sheet of tarred felt, conceived the idea that the advantages of both materials might be united by enclosing a thin sheet of lead between two thicknesses of tarred felt. In this way, while the enclosing felt protects the lead from being torn by the irregularities of the masonry, and from corrosion by the lime of the mortar, the metal, although thin, interposes an inpenetrable barrier against dampness, which is not liable, like the felt alone, to gradual decay. Moreover, the combined felt and lead is much cheaper than lead alone, of the thickness that it would be necessary to use, and although patented, it is available, so far as cost is concerned, for buildings of very moderate pretension.

WHILE engaged in perfecting this invention, it occurred to Herr Siebel that the felted lead would make a very impervious roof covering, and perhaps a durable one, and thorough tests seem to confirm this idea. The felted lead is sold in the same form as ordinary roofing felt, and applied in the same manner, receiving the usual protecting coating of tar and gravel on top; but the metal protects the felt under it so completely from the evaporation of the volatile portions of the tar, which is the principal cause of the deterioration of composition roofs, that it is said to remain tight for an indefinite period; and, even when the lead is exposed, from the decay of the felt over it, nothing is necessary but to lay over it new felt, with tar and gravel finish, to make the roof as good as ever, while an ordinary felt roof, which has once begun to rot, is not usually worth repairing. The practical man will think of other details, such as the facility with which flashings, gutters and zinc or copper edgings, can be soldered to the lead of the roofing, which seem very much in favor of the new material, and it is to be hoped that it may come into use here. It is, however, difficult to roll very thin lead, and it is hard to understand how sheets, enclosed in felt, could be sold for roofing at a price to compete with a tin roof, which would be better in most respects.

FOUNTAINS.[1] — II.

Fig. 7*a*. Renaissance Fountain at Basle.

IN the Middle Ages, supply fountains consisted of a basin raised on steps; at the centre was a columnar stone construction for the adduction of the virgin water; in this, long spouts were fastened which carried the water to the edge of the basin and under which buckets could be placed. The fountain at Basle (Fig. 7*a*) gives an idea of this form, as brought down to the period of the Renaissance; but it is very probable that it has been remodelled and restored at different epochs.

The small construction exhibited in Figure 8 is a combination of a fountain, a laundry and a watering-place, designed in accordance with the above principle; the water comes to the centre and issues into a large reservoir through four spouts, so

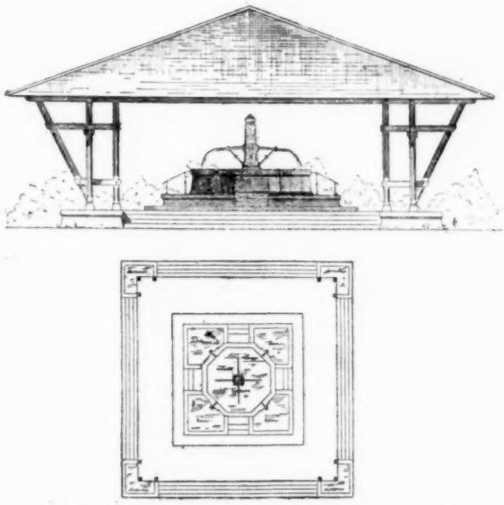


Fig. 8. Fountain, Laundry and Watering-place combined.

disposed that vessels can be filled from them; the four pentagonal basins at the angles serve as laundry tanks; they receive the overflow from the central reservoir and accommodate sixteen washers. As for the four watering-troughs outside the timber-work covering the central basin and the laundry tanks, at ordinary times they receive a portion of the overflow of the main reservoir; but on market days they can be fed directly.

The idea of roofing the basin is a very old one; examples of its application are found in mediæval fountains and in the greater part of the Turkish fountains.

The Fontana del Centauro, at Florence (Fig. 9), is constructed on the general principle of very many of the small supply fountains in Italy. In a great many Italian houses, notably at Rome, there was no distribution of water twenty years ago through the different stories; but in most dwellings there was a recess in the court with a trough in it into which a stream of water poured through a lion's head above; from the kitchens of the different stories an iron wire ran out to this niche so that a bucket, furnished with a pulley rolling on the wire, could be lowered and raised from each at will.

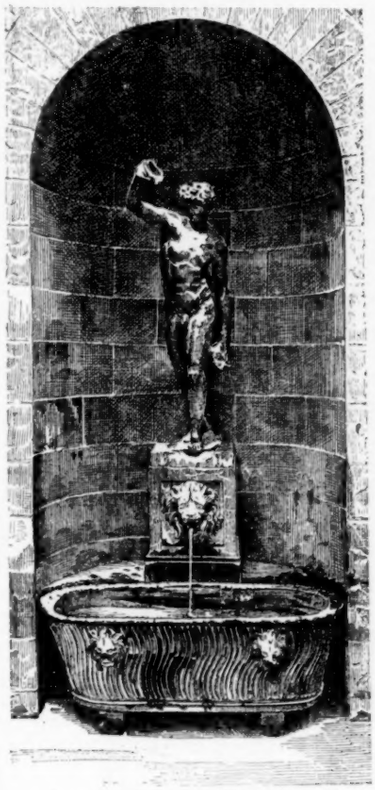


Fig. 9. Fontana del Centauro, Florence.

Supply fountains in cities often also assumed decorative forms and became veritable monuments: such is the fountain in the Piazza at Fano (Fig. 16); it dates from the close of the sixteenth century. Such likewise is the fountain of Neptune by Lauretti, at Bologna (Fig. 11), in the Piazza Vittorio Emanuele; the bronze statue of the god was executed by John of Bologna; at the angles of the pedestal are four sirens, represented pressing their breasts to cause the water to flow from them; this conception seems perhaps a little daring, especially when we remember that Bologna is an old papal city; nevertheless we see nothing shocking or improper in thus indicating that water is as necessary to man as milk is to the babe; these figures certainly have nothing in common with the indecent naïveté displayed in the Manikin Fountain at Brussels.

Fig. 10. Fountain in the Piazza at Fano.

[1] From the French of Léon Benouville, in Planat's *Encyclopédie de l'Architecture et de la Construction*. Continued from No. 879, page 68.

Figure 12 represents a decorative supply fountain at Braga, called the fountain of Passo. We reproduce in Figure 13 the fountain of Jacques d'Amboise at Clermont-Ferrand, on the Cours du Sablon, which was completed in 1515. It comprises three series of basins made from Volvic lava. The

Fig. 11. Fountain of Neptune, Bologna.

water falls first into six small basins borne on the central column, from these it overflows into the intermediary basin, and then is carried by three conduits into the lower basin. It passes off through pipes and there is no overfall; we are reminded here of the principle on which the Gothic architects managed the distribution of water from their fountains.

In some supply fountains there is no basin, the fountain proper being merely a place for obtaining water. Structures of the kind, as for example, the Fontaine Jeanne d'Arc, at Rouen (Fig. 14), are really monuments, the basements of which have been utilized for the insertion of water-spouts. The last mentioned fountain was erected on the site of an older one of the sixteenth century, in 1756, after the plan and under the direction of Alexander Dubois, architect to the king in the generality of Rouen; the statue, which appears to represent Joan of Arc as Bellona, is by Paul-Ambroise Slodtz, of the Academy of Paris. Figure 15 gives a sketch of the so-called "fountain of the Rue de Grenelle" at Paris. It was constructed in 1730 by Bouchardon. The projecting portion shown here forms the centre of a demi-ellipse. This monument, very beautiful in itself, is compared by Voltaire in the *Temple du Goût* with the fountain of the Innocents, an illustration of which will be found below; in his opinion "this last yields the palm in every way to Bouchardon's admirable fountain." Diderot also speaks of it: "The beautiful fountain of the Rue de Grenelle — I say beautiful in regard to the figures; as for the rest, I consider it below mediocre." Farther on he explains this restriction: "There is no beautiful

Fig. 12. Fountain of Passo, Braga.

Fig. 13. Fountain of Jacques d'Amboise, Clermont-Ferrand.

fountain in which the distribution of the water does not form the principal decoration."

The fact is that the first of these great constructions should be rather a commemorative monument; as to the second, which really offers only a couple of water-posts, it is of very great importance in recalling the gift made to the inhabitants of the quarter; Bouchardon's talent alone could have turned such conditions to good account. From the standpoint of utility, one of the two dispositions presented in Figure 16 would have answered. But for grand water-posts, these are indeed grand.

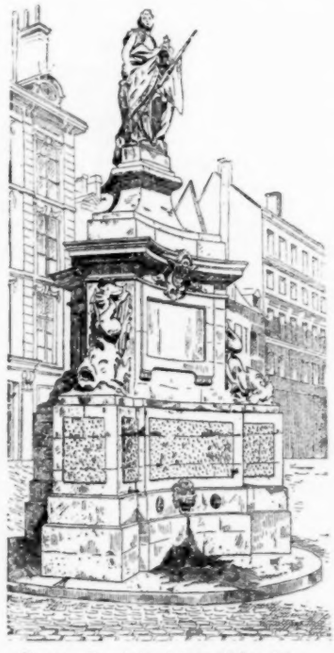


Fig. 14. Fountain of Joan of Arc, Rouen.

Let us turn now to the subject of ornamental fountains; although it is difficult to make a classification of these, we will arrange them in two groups: those serving as commemorative monuments and those in which no such purpose exists. These last are very numerous. We cite the fountain of the Tortoises, *delle Tartarughe*, at Rome (Fig. 17), in the Piazza Tartaruga, by some attributed to Giacomo della Porta, by others to the Florentine Taddeo Landini; the fountain occupying the centre of the beautiful basin known as *la vasca dell' isolotta* in the Boboli Garden at Florence, surmounted by a colossal statue of Oceanus by John of Bologna (Fig. 19). Figure 18 shows another fountain in the same garden with a statue of Neptune by Stoldo Lorenzi.

At Rome may also be noted: the fountain in the Piazza Navona; that of the Acqua Felice, which is well-known on account of its badly executed copy of the Moses of Michael

Angelo and the death of the sculptor, Prospero Bresciano, consequent upon his failure; the fountain of the Monte Cavallo; the Fontana del Tritone by Bernini; the fountains in the

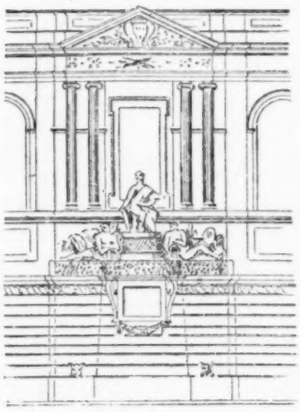


Fig. 15. Fountain of Grenelle, Paris.

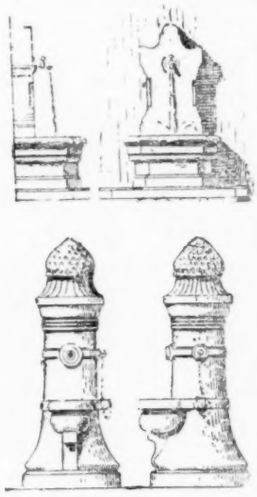


Fig. 16. Water-posts.

Piazza San Pietro, and, lastly, the curious one in the Piazza di Spagna. Almost all the other Italian cities offer very beautiful examples, which it would take long even to enumerate.

(To be continued.)

A DISCUSSION OF THE REQUIREMENTS OF THE NEW BUILDING LAWS OF THE CITIES OF NEW YORK AND BOSTON, REGARDING THE STRENGTH OF BUILDINGS.

Bronze Japanese Statuette.

THE construction of all buildings hereafter erected in the cities of Boston and New York, will be regulated by building-laws, which have but recently been enacted, and each of which is supposed to be a model building-law. They were drawn up by experts and passed by the legislatures of the two States without serious alterations. We would, therefore, expect them to contain the best knowledge and experience of the present time on the subject of construction.

The writer has given some study to their requirements, affecting the strength of materials, and believing that a comparison and discussion of the two laws would be interesting and profitable to those interested in safe building, has prepared the following paper, comparing the requirements of the two laws, and discussing the correctness of some of the values given; with the hope of benefiting the young architect who may look to them as a model.

STRENGTH OF WOODEN BEAMS.

We will first discuss the requirements for the safe or working strength of wooden beams.

The usual formula for the strength of rectangular wooden beams, supported at both ends and loaded at the centre, is:

$$\text{safe load} = \frac{\text{breadth} \times \text{square of depth} \times A}{\text{Length in feet}}$$

The values of A required by the Boston and New York laws are given for comparison in the following table, and also the values given in the ninth edition of "*Kidder's Architects' and Builders' Pocket-book.*"

	VALUES OF A FOR SAFE LOAD (IN POUNDS).		
	New York.	Boston.	Kidder.
White Pine.	112½	42	60
Spruce.	112½	42	70
Oak.	137½	55½	75
Georgia Pine.	137½	70	100

It will at once be seen that there is a wide variation between the strength of timber in New York and in Boston (apparently). The New York values were probably taken from "*Haswell's Pocket-book*," and the Boston values are those recommended by Professor Lanza. Neither agree with the tests on full size beams made at the Massachusetts Institute of Technology, and in the opinion of the writer, with the test of actual use, for the past fifty years.

According to Professor Lanza the average modulus of rupture of all white pine beams tested at the Institute is 4,451 pounds, which

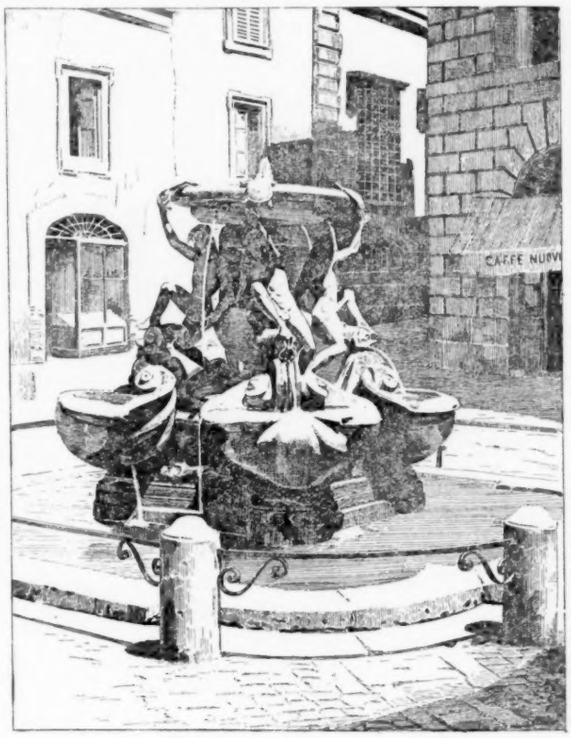


Fig. 17. Fountain of the Tortoises, Rome.

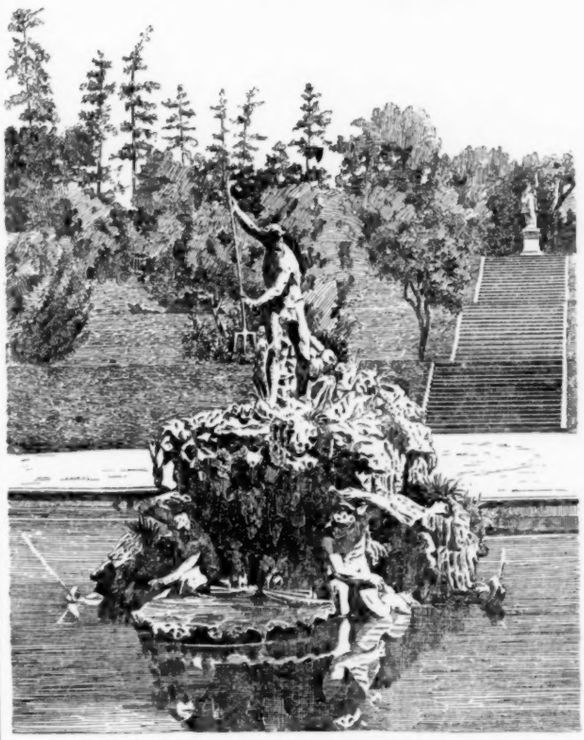


Fig. 18. Basin of Neptune, Boboli Garden, Florence.

with a factor-of-safety of 4, would give 61¾ pounds for the value of A.

If we omit from the list a few pieces which broke under only about one-half the average load, and which in the opinion of the writer should not be included in determining the average, the value

of A would be much higher. As an instance of this, five pieces of 6 x 12 white pine, from 19 feet to 20 feet span, broke under centre loads varying from 11,254 pounds to 13,023 pounds, with an average of 12,490, corresponding to a value of $71\frac{1}{2}$ for A, these were average timbers, and would seem to give a good average value for all timbers. With a factor of safety of 4, sufficient allowance is made for any defects that should occur in any lumber suitable for beams.

A number of "time tests" were made on both spruce and Georgia pine beams of large size and average quality. These time tests consisted in loading the beams at the beginning of winter, with about one-sixth of their breaking load, and leaving it on the beam until the next spring, about six months, when the load was increased until the beam broke. During the winter the beam was subject to steam heat and thus became well seasoned. Such tests come as near the actual conditions of floor beams as any tests that can be made. The average breaking values for A thus obtained were for spruce 360, and for Georgia pine 398, with a factor-of-safety of 4, we should have 90 and $98\frac{3}{4}$ pounds respectively. The average value of A for hard pine from all the tests is 104. In the opinion of the writer, therefore, the values of A designated by the Boston building-law, call for a waste of timber, while those of New York do not call for enough.

It will be noticed that both laws, as does also Professor Lanza, give the same strength to white pine and spruce although the tests plainly tell a very different story, and very little practical experience with the use of the two woods will convince any one (I think) that

Fig. 19. Fountain of Oceanus, Boboli Garden, Florence.

spruce is a much tougher and stronger wood than the white pine of New England.

STIFFNESS OF WOODEN BEAMS.

The following table shows the value of the *modulus of elasticity* (the constant used in determining the stiffness of beams) given by the Boston law, and also the average values obtained from the Institute tests, and the values given in the "*Architects' and Builders' Pocket-book*."

	MODULUS OF ELASTICITY.		
	Boston.	Institute Tests.	Kidder.
White Pine.	750,000 pounds.	1,152,500 pounds.	1,073,000 pounds.
Spruce.	900,000 "	1,473,980 "	1,294,000 "
Oak.	860,000 "	1,131,200 "	1,240,000 "
Georgia Pine.	1,300,000 "	{ 1,663,200 " { 1,757,900 "	1,780,000 "

The New York law does not give any value for the *modulus of elasticity*, and there is nothing in the Boston law requiring that beams shall not exceed any given deflection.[1] The first value for hard pine in the third column is the average of the time tests for original section, the second number is the average of the general tests.

The values in the last column were deduced from tests on small pieces, made by different persons, before the Institute tests were made, and as they agree very closely with the Institute tests they have never been changed. It should be taken into account, that almost the only case where beams are calculated for their stiffness is for floor beams, and then the permanent load will not average over one-half of the load which the beams are calculated to sustain, so that the average deflection will be very small.

STRENGTH OF FLOORS.

The following table shows the requirements of the two laws, regarding the superimposed loads which the floor beams must be computed to carry, over and above the weight of the floor itself.

	SUPERIMPOSED LOAD ON FLOORS.	
	Boston.	New York.
Dwellings[2].	70	70
Office Buildings.	100	100
Public-Buildings[3].	150	120
Stores, Warehouses, Factories, Drill-rooms, etc.	250	150

ROOFS.

The New York law requires that "the roofs of all buildings shall be proportioned to bear safely fifty pounds upon every superficial foot of their surface, in addition to the weight of materials composing the same."

The Boston law reads, "All new or renewed roofs shall be so constructed as to bear safely, in addition to the weight of the material, twenty-five pounds per superficial foot of area covered with proper additional allowance for a horizontal wind pressure of thirty pounds per square foot."

There is quite a difference in the above requirements for roof loads, amounting to 25 pounds per square foot on flat roofs, and very nearly as much on pitch roofs, for it will be noticed that the New York law requires 50 pounds on every superficial foot of *roof surface*, while the Boston law is only 25 pounds per square foot of *area covered by the roof*, plus the wind-pressure. It seems to the writer that the Boston law meets the actual requirements much the best, and is probably the best rule that could be drawn up for the load on roofs.

To go back now to the subject of floors, it will be seen that the requirements of the two laws are very nearly the same, except in the case of mercantile buildings. In this class of buildings, however, the actual loads with which the floors would be loaded should be computed, and the floor beams calculated accordingly.

Both laws require that the strength of the floors shall be computed and posted in a conspicuous place in all warehouses, and that the loads must not exceed that limit, the provisions of the New York law for the carrying out of this requirement being much more explicit than those of the Boston law.

Both laws require an exceedingly high limit for dwelling-house floors, 40 pounds being the average value now used by engineers and consulting architects, I think. This requirement, taken with the values given for the strength of beams by the Boston law, necessitates very heavy timbers, larger than has been the practice even in the best houses, and of the most careful architect, I think, and certainly larger than is necessary, as is proved by actual use in houses that have been built and occupied from thirty to fifty years.

What the actual loads upon the floors of dwellings may be can be easily determined in some such manner as this:

We will assume a parlor 15′ x 18′, furnished with a piano, bookcase and as much furniture as can conveniently be put into the room. The weight of a heavy upright piano is about 750 pounds (which is only 44 pounds per square foot of area covered). We will assume that the bookcase weighs 750 pounds, and allow 1,000 pounds for other furniture, which is a large estimate, making a total for furniture of 2,500 pounds. If such a room contained 30 people, they would be very much crowded, and, at an average of 125 pounds, would make a total load on the floor, including furniture of 6,250 pounds, or 23 pounds per square foot for the whole area of the room. To bring the average up to 70 pounds would require a dense crowd of 131 people, more than could stand in the room when filled with the amount of furniture assumed. That such an assumption is ridiculous is patent to every one.

To make the matter still plainer, we will take the case of a dining-room 16 x 24 feet. A table 18 feet long, and seating 28 people, would be about as large as it would be possible to get around, and much larger than would probably be used. The furniture in such a room would not exceed in weight 1,200 pounds, unless made of something besides wood, and, if we include six waiters, we would have a total load on the floor of 5,450 pounds, or an average of 14 pounds for the whole floor, and this is the full extent of probability, if not possibility. Hence we see that both laws have a requirement three times as great as the utmost probability, and, with a factor-of-safety for strength of 4, they really have a factor-of-safety of 12 for floor beams; and even if 40 pounds were the requirement, we should then have a factor-of-safety of from 8 to 10, and in most dwelling-houses floors of fully 12.

The following table shows the size of spruce floor beams and distance on centres, as required by the building-laws, and also the sizes

[1] The New York law, however, contains this clause, "Iron or steel floor beams shall be so arranged as to spacing, and length of beams, that the load to be supported by them, together with the weight of the material in the floor, shall not cause a deflection of more than one-thirtieth of an inch per lineal foot of span."

[2] Also hotels and apartment-houses in New York.

[3] In New York, "place of public assembly."

that would be required for a load of 40 pounds, the beams not to deflect more than one-thirtieth of an inch per foot of span, computed from the tables in the ninth edition of the "*Architects' and Builders' Pocket-book.*"

SIZES OF SPRUCE FLOOR JOIST FOR DWELLINGS.

Span in feet.	Boston.	New York.	Kidder.
10	2 x 8 — 14½″ on centre.	2 × 6 — 22″ on centre.	2 x 6 — 13½″ on centre.
12	2 x 10 — 15½″ " "	2 × 6 — 15″ " "	2 x 8 — 18½″ " "
14	2 x 12 — 16″ " "	2 × 8 — 19″ " "	2 x 8 — 12″ " "
16	2 x 12 — 12″ " "	2 × 8 — 15½″ " "	2 x 10 — 15″ " "
18	3 x 12 — 14″ " "	2 × 10 — 17″ " "	2 x 12 — 18″ " "
20	3 x 12 — 11½″ " "	2 × 12 — 19″ " "	2 x 12 — 13″ " "

In practice, the writer would recommend: 2″ x 8″ joist, 16″ on centres for spans of 10 and 12 feet; 2″ x 10″, 16″ on centres for 14-foot span; 2″ x 10″, 12″ on centres, or 2″ x 12″, 16″ on centres for spans of 16 feet; 2″ x 12″, 16″ on centres, for 18-foot span; and 2″ x 12″, 12″ on centres, for 20-foot span. Anything above 20 feet should be 14″ joist.

The New York law has a provision that no wooden floor beam or roof beam used in any but frame buildings shall be less than 3″ thick, which practically does away with the formula for strength.

If we make a comparison between the two building laws for the size of floor joist required in the floor of a store of 16-foot span, we shall find that we must use 3″ x 14″ hard pine joist, 13½″ on centres, to satisfy the Boston law, while 3″ x 8″ joist, 14″ on centres, or 3″ x 12″ joist, 31″ on centres, will satisfy the requirements of the New York law.

STRENGTH OF WROUGHT-IRON AND STEEL.

The Boston law makes the following requirements for the safe strength of wrought-iron and steel:

STRESSES IN POUNDS PER SQUARE INCH.

	Wrought-iron.	Steel.
Extreme fibre stress, rolled beams and shapes.	12,000	16,000
Tension.	12,000	15,000
Compression in flanges of built beams.	10,000	12,000
Shearing.	9,000	10,000
Direct bearing, including pins and rivets.	15,000	18,000
Bending on pins.	18,000	22,500
Modulus of elasticity.	27,000,000	29,000,000

"For columns and members acting as such, 10,000 pounds for iron and 12,000 for steel, reduced for ratio of length of column to its least radius of gyration by approved modern formulas.

"Stresses due to transverse strains, combined with direct tension or compression, not to exceed extreme fibre-stress given above for rolled beams and shapes, or, in case of built members, the above tension and compression stresses. Compression flanges of beams to be proportioned to resist lateral flexure, unless properly stayed or secured against the same."

These requirements coincide with the practice of the iron manufacturers and bridge-builders, except that, for shearing of rivets, 7,500 pounds is generally assumed as the strength both for iron and steel, and 12,000 and 15,000 pounds for direct bearing.

The requirements of the New York law regarding the strength of wrought-iron and steel girders are as follows:

"Rolled-iron or steel beam girders, or rivetted iron or steel plate girders used as lintels or as girders, carrying a wall or floor, or both, shall be so proportioned that the loads which may come upon them shall not produce strains in tension or compression upon the flanges of more than twelve thousand pounds for iron, nor more than fifteen thousand pounds for steel per square inch of the gross section of each of such flanges, nor a shearing-strain upon the web-plate of more than six thousand pounds per square inch of section of such web-plate, if of iron, nor more than seven thousand pounds if of steel; but no web-plate shall be less than one-quarter of an inch in thickness. Rivets in plate girders shall not be less than five-eighths of an inch in diameter, and shall not be spaced more than six inches apart in any case. They shall be so spaced that their shearing-strains shall not exceed nine thousand pounds per square inch of section, nor their bearing exceed fifteen thousand pounds per square inch on their diameter, multiplied by the thickness of the plates through which they pass. The riveted plate girders shall be proportioned upon the supposition that the bending or chord strains are resisted entirely by the upper and lower flanges, and that the shearing-strains are resisted entirely by the web-plate. No part of the web shall be estimated as flange area, nor more than one-half of that portion of the angle-iron which lies against the web. The distance between the centres-of-gravity of the flange areas will be considered as the effective depth of the girder. Before any girder, as before mentioned, to be used in any building shall be so used, the architect or the manufacturer of or contractor for it shall, if required so to do by the Superintendent of Buildings, submit for his examination and approval a diagram showing the loads to be carried by said girder, and the strains produced by such load, and also showing the dimensions of the materials of which said girder is to be constructed, to provide for the said strains; and the manufacturer or contractor shall cause to be marked upon said girder, in a conspicuous place, the weight said girder will sustain, and no greater weight than that marked on each girder shall be placed thereon."

These requirements form a model worthy of copying by other cities.

Wrought-iron and steel columns are to be computed by Gordon's formula, using constants for safe strength of 10,000 pounds for wrought-iron and 12,000 for steel.

No wrought-iron or steel column shall have an unsupported length of more than thirty times its least lateral dimensions, nor shall the metal be less than one-fourth inch in thickness.

CAST-IRON POSTS AND COLUMNS.

The Boston law gives a table for the safe strength per square inch of metal area for cast-iron columns varying from 12 to 40 diameters in length. The formula by which the table was computed is not given. At 20 diameters the values correspond with those given in a similar table in the "*Architects' and Builders' Pocket-book.*" Below that ratio, the stresses are slightly less in the Boston table, and slightly more for lengths exceeding 20 diameters. The New York law requires that cast-iron posts be calculated by Gordon's formula, using a constant for safe working load of 16,000 pounds. This would give values 20 per cent in excess of those given in the "*Architects' and Builders' Pocket-book.*" The Boston law is undoubtedly much the best in this respect. The New York law, however, limits the length of a cast-iron column, when not braced, to twenty times its least lateral dimension, which is a good precaution.

STRENGTH OF WOODEN POSTS.

The New York law requires that the strength of wooden posts be computed by Gordon's formula, using values for the crushing-strength of 6,000 pounds for oak, 5,000 for hard pine and 3,500 for spruce and white pine, with a factor-of-safety of 5.

The Boston law has the following specifications, which are known as the "Ely step formula."

Greatest working-stresses for posts, in which L = length of post in inches, D = least diameter, or width of post, and S = stress per square inch:

WHITE PINE AND SPRUCE.		LONG-LEAFED YELLOW PINE.		WHITE OAK.
$\frac{L}{D}$	S	$\frac{L}{D}$	S	S
0 to 10	625	0 to 15	1,000	750
10 " 35	500	15 " 30	875	650
35 " 45	375	30 " 40	750	560
45 " 50	250	40 " 45	625	470
		45 " 50	500	375

These values were first given out by Mr. Edward F. Ely, instructor at the Massachusetts Institute of Technology, as corresponding most closely with the tests that had been made on full-size posts at the Watertown Arsenal.

They have been generally adopted by engineers and architects, but the writer has always considered the abrupt breaks or steps objectionable, and believes that the following formulas give better results and appear more sensible. They were deduced by Mr. James H. Stanwood, S. B., Instructor in Civil Engineering, Massachusetts Institute of Technology, from the same data used by Mr. Ely.

SAFE STRENGTH IN POUNDS PER SQUARE INCH FOR POSTS.

$$\text{Hard Pine, } W = 1{,}000 - 10 \times \frac{\text{length in inches}}{\text{breadth in inches}}.$$

$$\text{White Oak, } W = 750 - 7.5 \times \frac{\text{length in inches}}{\text{breadth in inches}}.$$

$$\text{White Pine, } W = 625 - 6 \times \frac{\text{length in inches}}{\text{breadth in inches}}.$$

These formulas are to be used only for posts exceeding 10 diameters in length for pine, and 12 or 15 for hard pine and oak.

By the use of these formulas, there is a regular decrease in the safe load, with increase in length of post. The following safe loads for 10 x 10 hard pine posts of different lengths, calculated by the two formulas, will better illustrate the above.

SAFE LOADS FOR 10 X 10 HARD PINE POST.

	Ely.	Stanwood.
Length 10 feet.	100,000 pounds.	100,000 pounds.
" 12 "	100,000 "	85,600 "
" 14 "	87,500 "	83,200 "
" 24 "	87,500 "	71,200 "
" 26 "	75,000 "	68,800 "

It will be seen that the Stanwood formulas give somewhat less values than the Ely formula, the difference increasing with the length of the post. In actual construction, posts are often loaded eccentrically, that is, the girder on one side brings more weight on the post than the girder on the other side, causing a bending tendency in the post, which is more injurious the longer the post, and it is principally for this reason that the writer prefers the Stanwood formulas.

With the same constant for resistance to crushing, Gordon's formula gives much less results than either of the above.

STRENGTH OF STONE AND BRICKWORK.

Working-strength in tons per square foot (Boston law, not specified in New York law):

Granite	60
Marble and Limestone	40
Sandstone	30

First quality, dressed beds and builds, laid solid in cement-mortar.

BRICKWORK.

First-class work, of hard-burned brick, including piers in which height does not exceed six times the least dimensions. — (*Boston.*)

SAFE LOAD IN TONS PER SQUARE FOOT.

Brick laid in	Boston.	New York.[1]
1 part cement, 2 parts sand (*a*).	15	15
1 part cement, 1 part lime, 8 parts sand (*b*).	12	11½
Lime mortar (*c*).	8	8

Brick piers of hard-burned brick, in which height is from six to twelve times the least dimensions (Boston.)

Mortar *a*	13
Mortar *b*	10
Mortar *c*	7

For "light hard" bricks, stresses not to exceed two-thirds of the above.

Bearing power of soil and weight of materials (New York, not specified in Boston). Good, solid, natural earth shall be deemed to safely sustain a load of four tons to the superficial foot, or as otherwise determined by the Superintendent of Buildings, and the width of footing-courses shall be at least sufficient to meet this requirement.

In computing the weight of walls, a cubic foot of brickwork shall be deemed to weigh 115 pounds. Sandstone, white marble, granite and other kinds of building-stone shall be deemed to weigh 160 pounds per cubic foot.

The following table gives the bearing power of soils as recommended by Professor Baker, the recognized authority on the subject.

BEARING POWER OF SOILS IN TONS PER SQUARE FOOT (BAKER).

	Minimum.	Maximum.
Clay on thick beds always dry.	4	6
Clay on thick beds moderately dry.	2	4
Clay soft.	1	2
Gravel and coarse sand, well cemented.	8	10
Sand, compact and well cemented.	4	6
Sand, clean, dry.	2	4
Quicksand, alluvial soils, etc.	0.5	1

F. E. Kidder.

THE EFFECT OF THE FAIR BUILDINGS ON CHICAGO.

Hotman, Hotel de Ville, Paris.

What may be considered, even if it was not intended to be, the closing function of the various celebrations that marked the dedication of the World's Fair buildings took the form of a dinner given by the Commercial Club to those architects and artists connected with the creation of the exhibition buildings who chanced to be in Chicago on the last Saturday in October. As an occasion it had a good deal more of real significance than the public bestowal of medals upon nearly the same men on the day of actual dedication. That was well enough in its way, but it was but one feature of a programme which had been prepared with a certain eye to scenic effect. The banquet was, on the other hand, almost unheralded and had an air of spontaneity and personal intention about it which the other lacked.

The Commercial Club is not a very aged body — nothing in Chicago can boast great age — nor is it a large one, the membership numbering only sixty men, but these sixty probably include the possessors of more wealth and enterprise than could be represented by any similar gathering in the country, for they are the men who in a very large degree have made Chicago the great and surprising entity she is.

To a very large degree the success of the World's Fair up to date is due to the initiative, the push, the financial and administrative support of the members of the club acting in their individual capacity, and it seemed to us that the evening's festivities were less an indication of courteous appreciation of the artists' services than a crowning of the most worthy enterprise these magnates had yet undertaken.

The real significance of the occasion lay in its potential effect on the members of the club, though none of the speakers referred to it, for the text assigned them was: the Allied Arts as illustrated in the construction of the World's Columbian Exposition.

It will be curious indeed if these men, who have had ocular proof how much and how great really good work can be accomplished by setting about it in the right way, do not apply the same method to developing on its æsthetic side the city they are all so deservedly proud of, and creating here on these Western prairies such a city as no Saxon or Italian king ever dreamed of, nor any Haussmann could bring into being. It is just the thing to strike the fancy of such men as these. Until quite recently they have been content to do the "biggest" things, simply because they were big, but now that they have created a substructure of mammoth things they are turning their interests, pecuniary and mental, to developing things of a higher order — but still big. With one effort they erect a score of the loftiest buildings in the world — some of them far from being the worst architecturally; with another they create a great university with a full equipment of educators of acknowledged capacity and an adequate endowment; with another they aid in bringing into existence one of the most astonishing collections of imposing buildings — if one does not stop to remember they have but the unsubstantiality of a dream — that the world has ever seen, and if they but choose they can take hold of the matter of municipal adornment and make Chicago one of the wonders of this century. Perhaps they will, for we fancy that the absolute value of such work as Mr. Olmsted has done at Jackson Park is far from being lost upon them, and it seems within the bounds of possibility that they might call him into consultation to consider what might be done to develop some general scheme of Haussmannic magnitude which, through their instigation and influence, the municipality might be induced to undertake. Thanks to the bifurcated river with its tunnels and bridges, the checker-board system of street building is less tedious and commonplace in Chicago than it is in other places, and if the approaches to the river and the lake shore are properly handled a great deal might be accomplished which would add interest to the outward appearance of the city without entailing a very great amount of expensive condemnation of land and buildings.

It will be pitiful if the great and impressive lesson Chicago has been witnessing, should leave behind it no tangible mark of equivalent magnitude. To be sure an attempt is making to secure the preservation of Mr. Atwood's beautiful Art Building, and Mr. Post's more imposing Liberal Arts Building, but they were not built for permanent structures, though the Art Building, which is of brick, could have its external coat of staff replaced by a covering of marble. But to do this would be to preserve merely a memento of an event, it would not do much to mark the appreciation of the spirit and the method through which this event has been brought to pass.

The real essence of the lesson, which it seems to us the members of the Commercial Club now appreciate at its true worth, lies in the method which has been devised and the manner in which it has been applied by the artists of the World's Fair Buildings, the way in which its details have been administered and the steadiness with which they have received the solid and appreciating support of those who hold the purse-strings, and if only the undertaking proves to be a fair commercial success, direct or indirect, we cannot but feel that Chicago will find herself impelled to undertake other work of a similar kind in a very similar way.

That the artists employed should intensely relish their work can surprise no one, but they are surprised to find how truly it is appreciated. To them it has seemed as if they were living and acting in the time of the full Renaissance and through the peculiarities of the artistic temperament they have been able to bring themselves and their work fully up to the spirit of the occasion; but when they leave their work and go down into the city amongst the bustle of the commercial life of the nineteenth century, they are even more amazed at what they are accomplishing than are the uninitiated. Mr. Potter, who is modelling some very successful groups of animals for some of the bridges, voiced this feeling very aptly. He said that he had come to Chicago with doubts and misgivings which had long since disappeared and had left in their place only the feeling of overwhelming surprise that these things were being accomplished in his native land and by American artists. And Mr. Simmons, speaking to the same point, was reminded of the little boy who, when an engaging spinster of uncertain years asked him if she might not adopt and carry off his baby sister, replied with infantile perception of impossibilities; "No you can't; she'd starve; your dress buttons behind." Instead of being put on short rations he had found to his surprise that Chicago could furnish him with all the life-giving fluid that he and his art required. He then went on to say that about the only mistake the promoters had made was in not understanding how willingly he and the other artists would have done their work without pay rather than have missed the chance to do it at all.

The short speeches were such as might have been expected when such a text was prescribed as the theme and were neither more nor less interesting than such speech-making usually is, but it was extremely interesting to observe with what attention and appreciation the members of the club took them in and with what a full understanding of conditions and possibilities they replied when it came to their turn to speak. A year earlier we fancy such a gathering would have been found by guests and hosts irksome to the last degree, while at this banquet there was noticeable marked interest between host and guest from first to last, and if one short year can bring about such a change, can produce a *milieu* in which men of such dissimilar daily interests can meet understandingly, what may not be accomplished in the future in a similar way?

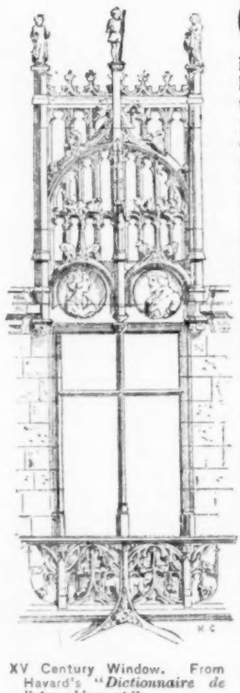
What has been said above may possibly hint the suggestion that Chicago has been waiting in chrysalid condition, so far as æsthetic and intellectual development go, the coming of artists from other and older centres of education to burst through her cocoon and emerge to higher flights, with wings made resplendent by the undeniable success of her World's Fair undertaking. Those who know the city

[1] Proportion of cement and sand not specified.

and its people need not be told that our words do not contain any such intimation. What she has already accomplished in the direction of intellectual advancement is easily to be learned by those who choose to inquire. What she has lately accomplished is in consequence, as Mr. Burnham said, not of the influence of any one man, or of any body of men, artists or other; it has been accomplished simply because the spirit of the times was ripe for it and the men happened to be at hand to do the work. But we are looking to a greater and more rapid development because of the success that has attended this latest of her undertakings and we cannot but believe that the spirit of the city and its citizens, so easily perceptible, so different from the hesitating consideration that marks progress in Boston, so different from the narrow selfishness that marks what is boasted to be the cosmopolitanism of New York, will finally attract to the new Chicago a large body of artists of all kinds whose semi-Bohemian tastes do not find in New York or Boston the kind of freedom which will encourage them to their best efforts. It lies with the solid men of Chicago to make their city attractive to these men who have shown that some at least of them have the capacity to do really great things and only look for further opportunities. More than one painter and sculptor expressed a willingness to make Chicago his home if it could be made apparent to him that he might hope for a modicum of the applause and support that is now so heartily accorded to him and his fellow-artists. The resident artists might not relish such an inroad of outside talent, but the Fair Buildings have been to them an object-lesson, too, and they have seen, as Mr. Sullivan happily phrased it, how much more can be accomplished by the alliance than by an anarchy of the arts.

A CORRECTION. — We regret to perceive that in the article on the World's Fair Buildings in the last issue a slip of the pen allowed us to say that "the Manufactures' Building seems to us the most successful 'fair' building of the whole group and, withal, extremely interesting and abundantly architectural in its treatment." The appellation was not only wholly wrong but, worse than that, was misleading, since Mr. Post's building is known as the "Manufactures and Liberal Arts Building," while it was our purpose to signalize the success which Messrs. Peabody & Stearns have achieved in their Machinery Building where the vivacity and variety of treatment give it a markedly holiday air, while the more satisfying qualities of sturdy dignity have not been neglected.

ENGLISH AND AMERICAN ARCHITECTURE — A COMPARISON AND A PROPHECY.



XV Century Window. From Havard's "*Dictionnaire de l'Ameublement.*"

COMPARISON is peculiarly fatuous when any endeavor is made to accurately weigh, each against each, individual artistic results. On the other hand, if the end in view is to estimate the relativity of diverse schools, comparison is not alone justifiable, it is indispensable. "When," says Sir Christopher Wren, with quaint inconsequence, "the old statuaries in Greece, such as Phidias and Praxiteles and their disciples, began to be celebrated for their art, and people grew fond of their works, it is no wonder (for *honos alit artes*) they fell on the Corinthian capital, which in no after age to this time has been amended, though the French king, Lewis the Fourteenth, proposed rewards to such artists as should find out a Gallick order."

From long before the time of the "French king," and after to our own day, has the feverish quest for a "new architectural style" been pursued, nor yet, nor in our country, with any predicable degree of success.

A will-o'-the-wisp quest indeed it is, comparable only to the weary searches for the philospher's stone or for the secret of perpetual motion, and, like these, apt to lead its followers into the hopeless bogs of doubt, the limitless quagmires of disappointment. To evolve an absolutely new style, it must be now conceded, is neither possible nor desirable, paralleled, as such an evolution might be, with the construction of a new tonal and harmonic theory or the invention of a new system of linear perspective. The fact is that in architecture the æsthetic sentiment has to be expressed in symbols of a conventional character, and that the civilized mind has by a natural but infallible process, learnt to connect with these symbols absolute and fundamental ideas. New combinations of words to express new thoughts and feelings may be, and are daily being, formed, but the language remains in essentials the same. To saddle the architect, therefore, with a charge of want of creative power because he uses the recognized symbols of his art, is as illogical as to quarrel with the literary artist for using a vocabulary common to Chaucer as to himself. At the same time, were the modern poet to fetter himself by the precise phraseology of the fifteenth century, more reason would exist for the accusation of literary barrenness, while if, going a step still further, he presented a cognate sequence of ideas, his claims as creator would inevitably fall to the ground.

It is to a charge akin to this last that, not in solitary instances here and there, but in whole schools, modern architects have laid themselves open. They have read archæology for architecture, taking to their arms and endeavoring to crown with a chaplet of withered roses and dusty immortelles the mummified corpse of what was once a living, breathing, palpitating art. Working side by side with such as these, we find men of a surer faith in themselves and their century's possibilities, artists who, recognizing the limitations of the fitness of things, may avail themselves indeed of the types and hieroglyphs of a deathless past, but who, by deft and master-worthy permutation, enable us to read a new message at their hands. In our own land, it would appear that this archæological school has triumphed over what — from its fashion of delving into the midden-heap of the ages for the broken shards of the past, in which, when deftly pieced together, it may house its new-born ideas — may fitly be called the eclectic. Of our near neighbors France, Germany, and Belgium, all incline to follow the same path, such differences as may be noted in their architectural expressions being merely those of evanescent taste and not of abiding principle. It is to the West, and not to that former treasure-house of nascent arts, the East, that we must turn to find the strongest rival to our own archæological cult, though to the ears of those who in architectural matters are mere laymen, rather than to English architects themselves, will the assertion that to America we may look for any degree of artistic enlightenment savor of boldness. That America, influenced by its strongly marked individualistic bias, swayed as a nation by a restless impatience under authority of every description, should have remained but uneasily quiescent beneath the shackles of hard and fast architectural tradition, and should as early as was possible to it have thrown off these hampering bonds, and adventured for itself in absolutely new and virgin territory, might have been expected by the majority of European observers. Up to a certain point, indeed, this hypothesis has been borne out by the actualities of the case. That American architects of the first rank are free from the reproach of those wild and wanton excesses which might fairly have been a consequence of sudden reaction, is owing in part to those habits of introspection and self analysis which belong to them as units of their nation, in part to that finely trained appreciative and critically receptive sense which is equally a national characteristic. Thus no attempt has, happily, been made to evolve a new style, or to recklessly belittle the influences of the past. Wise discrimination has taken the place of slavish accuracy, an ample catholicity of taste has dominated a too bigoted adherence to precedent. It is not only in our own day, or even in our own generation, that this tactful recognition of the eternal truths of bygone discoverers has restrained the impetuous self-enfranchisement of the American character. When, in the early days of the building of the Capitol at Washington, the Philistinian patriotism of those who had the work in charge sought to impose upon the architect the revelation of a "new American order," much after the fashion of that "Gallick" one desired by Louis XIV, the fruit and leaves of maize, or Indian corn, were indeed deftly handled so as to take the place of the acanthus leaf on some of his capitals; but the exact proportions, and, more than this, the precise outline of the conventional Greek examples were rigorously adhered to. The same sense of the fitness of things prevails to-day among American architectural craftsmen; but were this all, and had they no greater claim to our respect than a merely negative virtue of forbearance from artistic libertinism, the comparison — casual as time and space condemn it to be — I am about to enter upon, between the latest developments of the art as displayed in London and New York, would be scarce worth the making.

Many years' careful consideration of Transatlantic architectural examples has, however, convinced me that while we in England have, for the past decade, merely advanced sufficiently to save ourselves from the reproach of retrogression, the Americans have, on the contrary, been pushing so earnestly and steadfastly forward as to have evolved, not the new style, which we neither desire nor solicit, but at least a new underlying principle, or, seeing that as yet it has not been more than tacitly recognized even by those who employ it to their manifest advantage, perhaps I should term it rather a quality. I hesitate at employing as a classifying adjective a term which has lately been used to the point of abuse in reference to another art, the more especially so as none but a misleading similitude can be traced between the two, but I have as yet found no definition which is, to myself at least, more intimately suitable to the characteristic I find in so much of recent American architecture than the word "impressionistic." Badges and labels, as applied to movements in Art, are but too often the outward and visible sign of an inward and intellectual indolence. What I mean to imply conveniently and succinctly by this term, is that quality or characteristic of a building which leads the spectator to carry away from it when he departs a more or less vivid impression of some one feature in particular which shall so dominate the rest as to be thereafter primarily called into imaginative existence by the reminiscent faculties. It may be an entrance, a roof, a bay, a chimney-stack that is thus, not to the detriment of other features but to their partial obliteration, earnestly insisted

upon; it may be something more abstract, a sentiment, an association, or even a dimension; it may be an ideal of domesticity, of grandeur, of simplicity; it may be a sense of loneliness or communion, an apprehension of breadth or of height. In all cases the underlying principle is the same, and though it is one which, from the days of the builders of the Parthenon to those of the master-builders of the Italian Renaissance, has never been absent from the more imposing examples of monumental architecture, it has, I think, never been so universally and practically applied as in our own generation, across the Atlantic.

This, at all events, is the conclusion to which I was led after a dozen years' residence in various great cities of the American Union. Nor, since my return to London some eighteen months ago, have I seen aught which would incline me to the belief that even our most notable living English architects can, in this respect at least, be placed upon a level with their American cousins. England, equally with America, is a great commercial nation, and it is, therefore, to the buildings in either country which owe their existence more or less directly to commerce, that we should naturally look for the fullest expression of the national sentiment. Here, at least, I think it is as capable of proof, as far as any purely æsthetic proposition is provable, that we have let slip the opportunity which across the Atlantic has been seized with both hands. Wandering through the narrow streets or broader main thoroughfares of London City proper, I have found little that has come into existence since my departure hence late in the seventies, which has impressed me as reflecting in any degree the opulent solidarity of our community of merchant princes and barons. Here, one comes on a picturesque gabled front or a bay treated with the refined daring of the New Zealand Chambers; there, one espies a more academic, but hardly more imposing, pile of stone, over-labored somewhat with carving, which seems to ignore and be reckless of its speedily forthcoming secretion beneath an obliterating mantle of the sooty deposit peculiar to our city; and of this latter type perhaps the most scholarly example is the new home of the Metropolitan Life Assurance Association in Moorgate Street; elsewhere one's sense of becoming prettiness and decorative skill is touched by such quaint apparitions as the City Bank in Ludgate Hill, in which all that terra-cotta plasticity can offer us is to be seen displayed to the uttermost. Such merits as all these possess, however, are but intensified by the gray neutrality of that general background of conventional respectability and hopeless mediocrity in which they are set. Dull variations of dull Classicism, under the very shadow of that crowning glory of our English Renaissance, and Wren's title-deed to immortality; spiritless essays in the Gothic of the schoolmen, within measurable distance of Westminster Abbey, form the bulk of our latter-day architectural pabulum.

Contemptuous dismissal of American commercial architecture, as vulgarly extravagant, may be an easily applied salve to our own irritated conscience, but it is hardly an efficient one. Vulgarity and extravagance riot in New York and Boston as in London and Paris; but even these æsthetic crimes have their degree, and a vice which arises from mere ignorance and absence of training is more readily susceptible of cure than one that is due to ingrained and hereditary predisposition. The American architect of the latter quarter of the present century had offered to his consideration a somewhat novel problem, and that, in working it out, he should have fallen into some sufficiently obvious errors is not surprising to those who are cognizant of the difficulties which lie in the path of those who seek to deliver a new message in the outworn terms of the past. That exaggeration of height, for instance, which primarily strikes an observer when he makes his first acquaintance with New York architecture, has been forced upon, and not encouraged by, the native architects. Even here, I venture to say, they have snatched victory where others would have sustained irreparable defeat. In such imposing structures as the "Mills Building" in Broad Street, the "Washington Building" in Broadway, and, most especially, the "*Times* Building" in City Hall Square, the effect of height, necessarily disproportionate to breadth, is almost entirely lost owing to the skilful disposition of the horizontal lines. Yet no attempt is made to juggle the beholder into the idea that the building is not so high as it really is, by a deliberate designing of it to a false scale, as would immediately suggest itself as the simplest way out of the difficulty, but a way whose very appearance of ease carries with it its condemnation. A less successful treatment of the same problem is to be seen in the United States Trust Company's new building in Wall Street, which, while the upper stories are sadly wanting in homogeneity of conception, is yet noticeable for its especially bold and dignified entrance and mezzanine story. Even this I think compares favorably with Mr. Aston Webb's Moorgate Street building, to which I have already made casual reference. And what one sees in New York is to be seen not only in Boston and Philadelphia, but in such smaller cities of the West, as Minneapolis and Pittsburgh, Denver and St. Paul. I have in mind a strictly utilitarian building of exaggerated height in one of these thriving cities which, bristling with faults in its minor details as it is, yet left on my mind an impression of dignity and soaring strength such as would not have been unworthy of one of the most cherished of Italian campaniles.

In public buildings, so called, London is able to more deservedly ask for our admiration, or so at least it appeared to my stranger eyes. It will take us some years yet to judiciously appraise the exact value of the new Law Courts in an artistic sense, but already it is evident that the storm of disparagement which from the time of their erection has been beating against them, is slowly dying down. Though one is at first, perhaps, unduly impressed with the lack of that abiding sense of solemnity and ennobling grandeur which it is felt subconsciously may be, but still insistently, by the multitude, should be, the predominating passage in the theme — a sense which in so marvellous a degree is imparted by that other great neo-Gothic pile, the Houses of Parliament — one latterly cannot fail to be agreeably fascinated by the consummate knowledge of detail, the faculty of pleasing picturesqueness displayed at every turn of the rambling edifice. Nor should it be forgotten, when drawing comparisons between it and the palace at Westminster, that the latter owes its being to the rare and casual combination of two distinct geniuses; neither Barry nor Pugin alone could or would have produced what we have at length come to so ungrudgingly admire, and it is no discredit to Street if we say that only now and again during the ages do we recognize the presence of an artist uniting in himself those dual attributes possessed by Sir Charles Barry and his less prominent coadjutor.

In the United States, unfortunately, though in my opinion the man has already come, the hour was not yet, and, great as H. H. Richardson undoubtedly was, the opportunity for which throughout his too short life he yearned of producing work which would have allowed him to imperishably place on record his undeniably authentic claims of kinship to Bramante and Wren was denied to him. From such detached fragments, however, as his Senate Chamber in the Albany Capitol, his Pittsburgh Court House, and his Albany City Hall, apart from his College Buildings at Cambridge and his Ames Memorial Buildings, we can, without an undue stretch of imagination, conceive what he might have made of a commission such as in our own generation has more than once fallen to an English architect's lot. It is gratifying to be able to add that since the erection of that restrained and scholarly example of the trained genius of Mr. Norman Shaw, the New Scotland Yard building on the Embankment, we can pride ourselves in having still with us an architect of the first order. The freedom from conventionality, shown especially in the unemphasized transition from the granite material of the lower stories to the brick and stone of the upper, is accompanied by a marked abstention from those vagaries which too often in modern architecture should be spelt vulgarities, while the refinement of detail and moulding is not allowed to emolliate the vigor of the stately conception.

To find the most striking examples of domestic architecture in London one must, to use a Hibernicism, go out of London, that is to say, to the more outlying and suburban districts of greater London. Within a three-mile radius, of which the Mansion House may be the centre, such domestic work as calls for attention is confined to the large hotels and flats rather than to private houses. The flat, or apartment-house, is scarcely yet naturalized among us, and it may, therefore, be claimed that it is no disgrace for a city like New York, to which they are almost indigenous, to have gone beyond us in this respect. Certainly there can be no question on this point. Such monotonously mechanical repetition of insignificant phrases as is to be seen in the neighborhood of Whitehall, such ostentation of the commonplaces of design as flaunts itself in Knightsbridge, so dismal a waste of arid nothingness as is presented to us in Victoria Street and in some of the newly-formed Avenues, are but poorly paid for by the intermittent picturesqueness across which we come at intervals in Chelsea and Kensington. Certainly in hotel buildings London has not yet much to show save what must make the judicious grieve. Opportunity was abundantly offered by such Brobdingnagian piles as the Victoria, the Metropole, and the Grand, all within a stone's throw of Charing Cross; but in truth the best of these is scarcely more commendable than certain blots on the Thames Embankment, which need not be further particularized. Nothing akin to Messrs. McKim, Mead & White's scholarly Hotel Imperial in New York, or that opulently conceived re-edification of Mauresque magnificence, the Ponce de Leon Hotel in Florida, has yet appeared within our own metropolis. Those who have seen not only such nineteenth-century palaces as the famous Vanderbilt houses, or such sturdy picturesqueness as the Tiffany House exhibits, but also the thoughtfully-studied and soberly-balanced compositions which, in the upper quarters of New York, are the rule rather than the exception, will readily acknowledge that it is not only in the skill of interior arrangement that the architects of that city are demonstrably superior to their London brethren. More especially in the middle-class city houses does New York excel us, as well as in dwellings of a slightly higher grade. The fact is that even the opulent Englishman seldom builds his own town-house, while the rich American almost invariably does so; and this, more than all else, gives that charm of frequent variety to that newer portion of upper New York of which the population has now been somewhat emancipated from the thraldom of the speculative builder. It may be noticed, however, that that enemy of the human race has been keen enough across the Atlantic to move with the times. I recall in especial one large block of building ground controlled by one speculator, who has within a twelvemonth built on it whole streets of houses. Yet, though a certain uniformity of plan necessarily prevailed, each house had some individuality of its own, and in outward appearance differed from its neighbors as much as those quaintly diverse houses on the Quai de Rosaire in Bruges. Compare it with a street of similarly occupied houses in London, say, for instance, Fitzjohn's Avenue in the Hampstead district, and the comparison is all in its favor. The London builder has built his not inexpensive houses, on one far from beautiful

or even attractive model, and, save for a welcome break here and there afforded by such houses as those built by Mr. Shaw for his artist friends, the prospect is disheartening to a degree.

It would be manifestly unfair to make no reference to ecclesiastical architecture, for here our fellow-countrymen assuredly stand on firmer ground. No such scholarly example of archæological lore, informed with a reticent modernity of spirit, can be found throughout the length and breadth of America, with the one possible exception of Trinity Church, Boston, as is presented by St. Augustine's in Kilburn. More in accord, perhaps, with the end towards which American architects are progressing, but surpassing anything that their church architects have produced, save some other less famous examples of Richardson's genius, such as his earliest Boston church, is the late Mr. Sedding's interesting church in Sloane Street. Here one finds an electicism founded on consummate knowledge, and thus free from the vices into which the electicism which is but the fruit of ignorance too surely falls. There is a sad significance in this, reminding us, all too sharply, that in its creator English architects have lost, in the full flush of his ripened powers, that Moses upon whom they were beginning to look as upon one destined to lead them out of their wilderness of doubt and weakness.

Space will not permit of my referring to other instances, apart from those I have all too briefly touched upon, which might further illustrate my text; but those who, like myself, can in the gallery of their memory hang side by side the best that has been achieved during the last decade on both sides of the Atlantic will, I feel sure, be disposed with me to say that, when the day shall come that American architects shall unite to the quick receptivity, the vigorous freedom of expression and the buoyant originality of design they at present possess, an equal measure of the recondite knowledge, the calm and sober judgment, and the nicely cultured taste which are the distinguishing marks of the English school, then, indeed, we may hope for such a new birth of this mother of the arts as has not taken place since the revival of learning in Italy helped to bring about the Renaissance of the arts which forms one of the world's glories. — *Horace Townsend in the Art Journal.*

EARLY SCULPTURE IN ENGLAND.

THE first name of an artist recorded in England was a Roman employed by Henry III, who was the first royal patron of sculpture in this country. A few years after Henry's coronation, 1216, he began to enlarge, partly rebuild and magnificently adorn the Abbey of Westminster, in which the grand object of attraction was to be the shrine erected to the memory of Edward the Confessor. This monument was intended to surpass in splendor of design and execution all that had previously been attempted, and accordingly we learn that Richard Ware, shortly after being elected abbot in 1258, went to obtain his confirmation at Rome, where it is supposed he engaged a Roman artist to construct the tomb of his patron saint, also the beautiful mosaic pavement round the same and before the high altar. These works and the monument of Henry III have, on the authority of Vertue and Walpole, been attributed to Peter Cavilini, merely from an inscription on Edward's tomb, which was legible till within the last fifty or sixty years, in which appeared the words, "*Petrus duxit in actum Romanus civis*," etc., which might signify any other Roman artist of the name of Peter.

The art of working in mosaic had been invented but a short time before Abbot Ware went to Rome, and Cavilini, as well as other artists then in practice had already performed several costly works in that city exactly in the same taste, though not in the precise form, of that of St. Edward's tomb. Nothing is more probable than that a rich abbot, either at his own expense or to gratify the taste of his sovereign master, whose partiality to foreigners was remarkable, should engage one of these artists to return with him and undertake the shrine for the great patron of his own church in this new-fashioned style of decoration.

The design of the tomb is unquestionably Italian; corkscrew columns, surmounted by Ionic and Corinthian pilasters, certainly had not appeared in England before this date, nor again until 250 years afterwards. Although possessing very considerable merit as far as regards mechanical ingenuity, this tomb can scarcely be considered as a work of art, and there is no authority whatever for supposing the Roman artist was employed about any other work than the newly-invented ornament called mosaic. It is extremely doubtful whether Cavilini ever was in England; and according to the best authorities for dates he was not born until some years after St. Edward's shrine was completed. But such is the love of foreign origin that the moderns have ascribed all the principal works sculptured within many years of the reign of Henry III to Cavilini. All the crosses erected by Edward I to his beloved Eleanor, the figure of King John on his tomb in Worcester Cathedral, the brass figure of Henry III on his monument in Westminster Abbey, and the four remaining statues in the niches of the buttresses on the north side of the same church, with many other works, have been attributed to this Roman artist.

This chapel was arrayed with a brilliant crowd of the most valuable images; on each side especially was placed a statue of the Virgin, one in silver presented by Eleanor, queen to Henry III, and the other in ivory, by Thomas à Becket, Archbishop of Canterbury, offered by that prelate to the old shrine. Of this once glorious performance, spangled with brilliant stones of various colors and profusely adorned with pure gold, which must have shone resplendent from the rays of numerous lamps constantly burning around it, all that now remains is but a fragment of departed splendor which displays itself in melancholy state, and is, comparatively, only a memento of olden time — a faint tracing like that which the foot of a traveller in the desert leaves on the sand.

During the long reign of Henry III many other admirable specimens of architecture, magnificently adorned with sculptures, were produced. The exterior of Salisbury Cathedral has an amazing number of niches or recesses for figures situated in tiers at different heights. Many of the statues, larger than life, are still remaining, and by a calculation of the number of recesses all round the building there must originally have been at least two hundred placed within them. Various parts of the interior are also highly sculptured, and command attention on account of the curious style of ornament, often possessing much novelty and beautiful execution. Under the windows in the chapter-house is a series of about fifty busts or corbel-heads, which are all interesting from their diversity of forms, characters and expressions; above these is a like number of bas-reliefs, containing from three to eight or ten well-executed figures in each; some of them show much simplicity and elegance in the grouping, with good taste in the style and disposition of the draperies.

The cathedral church at Wells, in Somersetshire, which, with several others, was erected about the same time as the last-mentioned, is decorated with a profusion of sculpture, decidedly of a more elevated character than that at Salisbury. Here may be seen a considerable number of alto-reliefs, of two or three figures, representing some of the choicest subjects, selected from the Old and New Testaments, in the arrangement of which many of the groups display very considerable taste and judgment. In more elevated situations are ranges of niches containing colossal statues of the principal personages connected with the Church, such as saints, kings, queens, nobility and clergy. The principal subject in the west front is evidently Christ, attended by angels and His twelve apostles. Many of the designs occupying the upper arches round the church are from the Creation, the Deluge, the life of Our Saviour, and particularly from the Resurrection and the Day of Judgment.

Although these works exhibit great deficiencies in what we now term classicality, or principles of art, they yet possess many fine original sentiments and occasional elegancies which overbalance minor defects, and are consequently fairly deserving our esteem, especially as they were produced long before the revival of arts and learning in Italy. Flaxman, in alluding to these specimens of early statuary in his "Lecture on English Sculpture," said, "In parts there is a beautiful simplicity, an irresistible sentiment, and sometimes a grace excelling more modern productions."

The artist who was employed at Wells has left ocular evidence of his superior abilities, and it is pleasing to observe that such talent was encouraged by his sovereign Henry III, who, as it appears by records in the Tower, on the death of Catherine, his youngest daughter, who died under five years of age, 1257, ordered a monument to be erected to her memory in Westminster Abbey, and commanded his treasurer and chamberlain of the exchequer to deliver to "Master Simon de Wells five marks and a half for his expenses in going to London with a certain brass image to set on her tomb, and returning home again." On this tomb was likewise placed a silver image, for which William de Gloucester, the king's silversmith, received seventy marks; this artist obtained the commission by a competition of talent; for we are informed that sculptors in stone and silver applied to the king to be employed about this figure of his daughter; he gave preference to the latter, and paid premiums to such candidates as came from the country — a proof that our artists were respectfully and liberally treated at this period.

The diversity of materials used for sepulchral statues, in the twelfth, thirteenth and fourteenth centuries, is rather remarkable, but whether from motives of economy, expedition of execution or other causes, of which we are uninformed, it appears that figures in wood were not so uncommon as some persons may imagine; one of the earliest is probably that of Caducan, bishop of Bangor, in Dore Abbey, Hereford; another to Robert Curthose, or Courtois, eldest son of the Conqueror, in Gloucester Cathedral; two at Danbury, Essex; William de Messing, founder of Messing Church, Essex; a knight in Buers Church, Suffolk; Bois, at Fersfield; Sir Hugh Bardolph, at Banham; Sir Roger Harsick, at South Acre, all three in Norfolk; Archbishop Peckham, at Canterbury; and many others, most of which were originally painted, gilt and otherwise elaborately decorated. In St. Edmund's Chapel, Westminster, is the tomb of William de Valence, Earl of Pembroke, half-brother to Henry III; on a wainscot chest lies the effigy of the deceased, carved in oak and covered with thin plates of copper, originally richly gilt, enamelled and decorated with precious stones. The chest was formerly plated with copper gilt, and had round it thirty, some writers say thirty-three, small niches containing images now all gone, leaving only a few vestiges of the panelled recesses wherein they stood. Gilbert de Clare, first Earl of Gloucester, who died in 1230, had an image of silver on his tomb in Tewksbury choir.

At a later period Queen Katherine caused a statue of her husband,

Henry V, to be placed on his tomb at Westminster; it was carved in oak, covered all over with thin plates of silver gilt, the head composed entirely of massive silver, and consequently very soon sacrilegiously stolen, in which headless condition the wooden core alone remains to this day.

The monument of Henry III at Westminster was erected in the eighth year after his decease, or in A. D. 1280; the statue of the king, reclining at full length in an attitude simple yet noble, is cast in brass, and was originally gilt; the pedestal, which is in the same style of ornament and workmanship as the tomb of St. Edward, is much too high to show the statue to advantage, but not so high as to have prevented sacrilegious plunderers from having robbed Henry of his two sceptres, which he originally held one in each hand; the lion at his feet, and the canopy over the king's head passing down both sides, are also gone, and only the marks of the fastenings remain to indicate they had ever existed.

The commemoration of Eleanor, queen to the first Edward, was an event that seems to have given a surprising stimulus at that time to the artists in England. This lady, whose attachment to her husband has been so pleasingly recorded, lived thirty-six years the constant associate of his perilous undertakings and expeditions, accompanying him even into the Holy Land. She died A. D. 1290 or 1291, at the mansion of Richard de Weston, near Hardeby in Lincolnshire, whilst attending the king into Scotland. Edward's affection for his beloved and departed Eleanor required no embellishment from legendary writers to set it off; he was personally the chief mourner in the solemn procession that conveyed the precious remains to Westminster; and that pilgrims and passengers might be reminded to pray for her soul, he ordered a cenotaph or cross to be raised to her memory on the side of the high road nearest to each place where the cavalcade rested for the night in its progress to her sepulchre. Such unparalleled memorials of conjugal love adorn the pages of regal history in no other kingdom.

It is uncertain how many of these crosses were erected. Historians have mentioned Hardeby, Lincoln, Newark, Grantham, Stamford, Leicester, Geddington, Northampton, Stoney Stratford, Woburn, Dunstable, St. Albans, Waltham, Tottenham, Cheapside and Charing as having been so honored. Crosses at most of these places are known to have existed, but now only those at Northampton, Geddington and Waltham remain in their original form. In tracing the situation of these various places on a map, the indirect route may at first seem unaccountable; as, for instance, how came Waltham to be a station between St. Albans and London? The reason might probably be that in many parts of the direct road there were no royal palaces, manors or abbeys of sufficient importance to accommodate so grand a cavalcade.

At Dunstable "the corpse of Queen Eleanor was deposited in the Priory for one night. On this occasion a cross was erected in the midst of the market-place; the ground was marked with great solemnity by the chancellor and attendant nobility, assisted by the prior, who sprinkled the destined spot with holy water."

Notwithstanding the distances between the resting-places were short, yet, as this awful ceremony took place in the month of December, it must necessarily have been sunset before the procession could arrive at some of the stations. "When it reached St. Albans it was met at the town's end, near St. Michael's Church, by the whole convent, consisting of the abbot and one hundred Benedictine monks in their cowls, and, according to the usages of the Catholic Church, bearing torches. These preceded the royal corpse to the high altar of their abbey, where they attended it the whole night, saying masses and celebrating the proper offices. At sunrise they conducted the retinue into the high road leading to the next station." It may be fairly presumed that similar dignified attentions occurred at each resting-place.

The general design of all these cenotaphs was rather similar, but the architectural details and sculptured ornaments varied considerably. They are divided into three stories, of an octagonal plan (the upper part of that at Northampton is square). The middle stories contained eight niches, with figures about six feet high, several of which still remain and are in tolerably perfect condition. These may be considered amongst the earliest and decidedly some of the finest specimens of English sculpture, possessing considerable simplicity and elegance. The statue of the queen on Waltham Cross is certainly a most delicate figure of a beautiful female in an easy, unaffected attitude. Her left hand, raised lightly to her breast, holds the hem of her dress with the forefinger, while her right gracefully retains the sceptre. Her head is adorned with a coronet of fleurs-de-lis and trefoils, under which her hair falls in ringlets down her neck. The raiment consists of a simple dress in well-disposed folds, without any band or girdle, and so long as to envelop her feet. Over her shoulders is a mantle reaching to the ground, nearly covering the arms, but leaving the hands at liberty.

The same remark, as far as regards beauty of design and execution, might be applied to the few remaining statues that the crumbling touch of time has left on these now tottering crosses; but by far the greater number were destroyed during civil, or, to use a more suitable expression, during uncivil commotions, and at the Reformation, when those vulgar and brutal fanatics thought it meritorious to annihilate or mutilate these sacred relics, as well as every other object of art or taste in this country.

Although the statues of tutelary saints and benefactors, distributed in various parts of the exterior of our ecclesiastical structures, have suffered much, even in their pedestals and canopies, by the mutilation of fanatics, it is much more to be regretted that so many of our cathedrals which have escaped this devastation, to a certain degree, should have been built and the decorations carved in such friable stone as that of which the cathedral at Lichfield is a lamentable specimen, at a period when a true feeling for the beauties of sculpture, and an ability to equal its proudest excellences, alike distinguished the artists and patrons of this country.

Few can imagine, while they contemplate a Gothic structure, how much beauty and refinement it has lost by the destruction of statues and ornamental carvings. A rich screen or lady chapel of a cathedral, with a number of vacant niches, is somewhat analogous to a splendid apartment, on the walls of which are suspended handsome carved frames without pictures. — *The Architect.*

CHURCH TOWERS AND SPIRES.

ENGLISH and French spires have eight angles generally. On Caldy Island, Pembrokeshire, there is one with six. Some very old spires, like those at Tournai Cathedral, in Belgium, and Valladolid, in Spain, are four-sided; while at Verona, at Piacenza and elsewhere in Italy there are circular or conical ones, shaped like an extinguisher. Towers vary in form as much as spires. The great majority, of course, are square. Octagonal ones are also numerous. Two of those at Ely Cathedral are ten-sided, and the Golden Tower at Seville has twelve sides. In Norfolk and Suffolk round towers are common. The reason for this is supposed to have been the scarcity of freestone. The walls were built of flints, which were plentiful enough, but at every corner quoins of dressed stone were necessary. There was, therefore, much to be saved by adopting a plan which had no corners and needed no quoin stones.

Round towers, however, have been built where this motive could not have existed, and one of the most noted, though not the most beautiful, of all such structures, the leaning tower at Pisa, is circular. On a smaller scale, for example, in turrets, the circular shape is often very pleasing. This can hardly be said of the triangular one, and yet at Maldon, in Essex, there is a three-cornered belfry tower of considerable dimensions. This last is one of the oddities of tower design. Of these there are many. The strangely twisted spire of Chesterfield Church, which, from some points-of-view, looks as if it were in the very act of falling, cannot, perhaps, be fairly classed among them. It is odd enough beyond all question, but its oddity was probably undesigned. It is built of wood, and not of stone, and the twisting seems to result from the prolonged action of sun and wind on badly-seasoned timber. The spire of St. Michael's, Lewes, which is of similar materials, is similarly twisted, though in a less degree. The Church of our Saviour, at Copenhagen, has a curious spiral staircase winding round and round on the outside of the spire. The Round Tower, in the same city, has no staircase at all. In place of one, there is a paved roadway inside it, turning round and round an inner circle, and thus rising at a gentle slope till it reaches the top. Horses and carriages, even, have at times made the ascent.

Of fantastic ugliness in tower forms, we are not without examples in London. The misshapen obelisk, for instance, which serves as the tower of St. Luke's, Hoxton, might have been decided on by a committee chosen from the neighboring mad-house. A church just on the north of the railway between London Bridge and Bermondsey is not much better. Where St. Luke's has an obelisk, it has one enormous column. We are happily free, in this country, from the bulbous excrescences which deform so many buildings in Holland and North Germany. There the tulip mania seems to have made its way even into church building, and roofs shaped like magnified tulip roots often take the place of spires. Sometimes there are several, one above the other, as, for example, in the great church of Middleburg. But even this was outdone in Russia. In the Kremlin, at Moscow, stands what is probably the oddest of all architectural oddities. This is the Church of Vasili Blagennoi. It is like no other church on earth, and almost indescribable. If it suggests anything, it is a gigantic cruet stand. Nine polygonal towers stand round a loftier central spire, like the cruets round the handle. But this is not the whole of the resemblance. Each polygonal tower has a bulb-shaped top, forcibly recalling a familiar type of stopper. To complete the suggestion, every tower, and still more, every top, is covered over with just such projecting patterns as the glass-cutter most affects. There are ribs and lozenges and pyramid ornaments; one bulb has a twisted surface, another a diapered one, and another is embossed in squares. Théophile Gautier compares the building to a stalactite grotto turned upside down. But the comparison is much too poetical. The affinities of the design are not with nature, but with art, and with precisely that sort of art which is turned out wholesale by a prosperous town in the Midland counties. — *London Standard.*

Black Glass. — A curious discovery is reported to have been made at the Holywood Gasworks. One of the retort flues has been choked up for some time and on examination it was found that one of the retort arches was filled up with fine black glass. The cause was found to be in the fact that this arch had been built of common brick instead of fire-brick, and the intense heat had converted the sand and lime in the brick and mortar into black glass, as mentioned above. — *Inventions.*

COMPARATIVE MUNICIPAL BUILDING LAWS. — XVII.

[*Note:* — In these tables bracketed letters invariably refer to preceding passages in the same column.]

Smoke-Pipes.

Boston: — *a.* No smoke-pipe shall project through any external wall or window.

b. No smoke-pipe shall pass through any wooden partition without a soapstone ring of the thickness of partition, and extending 4″ from pipe; or a double metal collar of thickness of partition, with a ventilated air-space of not less than 4″ around pipe.

c. Nor shall be placed within 8″ of any wood, unless such wood is plastered and protected by a metal shield 2″ distant from wood, in which case the pipe shall not be less than 6″ from wood.

(*a*), (*b*) and (*c*) may be modified by Inspector in *First Class Buildings.*

Baltimore: — *In buildings with combustible floor and ceiling:*

d. No smoke-pipe shall enter flue nearer than 12″ from floor or ceiling.

e. Smoke-pipes passing through wooden partition, floor or roof shall be guarded and well protected at every point.

f. Smoke-pipes of furnaces shall be kept at least 2′ 0″ below joist or ceiling, unless properly protected by shield or metal plate, with 3″ free air-space above and below shield, and smoke-pipe shall in no case be less than 14″ from joist or ceiling.

Brooklyn: —

Charleston: —

Chicago: — *g.* Furnace smoke-flue shall be kept at least 20″ from any unprotected woodwork.

Cincinnati: — (See "*Hot Pipes.*")

Cleveland: — (See "*Hot Pipes.*")

Denver: — (*a.*)

h. Smoke-pipes entering flue shall be kept at least 12″ from any wooden partition, floor or ceiling.

i. And shall be guarded by double metal collar, with air-space around, when running through any wooden partition.

j. Furnace smoke-pipe shall be kept at least 12″ from beams and ceiling not protected by tin-plate shield at least 2″ from such beam or ceiling. Smoke-pipe may be placed within 6″ of plastered ceiling if protected by such tin shield.

Detroit: — (See "*Hot Pipes.*")

District of Columbia: — *In buildings with combustible floor or ceiling* (*d*).

k. Smoke-pipes of furnaces must be kept at least 2′ 0″ below ceiling, unless they are properly protected by shield or tin plate with sufficient air-space above and below for ventilation, and then the smoke-pipe shall be kept at least 8″ from beam or ceiling.

Kansas City: — (*a*); (*h*) and shall be guarded by soapstone ring, brick noggin not less than 4″ thick, extending through floor or partition, or by a double metal collar with air-space not less than 4″ around same when running through stud or wooden partition. (*j*).

Louisville: —

Memphis: — *l. In buildings with combustible floors, ceilings or partitions*, stove-pipe entering flue shall be at least 12″ from either floor, ceiling or partition, unless same is properly protected by metal shield; then the distance shall not be less than 6″.

m. Smoke-pipes passing through wooden or stud partition shall be guarded by double collar of metal with 3″ air-space and holes for ventilation, or by a soapstone ring not less than 3″ thick extending through partition.

n. Smoke-pipe from laundry stove or from furnace must be kept at least 18″ from floor beams or ceiling, unless same is protected by metal shield, and then distance not less than 9″.

o. Smoke-pipes passing through wooden or stud partitions shall be protected by a thimble with 8″ brickwork around it, or a double collar of metal with at least 6″ air-space and holes for ventilation. No smoke-pipe shall pass through any floor.

Milwaukee: — (*g*).

Minneapolis: — (*k*).

In buildings with combustible floor and ceiling, (*d*). Smoke-pipes passing through stud or wood partitions shall be guarded by a brick ring at least 3″ thick extending through partition, or by a solid coating of plaster-of-Paris 3″ thick, or by an earthenware ring 3″ from pipe.

Nashville: — No stove-pipe shall run through wall, but shall connect with flue properly topped out. *p.* Stove-pipes passing through stud or wooden partition shall be guarded by double collar of metal at least 2″ larger than the pipe.

Newark: — Furnace smoke-pipes shall be at least 12″ from any woodwork.

New Orleans: — No stove-pipe shall project over sidewalk or into street.

New York: — (*l*); (*m*); (*n*); (*o*).

Omaha: — (*h*); (*i*) or by a soapstone ring not less than 4″ thick extending through partition. (*a*) or roof. (*j*).

Philadelphia: —

Pittsburgh: — No stove-pipe shall project through any front door, front window, front wall or past front corner of building.

All stove-pipes and flues shall project and be carried safely through walls. Their ends shall project through wall or roof at least 3′, and so as not to set fire.

Providence: — *In buildings with combustible floors or ceilings* (*d*). (*b*).

Earthen funnels in chimneys shall not project more than 1″ from brickwork thereof.

Metal funnels carried through furring or studding shall be filled around with brick or stone at least 6″ out from pipe, shall pass entirely into chimney, or have an outer ring of metal at least 4″ at all points from funnel, the space between left open or covered with perforated metal.

Furnace smoke-pipes kept at least 18″ from wooden beams or ceiling, or woodwork protected by tin shield at least 1″ below.

St. Louis: — *In buildings with combustible floors and ceilings* (*d*).

Smoke-pipes passing through stud or wooden partitions shall be guarded by soapstone ring or other incombustible material not less than 4″ thick, or a vitrified clay pipe at least 2″ greater diameter, and to pass through partition.

Furnace smoke-pipes must be kept at least 2′ below beams or ceilings, unless beam or ceiling is properly protected by shield or tin plate 2″ below beam or ceiling.

Stove-pipe passing through woodwork shall be separated from woodwork at least 6″ by incombustible material, and project beyond roof not less than 3′.

San Francisco: — *In any building with combustible floor and ceiling*, smoke-pipe shall enter flue at least 18″ from floor or ceiling.

Smoke-pipes passing through wooden partition shall be guarded by double collar of metal with at least 4″ air-space and holes for ventilation; or by soapstone ring not less than 3″ thick extending through partition; or by a solid 3″ coating of plaster-of-Paris; or by earthenware ring 3″ from pipe.

Where a stove-pipe enters a brick flue, there shall be a double metallic collar with 4″ air-space and holes for ventilation, or an earthen receiving-pipe extending from inside of flue to outside of plastering.

Openings through roof or side of building where stove-pipes pass shall be at least 4″ greater diameter, and have double tin or earthen receiving-pipe, and tin or sheet iron inside and outside opening.

No stove-pipe shall be placed nearer than 6″ to side of building. (*k*).

Wilmington: — *In building with combustible floor or ceiling* (*d*), and provided the wood is not covered with fireproof material.

Pipes passing through stud or wooden partitions or roof shall be guarded by metal collar to keep pipes at least 6″ from woodwork, projecting at least 3′ above roof, or by other plan equally secure to be approved by the Inspector.

Registers.

Boston: — *a.* Hot-air register-boxes placed in floors and partitions, to be set in soapstone or other equally incombustible borders not less than 2″ wide, made of tin plate; have double pipes and boxes fitted to soapstone.

b. Register-boxes at least 1″ from all woodwork.

c. Register-boxes 15″ by 25″ or larger at least 2″ from all woodwork.

(These requirements may be modified by Inspector in First-class buildings.)

Baltimore: — Metal for register-boxes shall be doubled, as required for flues.

d. Hot-air registers set in floor shall have border of fireproof material; shall be made of sheet metal, with flange on top to fit groove in border, with register resting on same.

e. An open space of 2″ on all sides of register-box extending from the border to ceiling below.

f. And outside of that space covered tight with casing of metal.

Brooklyn: —

Charleston: —

Chicago: — *g.* Hot-air registers to be set in incombustible borders at least 2″ wide.

h. Such borders set in plaster-of-Paris.

i. Openings in floors for registers to be lined with bright tin to receive registers, such lining kept at least 1″ from register-box.

(See "*Hot Pipes.*")

Cincinnati: — *j.* Hot-air registers to be set in incombustible borders.

k. Openings in floors for registers lined with metal.

l. The preceding requirements may be modified by the Inspector.

Cleveland: — (*j*); (*k*); (*l*).

Denver: — *m.* Hot-air register-boxes placed in floor or partition shall be made of tin plate, with flange on top. (*b*).

n. Space extending from under side of ceiling below register to under side of register face, all such space lined tight with tin-plate casing. (*c*).

Detroit: — (See "*Hot Pipes.*")

District of Columbia: — Hot-air registers in floor shall have air-space extending all around register box, guarded by tin on outside.

Kansas City: — (*m*) to fit groove in soapstone or cast-iron frame. (*b*), extending from under side of ceiling below register to soapstone or iron frame.

o. The outside of such space covered tight with casing of tin plate, extending from under side of ceiling up to and turning under said frame. (*c*).

Louisville: —

Memphis: — *p.* Registers located over a brick furnace shall be supported by brick shaft built up from cover of hot-air chamber, said shaft to have metal pipe inside it.

q. Registers for hot-air furnaces placed in woodwork shall have stone borders firmly set in plaster-of-Paris or guaged mortar.

r. Such register-boxes shall be made of tin-plate, with flange on top to fit groove in stone border, register to rest on same, (*c*) and upper end turned under stone.

s. Register-box placed in floor over portable furnace shall have open space on all sides of register-box of not less than 3″.

t. When only one register is connected with furnace, that register shall have no valves.

Milwaukee: — (*g*); (*i*).

IC or IX bright tin used in construction of all hot-air flues and appendages.

Minneapolis: — Hot-air registers from hot-air furnaces in floors shall be set in iron border not less than 2″ wide.

u. With open space of 1″ on all sides of register-box extending from under side of the ceiling below register to border in floor, such space lined tight with tin-plate.

Nashville: — *v.* Hot-air registers in floors to be set in soapstone borders set in plaster-of-Paris or gauged mortar. They shall have open space of 2″ on all sides extending to soapstone in floor.

Newark: —

New Orleans: —

New York: — (*p*); (*q*); (*r*); (*c*), the upper end turned under stone. (*s*); (*t*).

Omaha: — (*p*).

Registers for hot-air furnaces set in woodwork or combustible floor shall have incombustible border firmly set in plaster-of-Paris or gauged mortar. (*m*) to fit groove in border, the register face set on same.

Philadelphia: —

Pittsburgh: —

Providence: — Registers connected with hot-air furnaces shall be set in non-conducting, incombustible borders at least 2″ wide.

(*m*) to fit groove in border. (*b*).

w. Space extending in floor registers from under side of ceiling below register to border in floor, the outside of such space covered tight with casing of tin-plate, to extend to and turn under border. (*c*).

St. Louis: — Hot-air registers in floors to be set in soapstone or other incombustible border not less than 2″ wide.

(*b*) extending from under side of ceiling under register to soapstone or other incombustible material in floor.

San Francisco: — Hot-air registers to be set in soapstone borders not less than 2″ wide.

(*h*) or guaged mortar.

Floor register-boxes (*r*), (*w*) and turning under stone.

Registers 12″ by 19″, and less than 15″ by 25″, shall have a space of 3″ between register-box and casing.

Larger registers shall have space of 3½″.

Register-boxes shall be made double, as required for hot-air pipes.

Wilmington: —

Compiled by HENRY A. PHILLIPS.

SAN MICHELI. — BRAMANTE.[1]

SAN MICHELI, who was born in the year 1484, may, with propriety, be called the founder of the Venetian School of Architecture. Having visited Rome, the grand pilgrimage of students in all the arts, at the early age of sixteen, for the purpose of studying its monuments with attention — and having found much employment in that city — many years of absence intervened before he returned to his native city. One of his first works after his return was the Porta Del Palio, or guard house, at Verona, — in which he combined pure and beautiful architecture with every requisite called for in a fortification of that period. It displayed great architectural merit, and showed its author's wonderful ingenuity and taste. But the most admired compositions of San Micheli were the palaces which he erected at Verona, — though that of the Grimani family, at Venice, was perhaps his most showy and magnificent production. It differed widely from the palaces of Florence and Rome, as it was marked by the use of a basement of rustic work, sustaining an order of columns above it, which are separated by arched windows. The latter feature is one in which San Micheli greatly delighted, and one cannot fail to observe the graceful effect produced by connecting these windows with the order, after the manner of an arcade. The whole is crowned with an entablature which is varied from that of the Italian Doric, differing much in appearance from the Doric of the Parthenon, assimilating better with the general expression of the kind of architecture which our present uses require. Sir Christopher Wren often modified orders in this way with much success, as will be found in the upper story of St. Paul's Cathedral, in the celebrated interior of the Church of St. Stephen, Walbrook, and in several of his other most admired compositions. San Micheli's works are all conspicuous for excellent construction, as they are for convenience, unity, harmony and simplicity. If, indeed, he had no other testimony in his favor, it would be sufficient to say that he was held in high esteem by Michael Angelo, and, that one of the most eminent of modern critics advises the student to apply himself to the works of San Micheli with diligence and attention. He appears to have devoted himself with great ardor to the study of military architecture in particular, and though the invention was not for a long time afterwards assigned to him, he was in fact the author of the system used by the distinguished Vauban, and his school, who, by some means or other contrived for a long time to deprive him of the credit of it. Before his time, all the ramparts of a fortification were round or square, but he introduced the method of triangular and pentangular bastions, which resulted in a great increase of the facilities for defending every part of the inclosure. This branch of construction belongs, at the present day, almost entirely to the department of engineering, but, at the time to which we now refer, it was intimately connected with the practice of civil architecture. But the masterpiece of San Micheli was the little circular chapel of San Bernardino. It has scarcely ever been surpassed in appropriate beauty, and exhibited in a striking degree the early perfection of the Venetian School. I make use of the term "*appropriate* beauty" in this connection, because the fact seems scarcely comprehended by many persons, and, even by some holding a high rank for taste, that an object which is beautiful in *one* place, and under *one* set of circumstances, may become highly improper in another. But those wants and uses of society which produce an effect upon the *modifications* of *domestic* architecture, in particular, were in the Italian States so much more nearly allied to our own condition, than any with which classical antiquity can furnish an example, that it is not strange if less inconveniences should arise, and less absurdities be committed by following the Italians, rather than the Greeks or even the Egyptians. By so doing, we find that we are never obliged to construct edifices whose essential features must be disguised, in order to fit them for their new employment, nor to carve out ornamental emblems in granite to signify a meaning in which we do not believe, to typify doctrines which were exploded even before the first promulgation of Christianity to the world. The productions of San Micheli belong to an age then, and a school of art, with which it is well for all to become acquainted. In a small space they often exhibit refinements, and graces of expression even, which we scarcely know to be equalled elsewhere. The number of the examples, too, which he left, surpass those of any other architect, with the single exception perhaps, of Palladio. He gave a tone and a feeling to his art in the Venetian States, which endured for a considerable period. Among his largest works may be enumerated the Cathedral of Montefiascone and the Church of St. Domenico at Orvieto. His death occurred in the year 1549.

BRAMANTE was born in the year 1444, and educated at first as a painter, yet may be considered as the founder of the Roman School of Architecture. Though likely to have ranked in his original profession as a master of more than ordinary powers, his great love of architecture induced him to apply himself exclusively to its practice. He met, at first, with but little success. During a protracted stay at Milan there is no evidence of his having been engaged in any work of importance or profit. But his determination to adhere to the profession of an architect was irrevocable. Leaving Milan, he proceeded to Rome and engaged in practice in that city, where he was obliged to make himself known by some works in his first profession of a painter, executed in one of the churches of the Papal City. So intense was his ardor to become great in the art he had adopted, that he refrained from all society, though he is said to have been naturally of a hospitable and social disposition, and, avoiding all expense and luxury, he gave himself solely to the study of the monuments of antiquity by which he was surrounded. He even extended his researches to Naples, losing no opportunity of noting, and often copying, all the ruins from which instruction in his art was to be drawn. Such intelligent perseverance could not long remain without its appropriate reward. The Cardinal of Naples, who had remarked his great zeal and taste, gave him his first commission in Rome, employing him in the construction of the cloisters of the Convent della Pace, and from the ability and speed with which he executed this task, he was, at once, brought into repute. Other employments poured in upon him, and his whole time was soon occupied in the successful practice of architecture. Rome, at that period, could boast of but few architects, and those that were established there were persons of but little account for their skill, science, or taste. This is evident from the great want of originality so apparent in their works. While the Florentine school of architecture seems to have sprung, in the most vigorous and decided manner, from the habits of the people, and from the nature of their materials, modified by some knowledge of the buildings of the ancients, that of Rome, on the contrary, seems to have been founded on the mistaken idea of bending the system of antiquity to suit the more modern habits of a very different people. Before the time of Bramante, they had not the good sense to see that placing the orders of architecture against the walls of a building where their use was not required by the interior distribution, was only a tasteless and useless application of them. Afterward, however, as in the noble front of the Farnese Palace, they were used only for the decorations of the windows, and not superfluously obtruded, in every situation, upon the eye. Bramante was the first architect of St. Peter's, which set the example for all the great modern churches of Europe, and was intimately connected with the rapid progress of the Roman School, but after his death, which occurred in 1513, his designs were lost, but Raphael the painter collected Bramante's ideas, and prepared them as they afterwards appeared in Serlio's "*Treatise on Architecture.*"

The "Sketch of the History of St. Peter's, at Rome," by the late Arthur Gilman, published in the *American Architect and Building News*, of December 22, 1883, gives a detailed account of St. Peter's, and Bramante's architectural connection with that world-renowned edifice.

[1] Extracts from a lecture by the late Arthur Gilman.

THE ILLUSTRATIONS

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

ALLEGHENY COUNTY JAIL, PITTSBURGH, PA. H. H. RICHARDSON, ARCHITECT.

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

ADDITIONS AND CHANGES TO HOUSE OF D. S. WALTON, EAST ORANGE, N. J. MESSRS. LAMB & RICH, ARCHITECTS, NEW YORK, N. Y.

PUBLIC SCHOOL, NOBLESVILLE, IND. MESSRS. WING & MAHURIN, ARCHITECTS, FORT WAYNE, IND.

A DESIGN FOR THE *Post* BUILDING, WASHINGTON, D. C. MR. W. J. MARSH, ARCHITECT, WASHINGTON, D. C.

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FIREPLACE IN CLUB-ROOM, NEW MERCANTILE CLUB BUILDING, ST. LOUIS, MO. MR. ISAAC S. TAYLOR, ARCHITECT, ST. LOUIS, MO.

[Additional Illustrations in the International Edition.]

HOUSE ON THE AVENUE DE L'ALMA, PARIS, FRANCE. M. L. PARENT, ARCHITECT. LONGITUDINAL AND TRANSVERSE SECTIONS: THREE PLATES.

[Photogravures.]

FOR description of the building, see Paris Letter in the *American Architect* for July 30, 1892.

COLOGNE.

NEW ROMAN CATHOLIC CHURCH OF THE HOLY ROOD, WATFORD, ENGLAND. MR. J. F. BENTLEY, ARCHITECT.

THE ROYAL KENT HOTEL, SANDGATE, ENGLAND. MR. W. HOWARD SETH SMITH, ARCHITECT, LONDON, ENGLAND.

SANDGATE is one of the most delightful situations on the south coast. It faces due south, and is sheltered by the Dover and Folke-stone cliffs from all east and north winds. It possesses an

uninterrupted view of the English Channel, with views of Hastings, Dungeness, Lydd, Littlestone and New Romney on the right, and Boulogne and the French coast on the left. It is one mile from Folkestone Harbor, through the charming lower road, and two and a half miles from the historical borough town of Hythe, with its fine old church and permanent school of musketry for officers, which is used all the year round. Shorncliffe Camp occupies the high ground immediately behind the town. The camp consists of an average of 4,000 troops, and has now become a permanent institution, Parliament having voted a sum of 200,000*l.* for its enlargement and completion. The traffic between Folkestone and Hythe is rapidly increasing, much to the advantage of Sandgate. The town itself is also rapidly being developed. The Folkestone Hill Road has been widened, and the Local Board have just laid down a new outfall sewer.

The present Royal Kent Hotel has been established for the last 150 years. It has long been extensively patronised by the medical profession and is highly recommended as a winter resort, being sheltered from the north and east winds. It is also very frequently visited by the officers at the camp, being within easy reach of the officers' quarters. Professor John Ruskin was resident there for upwards of five months. In the *Echoes of the Week*, George Augustus Sala wrote as follows: "My favorite excursion is by fly to Sandgate, because there I found a pretty smiling friendly hotel called the Royal Kent, with a green garden stretching down to the sea. The 'nobs' have discovered the prettiness and geniality of the Royal Kent, and had taken possession of it, so that I could not obtain room there. When the 'nobs' go back to their ancestral mansions I shall make, if I get well, an attempt to find shelter at the Royal Kent. The courteous landlord is a *virtuoso*, and has cabinets full of old china and rooms full of old tapestry, old chairs and rare old prints after Hogarth and Jan Stein and Joseph Vernet."

The site extends from the High Street to the beach, so that the great advantage of a sea-front can be secured with private sea-wall and terraces.

Hotels in many watering-places and health resorts have only a three or four months' season; but in the present case there is considerable business throughout almost the entire year, especially with military officers at Shorncliffe and Hythe. The cost of the building, of the entire furnishing of the hotel and all expenses, is estimated not to exceed 45,000*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.*]

TO PREVENT CHURCH SPIRES FROM SWAYING.

WATERBURY, CONN.

TO THE EDITORS OF THE AMERICAN ARCHITECT: —

Dear Sirs, — Can you give us any information in regard to preventing church spires from swaying by suspending a heavy timber in the centre, something like the inclosed rough sketch (Fig. 1). We have been asked to devise some plan by which the swaying of a

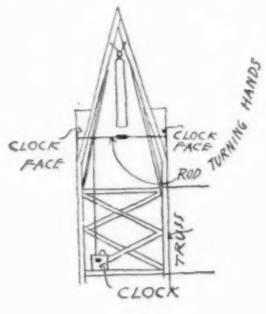

Fig. 1.

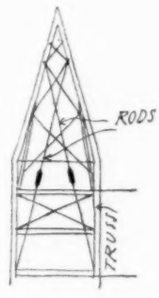

Fig. 2.

spire (with a clock in it) can be prevented. We propose to lattice brace it and carry four rods from near the top to the heavy framework at level with roof trusses, thus (Fig. 2), but it has been suggested to us that we hang a heavy timber, as before described, by an English builder who claims to have done it, and it proved to be successful.

On account of the clock-work the timber could not be more than two-thirds the length of the slanting part of the space, which in our opinion would add to the motion as it began to swing.

Above the church roof the spire is octagon. Your opinion in the matter would oblige us very much.

Yours respectfully, BENEDICT & UPHAM.

[THIS letter does not say whether the swaying to be guarded against is due to the wind, or to the ringing of a heavy bell in the spire. If the latter is the cause of the trouble, the remedy is to support the bell on a framework, which itself rests at the bottom, on the tower walls, but does not touch the walls elsewhere. By this method, the vibration of the bells is applied to the portion of the tower nearest the ground, and, therefore, best able to resist it.

If it is swaying due to wind that is to be resisted, the suspension of a heavy timber, or framework, from the top of the spire will be found advantageous, but the suspended structure should reach nearly to the ground to be of much use. The Japanese hang a heavy timber, swinging free, from the roofs of their towers, as a safeguard against earthquakes, it being supposed that, if a movement is communicated to the tower, and, with it to the timber, the latter will act as a pendulum, and, swinging back, will draw back the tower to its place. Whether it really acts in this way, or more simply, by lowering the centre of gravity of the tower, may be regarded as doubtful; but Sir Christopher Wren, one of the most ingenious and observant architects that ever lived, adopted the same device at Salisbury. The spire of Salisbury, which is 404 feet high, showed signs of leaning, and he was called in to remedy the trouble. His treatment, after patching up a few cracked stones, consisted in tying strongly together the pieces of the wooden staging which had been used for the work, and suspending the whole structure from a metal rod which is put through the cap-stone of the spire, cutting off all other connection between the framework and the walls. As the spire has passed through the storms of a hundred and twenty-five years since then, without apparent deterioration, it may be inferred that there was some virtue in this mode of keeping it in equilibrium.

In the present case, we should think that a framework might be made, and suspended from the roof, which would inclose the clock mechanism, without interfering with it, and thus carry down the centre of gravity of the whole.

The bracing shown would also increase the stiffness of the spire. If, however, as seems to be indicated by the sketches, the front of the tower rests on a wall, or on studding, and the back on a roof truss, the spire will soon lean backwards in spite of all precautions, as no wooden roof truss can be made which will not settle somewhat, and generally a good deal, by seasoning and shrinkage. — EDS. AMERICAN ARCHITECT.]

NOTES AND CLIPPINGS

IRON CASKS. — According to experiments which have been conducted by Herr Arthur Holle of Munich, with a view to manufacturing iron casks suitable for transport purposes, it is demonstrated that simple coating of the interior of the barrel with various kinds of lacquer, enamelling and also tinning, zincing, nickelling and coppering, are unsuitable. In the end the German technologist found that lacquered sheet-iron was best adapted to the object in view; but he endeavored, at the same time, to secure a fitting insulating coating by means of an intermediate layer. Strong paper, it was shown, became decomposed; the use of thin gauze material was also pronounced to be impracticable. The best intervening agent proved to be silk-paper. The operation of applying the coating was as follows: The interior of the barrel was first lacquered; the tissue-paper was then evenly put in position with the aid of some varnish; and finally it was furnished with a finishing coat of lacquer. The covering thus obtained resisted the influence of heat, moisture and of acids which were much stronger than those contained and developed in beer. It is to be noted that a special kind of lacquer is used, so that the fluid may not savor of the varnish. With regard to the shape of the casks, Herr Holle is of the opinion that a cylinder, with set-in top and bottom, offers the most suitable form of barrel. Simple soldering of the heads does not seem to suffice, and they should, therefore, be secured with four or five copper rivets. Casks fastened in this manner are claimed to sustain without difficulty a pressure of five atmospheres. Closing of the barrel is effected by means of a metallic flange-nut and brass screw. For tapping the liquid in the iron cask, a faucet of peculiar construction, furnished with a pipe for the inblowing of air, is utilized. — *London Iron.*

THE WOODEN HAT. — Somewhere about the year 1780 a travelling millwright, footsore, and with the broadest Northern Doric accent, stopped at Soho, the engine factory of Boulton and Watt, and asked for work. His aspect was little better than one of beggary, and Boulton and Watt had bidden him God speed to some other shop, when, as he was turning away sorrowfully, Boulton suddenly called him back.

"What kind of a hat's yon ye have on your head, me mon?"

"It's jist a timmer, sir."

"Timmer, me mon; let's look at it. Where did you get it from?"

"I jist made it, sir; me ain sell."

"How did you make it?"

"I jist turned it in the lathie."

"But its oval, mon, and the lathe turns things round!"

"Aweel! I jist gar'd the lathie gang anither gate, to please me. I'd a lang journey afore me, and I thought to have a hat to keep out water, and I hadna muckle siller to spare, and I made me ane."

By his inborn mechanism the man had invented an oval lathe, and made his hat, and the hat made his fortune. Boulton was not the man to lose so valuable a help, and so the after-famous William Murdoch, the originator of locomotives, and of lighting by gas, took suit and service under Boulton and Watt, and in 1784 made the first vehicle impelled by steam in England, and with the very hands and brain cunning that had before produced the "timmer-hat." — *Invention.*

THE DRAKE MODEL AT EXETER. — Devonshire is probably the only county in England where three statues, all *fac-similes* of each other, exist. The hero of this monument is Sir Francis Drake. His monument, crowned by a bronze figure of the sturdy sea-dog himself, is at Tavistock, and a replica graces the Hoe at Plymouth. Exeter has just acquired Sir Edgar Boehm's original model of the actual work, and has had it erected in the reading-room of the Albert Museum in that city. The sculptor's executors presented this fine study to the South Kensington authorities, and the latter in their turn gave it to the City

of Exeter. The statue is of plaster-of-Paris, painted a bronze color. It is 12 feet high, and weighs just upon a ton. Unfortunately, in transit from London the figure got broken into no less than 200 pieces, and headless and armless, little more than the actual torso remained intact. In this dilemma, the Museum Committee put the fragments in the hands of Mr. Harry Hems, of that city, with the ultimate result that the pieces have been so matched and joined together that it is now impossible to see that any accident had ever taken place. The success of this delicate task has been in a large measure due to the courtesy of Mr. Robert Glassby, sculptor, of Holbury Street, Chelsea, son of the late Mr. R. Glassby, managing artist to the Court sculptor. Mr. Harry T. Hems, Jr , has carried out the actual work of renovation with the aid of the original small medallion modelled for the colossal statue. — *Building News.*

The National Library of Florence. — A new library is being built for the accommodation of the treasures of this important institution. The collections in the library now embrace upwards of 400,000 printed volumes and 380,000 pamphlets, 17,000 manuscript volumes, 950 parchments, and 100,000 autograph letters, documents, etc. The library receives the copyright deposits of all works issued in Italy. The new structure will be lighted by electricity, and will employ the telephone, elevators and all modern aids to quick communication and delivery, for some of which the director acknowledges his indebtedness to the new National Library at Washington. It will have nearly four miles of shelves in a separate stackroom, in eight stories, averaging about 12 feet high, on account of the climate, but dispensing with ladders. An ultimate capacity of 2,000,000 volumes is contemplated. The reading-room is about 40 feet by 70 feet, with the desks and seats in amphitheatrical arrangement. A Galileo and a Dante chamber are among the special collections. The exterior will bear the statues of these two great Florentines, together with Machiavelli and Michael Angelo. The grand staircase will be adorned with a portrait fresco, "The School of Florence," after the manner of Raphael's "School of Athens." — *The Architect.*

A Memorial to the Inventor of the Lifeboat. — The unveiling of the memorial window to Lionel Lukin, the inventor of the lifeboat, took place last Monday in the parish church of Hythe, the mayor and corporation attending. There were also present the coastguards and lifeboat crew of Hythe, some of whom manned the boat when the *Benvenue* went down. The following inscription appears on the window: "To the glory of God, and in memory of Lionel Lukin, the inventor of the lifeboat, who died at Hythe, February 16, 1834, and lies buried in the churchyard." A very curious inscription on his tomb records his connection with the invention of the lifeboat and the encouragement he received from George IV. He was a native of Dunmow, in Essex, but was better known as a prominent coach-builder of Long Acre. The principles of the present lifeboat were patented by him in 1785, but his invention, notwithstanding the support it received from the Prince of Wales, afterwards George IV, was not favorably received by the Lords of the Admiralty. The memorial is due mainly to the efforts of Mr. Hall, vicar of Hythe. — *Invention.*

Bristol Docks. — A comprehensive scheme of dock and railway extension was lately laid before the Bristol Town Council. It furnishes ample lock and compact dock accommodation for vessels of a size one-sixth larger than even the biggest one afloat or on the stocks. It also allows ample space for the erection of adjuncts to a dock, such as graving docks, sheds, warehouses, rail-sidings, etc., and for great extensions hereafter. The dock, which will be 20 acres in extent, with a lock leading thereto 730 feet in length and 85 feet in breadth, will embrace a portion of Dumball Island and the old North Channel, some of the Corporation land lying on the south side thereof, and the site of the lighthouse and a portion of the Canadian cattle lairs. It would be capable of accommodating at one time three of the largest ocean steamers now afloat, in addition to providing quay space for smaller vessels. The cost of the work is estimated at about £700,000, exclusive of land and Parliamentary expenses. — *Timber Trades Journal.*

A Rock-cutting Dredge — The new rock-cutting dredge "*Poseidon*" has started work at the entrance to Newcastle Harbor. A trial of the rock-cutter was made and gave every satisfaction. The "*Poseidon*" is now moored on the southern side of the fairway, and to the eastward of the lightship, where she commences the much-needed work of deepening the entrance to the port, by cutting away the rocks that have so long been an impediment to shipping, inasmuch as deep draught vessels were unable, in consequence of the existence of these rocks, to load to their load line. The progress of the work will be watched with interest by all interested in the welfare of Newcastle. This is a triple rock-cutting apparatus, built by Messrs. Lobnitz & Co., Renfrew. The cutters are eight tons each, and remove the rock under water without the use of explosives, on Lobnitz's patent system. — *Sydney* (*N. S. W.*) *Morning Herald.*

The Site of an Ancient City in Oregon. — William Hanley of Ashland, who has just returned from a trip through eastern Oregon, reports that on the desert near Silver Lake the site of an ancient city has been discovered. One side of the square has been traced for four or five hundred yards. The top is just above the surface and is about four feet wide, made of cement, similar to those of Arizona and Mexico. The city evidently antedates the Aztecs and Toltecs. No geologist has yet visited the ruins. The cowboys have done a little prospecting on their own hook. Among other things found is an imprint of the cement work, showing that the hod-carriers of those days went barefooted. A cast of a large-sized trowel was also found. It is quite likely the city was built upon the shore of Silver Lake, which is now distant about thirty miles. — *Portland Oregonian.*

The One Mechanic Buried in Westminster Abbey. — Notwithstanding England's enormous indebtedness to her mechanics, only one mechanical workingman has ever been honored with burial in Westminster Abbey, and that was Graham the clockmaker. Graham made exact astronomy possible by his great improvements and inventions in timepieces. Graham was also a maker of great quadrants and instruments of that sort. His funeral was attended by all the members of the Royal Society. — *Invention.*

The Phenomenal Growth of the new American tin-plate industry is illustrated as follows: In the three months ending September 30, 1891, we produced 826,922 pounds of tin-plate. In the three months ending March 31, 1892, we produced 3,209,225 pounds. In the three months ending September 30, 1892, we produced 10,952,725 pounds. At this rate of increase in geometrical ratio it is plain that our liberation from the control of the Welsh tin-plate barons is very close at hand.

TRADE SURVEYS

The safest summary of the situation this week is, that a slight expansion of business has set in, which will probably continue up to the holidays. The reason for this anticipated improvement is the more or less depleted condition of stocks in all parts of the country. In a recent review it was stated that the volume of business so far this year was ten per cent greater than for the same time last year. Had the ordinary requirements of trade been as fully met as last year, the volume of business would have been greater, possibly fifteen per cent greater than last year. The characteristic of the trade of 1892 has been intense conservatism. This conservatism is now beginning to disappear. It has been supplanted by greater confidence, which is the outgrowth of an enlarging demand in a multitude of little channels, most of them at remote points as regards business centres. Travelling agents, whose business it is to keep on the go all the time, have told of late that they are meeting with a greater demand from localities which heretofore have not attracted them. This fact has been referred to heretofore. Large areas are rapidly building up in the newer States, and furnish a basis for enlarging markets. Railway managers also make mention of the wonderful growth of enterprise and investments in out-of-the-way places. There is a greater incentive to build small lines of road into these new localities, not only for lumber, coal, iron ore, but for traffic that will grow out of prosperous agricultural conditions. This expansion amounts to a great deal more in the aggregate than it appears to. Another movement worth mentioning is the shifting of population from small cities and towns into new sections, where less capital will enable young business men to succeed. This movement is particularly noticeable in Illinois, Michigan, Wisconsin and Iowa. Thousands of men with limited means have left those States within a year or two, taking up their homes in farther Western or Southwestern States, where more inviting opportunities are presented. This fact is only one evidence of a dispersion of population throughout the United States, which is deserving of study. If the fact could be proven, it would appear that people live a shorter time in one place than years ago. There is a drifting throughout the newer States, which will in the next two or three years absorb a great deal of the population that is at present apparently contented with what it has. This tendency is bringing about an expansion of values in land, a development of mineral properties, and the starting-up of a multitude of little industries along rivers and railroads. In other words, while our cities are growing rapidly, they are losing a good deal of the best blood in them, and the West and South are building up more rapidly than ever with commercial and manufacturing talent that will do much to improve the newer sections of the country. Much of this movement is due to the lower and declining freight-rates, and to the cheap machinery and appliances that advanced engineering have made available. It is stated on very good authority that the increase in small shops and foundries west of the Mississippi during the past ten months has been more than double that of any former year. A great increase has been made in the number of ore mines in the Lake Superior region; in the number of coal-mines in the Western States; in the number of saw and planing mills in the Southwest and South; in the number of small traders or store-keepers. This is due to the large crops of the past year or two, and to the increasing surplus among farmers. Throughout the New England and Middle States industrial conditions are satisfactory. Prices in the iron trade have at last begun to improve. Symptoms of a general expansion of trade are not wanting. It is impossible to find any evidences of a large extension of railroad building; at the same time, it is not improbable that next year may witness a very considerable expansion in mileage. The greatest activity in the iron trade is in the production of material for structural purposes; this activity will probably continue for months to come. The only new feature in the lumber trade is, that steps are being taken to increase the supply of lumber from the timber regions of the far Northwest, and from Mexico and some other hard-wood producing sections of Central America. There has been such a rapid growth of the demand for hard-wood during the past two or three years of great building activity, that steps have been taken by the more enterprising in the lumber trade to see what can be done to obtain a permanent supply from some foreign countries within easy reach of American ports. The money markets are in good condition, a fact very largely due to excellent financial management. The fact should not be lost sight of, however, that there is much latent discontent throughout the West over the monetary policy of the Government. The banks all over the country are apparently well supplied with money. European bankers, while anxious for more gold, are not able to command it. The export trade in agricultural products is quite heavy, and, from all that can be gathered, it will continue to be of large proportions. Values are steady in all channels of trade. Confidence is not jeopardized, and production is under the very best possible control. The makers of machinery and the builders of heavy engineering work are crowded with engagements that will probably keep them busy all winter. The demand for fuel is a pretty good indication of the condition of the industries. In the natural-gas regions, industries, big and little, are thriving, and the newspaper press gives almost daily accounts of the increasing drift of industrial concerns to those centres.

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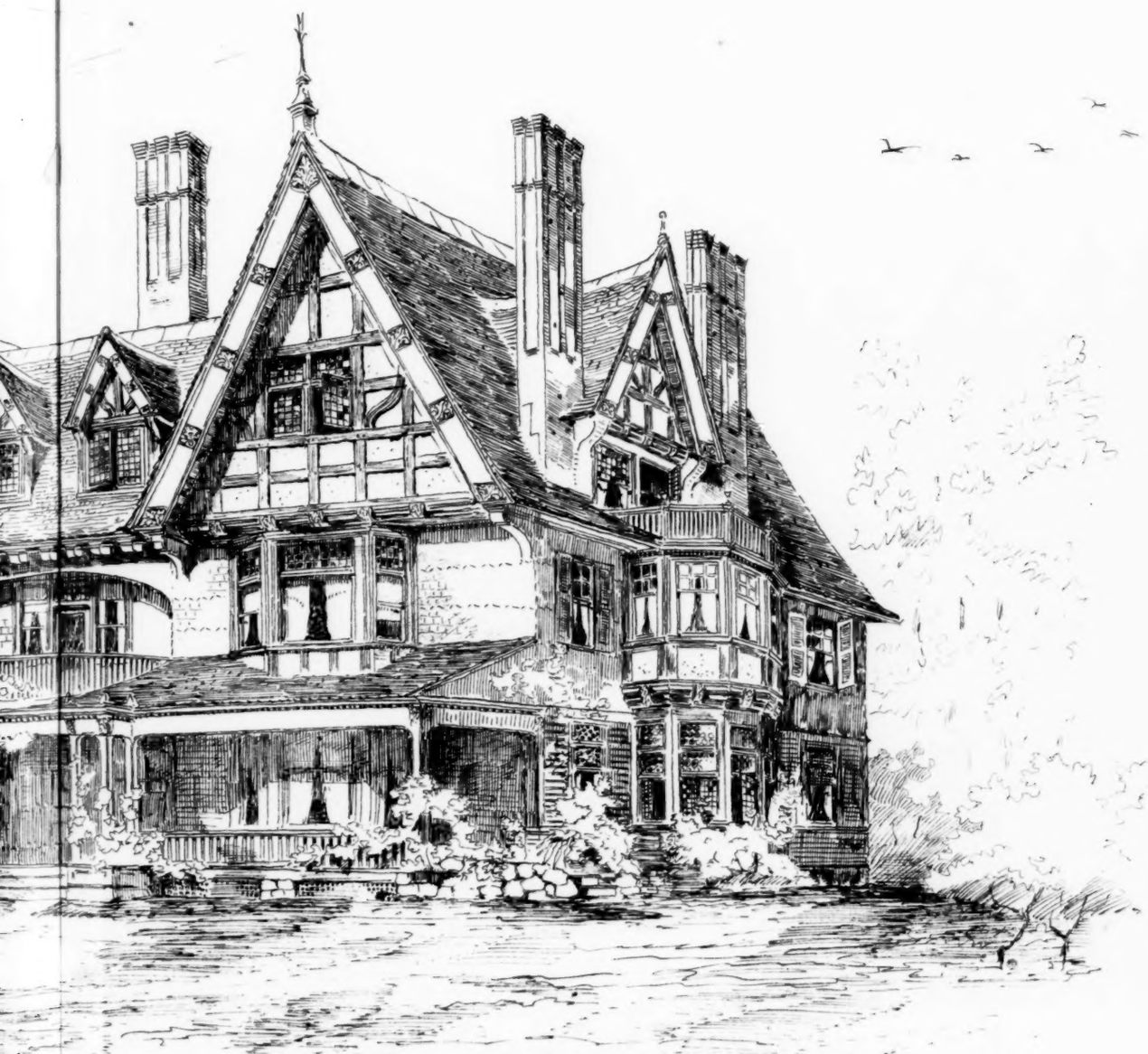
Lamb and Rich Architects



Residence of D. S. Walton East Orange New Jersey.
Additions and Changes.

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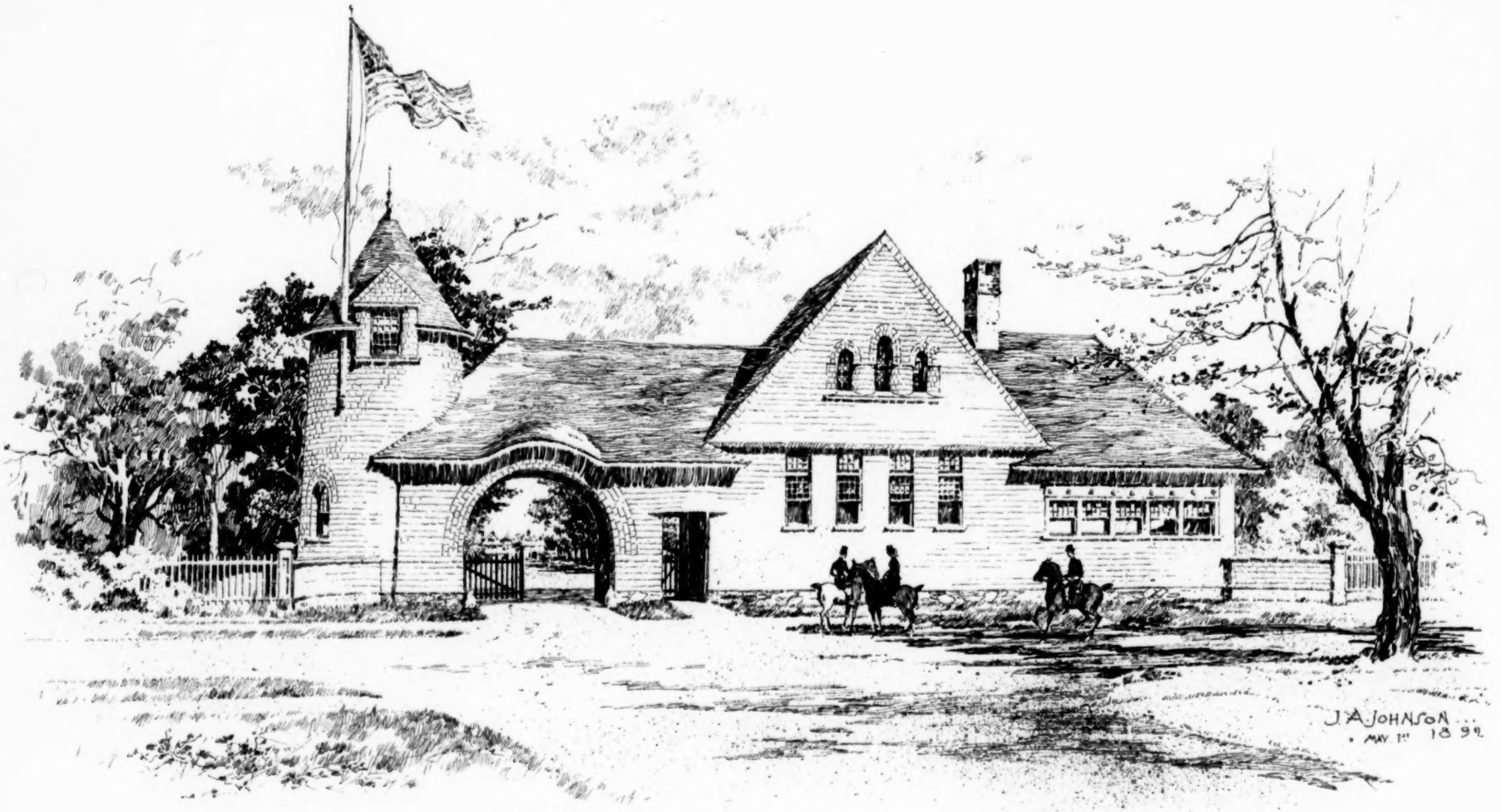

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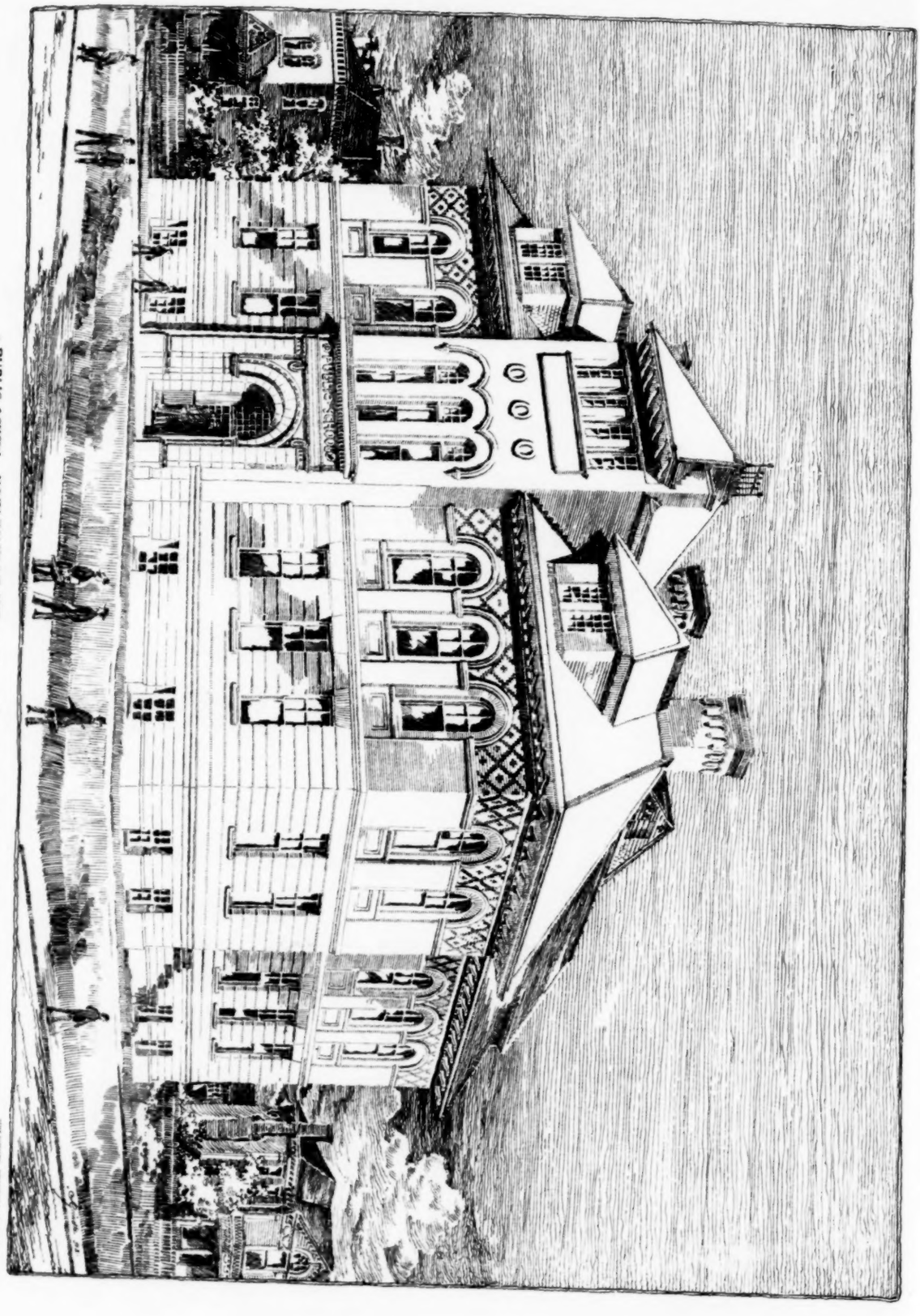

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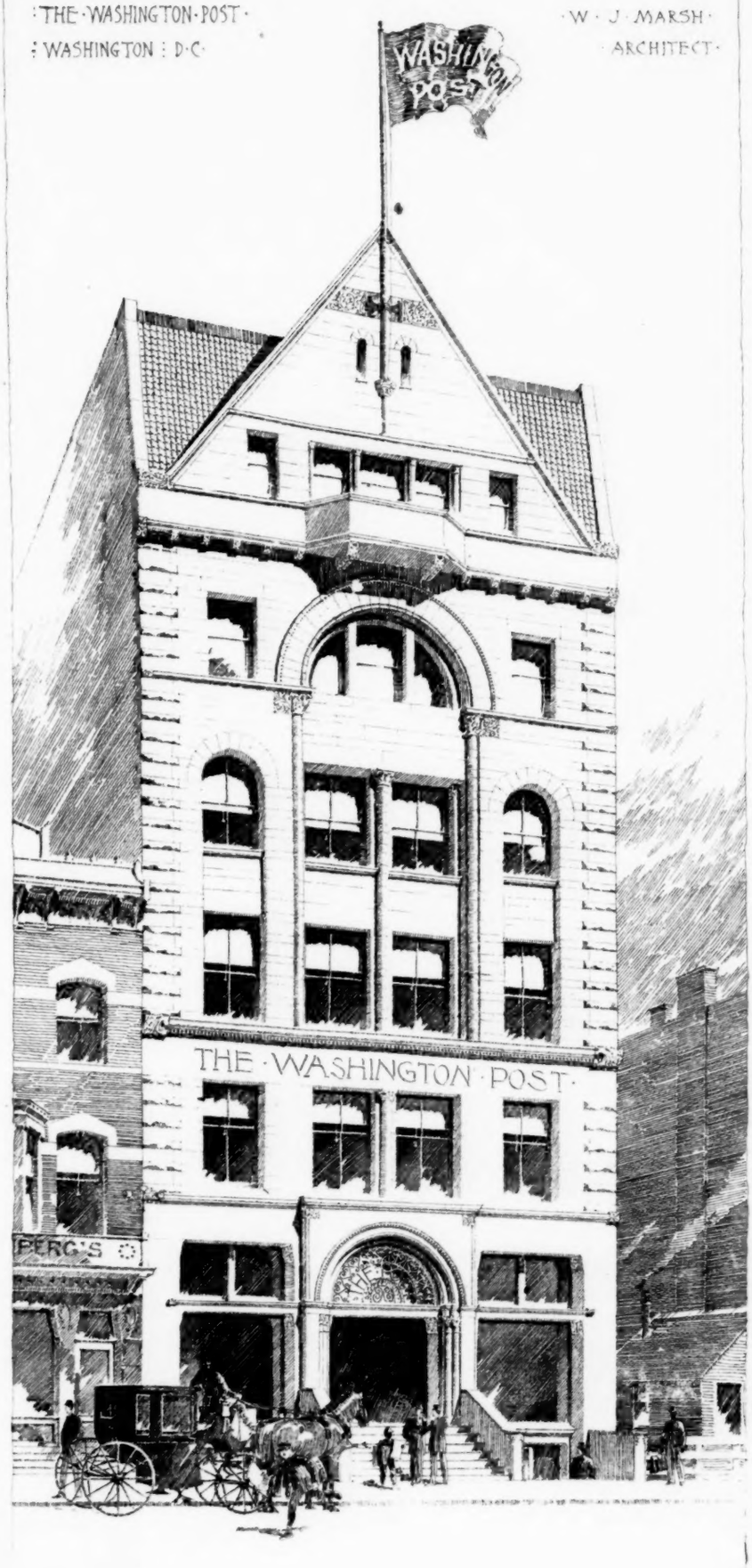

THE FIRE-PLACE IN CLUB ROOM
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