PRICE 15 CENTS.

APRIL 26, 1890.

THE AMERICAN ARCHITECT AND BUILDING NEWS

VOL. XXVIII. * REGULAR EDITION * NO 748.

ARCHITECTVRE

ENGINEERING

DECORATION

CONSTRVCTION

TICKNOR & COMPANY

BOSTON MASS.

CONTENTS.

ILLUSTRATIONS.

BOSTON, March 27, 1890.

IMPORTANT CONSOLIDATION.

We take pleasure in informing you that we have sold our business to the SMITH & ANTHONY STOVE Co. of Boston, and given them the exclusive right to manufacture and sell the Sanitas Specialties in the United States, with the exclusive right to use the firm name, trade-marks, etc. of the Sanitas Manufacturing Company.

Their ample resources will be devoted to pushing the Sanitas goods to a greater extent than heretofore, and the increased facilities thus acquired will be a guarantee that all orders will be filled with promptness and satisfaction.

The Smith & Anthony Stove Company have one of the finest Brass and Iron Foundries in the country, and the present high standard of the Sanitas Specialties will be fully maintained.

Under the above consolidation, the past management of the Sanitas Manufacturing Company will retain an active connection with the business, and we solicit a continuance of the good will and trade of our former patrons.

THE SANITAS MANUFACTURING COMPANY,
J. P. PUTNAM, *President.*

All accounts on the books to April 1, 1890, will be payable as heretofore, to the old company.

THE AMERICAN ARCHITECT AND BUILDING NEWS.

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Entered at the Post-Office at Boston as second-class matter.

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CONTENTS.

THE labor troubles still continue, with all the fury that the people whose living depends on agitation can contrive to give them; but within the last few days some complications have arisen, through the appearance of two or more rival walking-delegates as directors of the same strike. Not long ago a mischance of this sort occurred in Boston. The most conspicuous building, perhaps, in process of erection there is the Ames Building, on the corner of Court and Washington Streets, which is to be eleven stories high, and is under contract to be finished within a very short time. This conjunction of circumstances is just what most tempts the agitators, who can most effectually annoy those contractors that are strictly limited as to time of completion, and who get most free advertising in the newspapers by making a large and conspicuous new building the scene of their attacks. Hence it came about that one morning two or three elegantly-dressed persons appeared at the building, and informed the men that they were a committee, appointed by the Union for the purpose of ordering a strike, and that, in virtue of this authority, they commanded the men to lay down their tools at once, and leave their work. The men, with their usual docility, immediately obeyed, and the elegant delegates departed. An hour or two later, however, they reappeared, and, without any explanations or circumlocution, ordered the men to go back to work, which they did, as meekly as they had left it a little while before. Two or three hours more elapsed, when the familiar form of the regular walking-delegate of the Union came blustering up the ladders. He gathered the men together, and informed them that the committee which had previously visited them had no authority to order or countermand any strikes, and that he alone was the person to be obeyed. He seemed to be uncertain whether to test his influence by ordering another strike on the spot, and the men did not encourage him, but went on with their work, which they will probably pursue until the rival magnates have settled between themselves which shall remain in possession of the field.

ANOTHER circumstance has somewhat clouded the prospect of the immediate alliance of all workingmen for the subjugation of capitalists. The squabbling incident to the stone-cutters' strike in New England has brought out the fact that the association of the Knights of Labor, that mighty organization before which the would-be Governors of Massachusetts abjectly bowed the knee two or three years ago, has fallen into very low esteem among the building trades. Not only are the Knights of Labor "cards," about which as much talk was made not long ago as if they were passports to Paradise, refused recognition in nearly all Union shops, and on buildings where Union men are employed; but at least one of the unions, which admits ordinary mortals as members on payment of one dollar entrance fee, will not receive any Knight of Labor, unless he pays an entrance fee of ten dollars. Why this discrimination should be made against the members of an organization which, according to Mr. Powderly and his friends, comprised very recently most of the virtue and intelligence of the country, we are not informed, but we imagine that the "practical politicians" could furnish an explanation, if they wished.

A BILL has been introduced into the New York Legislature to appoint the present Superintendent of the New Capitol Building, Mr. Perry, architect to the State, at a salary of ten thousand dollars, and to give him charge of all building projects for the State Government. Practically, Mr. Perry, who is an able and experienced man, has done a very large part of the State building work for several years, as his position on the Capitol naturally made him the first to be called upon by members of the Legislature in relation to such projects, and his salary in the new position would probably be less than the sum of his salary for his work on the Capitol, added to the commissions which he has drawn for other professional service to the State; but there is no question of the disadvantage, in many ways, of committing all State work to one architect, and the New York Chapter of the American Institute of Architects has very properly protested against the proposed bill, on grounds which are familiar to the profession, such as the excessive expense of professional work done in this way, which, as abundant experience has shown, costs more than the fees of regular architects for the same service; the inferior quality of the work; and the corruption and scandal which almost always gather around an office where so much patronage is dispensed, and where the expenditure of so much money is controlled. The Chapter, in its protest, makes a suggestion, which is new and valuable, proposing that, instead of an official architect, an official building-committee shall be appointed, consisting of three architects and two State officers, who shall be paid for their service, and act for the State in the same way that a building-committee acts for a private corporation. Something of the kind has already been tried in Massachusetts, where the State-House Extension, and the Suffolk County Court-House are being constructed by Commissioners, to whom the State and County delegate the proper authority, and who devote themselves most energetically and successfully to the task of getting the best work possible for the State, at the smallest expense.

THE subject of the value of certain portions of an architect's work was brought up recently in the New York Chapter of the American Institute of Architects, by a paper from Mr. Bloor, reporting an award made by him in the case of claims made on an insurance company by a firm of architects, for the loss of drawings and papers. The most interesting part of the award was upon a claim for four thousand dollars for "sketches" of a proposed hotel, intended to cost four hundred thousand dollars. The "sketches" consisted of two elevations, "a pen drawing of elevation," by which we suppose must be meant a perspective drawing, a second-floor plan, and an alternative second-floor plan. The amount claimed was obviously one per cent on the proposed cost, the usual schedule rate for "preliminary sketches" of such buildings. It seems that there was another referee, who agreed with Mr. Bloor as to the value of all the other items on the list of lost property, but demurred to this, and Mr. Bloor, in his paper, considers very clearly the arguments on both sides. That one per cent on the proposed cost is a fair remuneration to an architect for preliminary sketches of an important building we suppose would be generally conceded. Mr. Bloor says that "the courts agree that one per cent is a proper and customary charge for such professional labor and product as is covered by this item"; a statement which certainly needs qualification, as courts are generally reluctant to admit even the five per cent rule as a "custom," legally binding on people in general, and we never yet heard of a court in which the schedule subdivisions were accepted as "customary," although the *amounts*

derived from calculations in accordance with these subdivisions might be, and probably would be, in most cases, regarded by a jury, when presented as lump sums, as reasonable and "proper" remuneration for professional service, carried to the points indicated by the schedule.

WHETHER the value of such drawings, to be collected from an insurance company in case of loss, is the same as the proper charge to the client for the incomplete service, is, however, a different question. Evidently, the architect who makes preliminary sketches earns his compensation more through the time, thought, experience and skill involved in fixing upon the outlines of a suitable scheme than by the comparatively trifling labor of making the drawings required to show the project upon which he finally determines, and, while it is perfectly fair that the client should pay the architect what this skill and thought is worth, an insurance company may say that as the architect would naturally retain in his memory more or less of the results of the mental processes he has gone through, he will need only a comparatively short time to reproduce the lost sketches, and that the claim on the company should be only for the time needed to make the duplicates. Mr. Bloor, in considering this point, says, with great reason, that "for an architect, whose creative faculties are kept constantly on the stretch for current purposes, to tax his memory in picking up constructional and artistic threads which he has long before dropped, as he supposed, for good, would be a most irksome, if not impossible, and certainly a very self-disappointing task, which he would in all likelihood speedly forego for the more satisfactory one — from the designer's point-of-view, even if unsatisfactory in other relations — of elaborating the whole scheme *de novo*, without reference to any antecedent processes"; but, to make all reasonable allowance for the probable value of the architect's recollection of his work, he advises the deduction of a thousand dollars from the claim, making the amount due from the insurers for the lost sketches three thousand dollars, instead of four thousand.

SATAN, always intelligent and inventive, has devised another scheme for the annoyance of architects. Many of our readers have doubtless received lately an official-looking envelope, with the legend printed in the corner, "If not delivered in five days, send to American Institute of Architects, 18 Broadway, New York," the "send to" being printed in very small letters. We suppose that most of the architects who received the envelope opened it with the respect due to an official communication, imagining that it must contain a notice of election to membership, or an appointment for a committee meeting, or some other important matter, and were by no means pleasantly surprised to find within a circular describing the goods of a radiator manufactory. We must confess that, although it did not escape our notice that the source of official communications from the American Institute of Architects is no longer New York, but Chicago, we were so much impressed with the importance of giving due attention to the communication, whatever it might be, that, on finding in our hands a radiator circular, we thought we must have opened the wrong envelope, and had to search the waste-paper heap before we found the envelope, and discovered the trick which had been played upon us. What might have been our feelings on the subject it is not necessary to mention, but as we received the next morning an indignant letter from a correspondent, enclosing the papers, and calling our attention to the "outrageous" manner in which he had been deluded into opening the circular, we suppose that there were others who felt themselves imposed upon. Of course, the scheme was not a very wicked one, and it was certainly ingenious; but, as we have often said, architects are peculiarly impatient of having the limited time during which they can give their personal attention to the business of the office encroached upon by bores, either in human form or enclosed in envelopes. Those that appear in the latter shape can generally be recognized and swept into the waste-basket unopened, and the surreptitious insinuation of one into the architect's attention, under the disguise of an important professional document, is nearly as annoying as to have an electric-wiring contractor or a stained-glass drummer mistaken for a client, and introduced into the private office. The authors of the device also, we believe, lose, rather than gain, by its success. First impressions are of great importance in business matters, and to have one's name connected with even a petty annoyance like this is far from possessing the key to the good graces of architects.

A RATHER singular strike, which was happily of short duration, took place last week in New York. Messrs. Paulsen & Eger, proprietors of the Hecla Iron Works, some time ago had a quarrel with the Unions, the result of which was that they were defeated, and signed an agreement to maintain their factory as a Union establishment, and to allow free admission to walking-delegates. A rather lively discussion took place on this occasion, and one of the delegates called one of the firm a liar. A few days ago, a story was circulated to the effect that Messrs. Paulsen & Eger were not paying their men the Union wages, and that some of them were working more than nine hours a day. Two walking-delegates were deputed to inquire into the truth of the rumor, and, with the characteristic insolence of the Unions, the man who had called Mr. Paulsen a liar was sent as one of the delegates. When the two deputies appeared, Mr. Paulsen refused to allow this man to enter the shop, but said that the other delegate might go wherever he wished. The latter refused to go anywhere without the first, and the two then retired, and reported to the Board of Delegates that "the rumor was confirmed." The sole foundation for this assertion appears to have been the fact that Mr. Paulsen refused to have a man make inquiries in his shop who could not treat him with decent courtesy; but this made no difference in the result, and the firm was immediately "struck." In all the important buildings where their men were at work, or wherever goods from their factory were being used, all the carpenters, masons, painters, plasterers and other workmen were ordered to drop their tools and stand idle until Paulsen & Eger's men and goods were excluded from the building. The contractors promptly surrendered to the walking-delegates, and, on the expulsion of everything flavored with Paulsen & Eger from the buildings, work not connected with them was resumed. A few days later, however, Messrs. Paulsen & Eger sent word that the impertinent delegate might go through their factory if he wished, and peace immediately reigned again, to the great relief of the contractors and building owners, to say nothing of some fourteen hundred men, who had remained idle for a day at the order of the delegates, and who, if the latter could not have vindicated their personal importance otherwise, might have been kept out of work for months.

A NOVEL engineering device was used a few days ago in the repairs on the Hudson River Tunnel. As the newspapers have already reported, a workman, two or three weeks ago, descended into the air-lock with a candle, with which he searched for leaks along the seams of the wooden caisson. The seams were caulked with oakum, and, perhaps aided by the increased chemical action of the compressed air, this, as well as the pitch from the timbers, caught fire. The alarm was immediately given, and the workmen escaped; but in a few minutes holes were burnt in the woodwork, through which the water poured, soon filling the caisson. On trying to pump out the caisson, it was found that the water came in faster than the pump could remove it. Divers were sent in, who searched in vain for the openings, and succeeded only in shutting one of the doors of the air-lock, which the workmen had left open on their escape. The engineer in charge then adopted a new plan. Instead of pumping the water out, he pumped air into the caisson. The air, of course, escaped through the leaks, but he meanwhile procured a number of rats, and tied a bunch of oakum by a wire to the tail of each. The rats were then, one by one, put into the air-pumps, and forced through the valves into the caisson. Of course, their first object was to escape, and, following by instinct the stream of air-bubbles which issued from the leaks, they made for these orifices, and struggled through them into the river outside. On the way, however, the bunches of oakum which had been tied to their tails caught in the crevice, and were pulled off, wedging themselves tightly in the opening. After a sufficient number of rats had been sent out in this way, the leaks were found to be so far stopped by the oakum which they carried that the air-pumps could gain on the water, and it was then an easy matter to complete the caulking, so that the pumping-out of the water could go on properly. As soon as the water is out the excavation of the tunnel will be resumed, and the delay will probably not be very serious.

RELIGIOUS ARCHITECTURE.[1] — III.

I. RELIGIOUS ARCHITECTURE OF ANTIQUITY. — EGYPT.

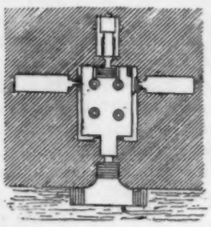


Fig. 15. Plan of the Speos of Addah (16th Century B. C.).

SUCH were the edifices of the great Theban period, constructed on a type which seems to have been preserved in almost absolute integrity. If we leave the neighborhood of Thebes and pass into Upper Egypt, we find the temples completely changed in external appearance. The question at once arises whether there was a like modification in the general plan-dispositions, and whether the Egyptians, on entering new regions, thought themselves compelled to abandon former traditions and adopt entirely different customs.

The temples to which we refer are generally contemporaneous with the eighteenth dynasty, rarely with the nineteenth; they are, then, at least as ancient as the edifices of Upper Egypt. But the chief difference which at once impresses the eye is that they are cut, wholly or in great part, into the rock. This mode of construction is ordinary ascribed to the precarious nature of the conquests made in the direction of Ethiopia by the Egyptian sovereigns, and to the necessity of rendering all such structures as little exposed as possible to attacks and injuries on the part of poorly subjugated tribes.

The speos, which is wholly underground, presents very similar dispositions at Addah, (Figures 15, 16) and at Feraïg, at Gebel Barkal, at Bayt-el-Waly, etc. The most casual examination furnishes an answer to the question asked above.

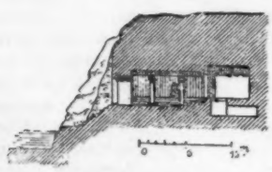


Fig. 16. Section of Speos of Addah. After Horeau.

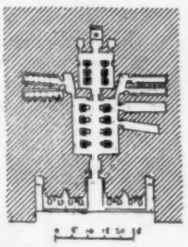


Fig. 17. Plan of the Temple of Ipsamboul. After Horeau.

On a small scale and reduced to their most elementary forms, these constructions faithfully reproduce the arrangements adopted for the temples of Lower Egypt; sometimes the *pronaos* is briefly indicated at the entrance, sometimes it extends quite deeply into the interior of the mountain; the hypostyle hall is always found beyond, though it may be diminished to a room of moderate dimensions, with only two

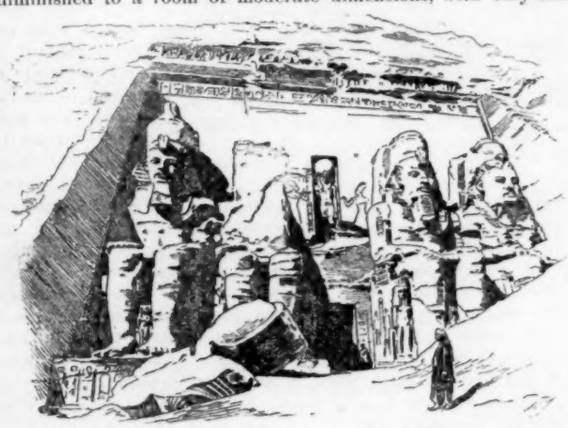


Fig. 18. Façade of Great Temple, Ipsamboul (15th Century B.C.).

columns. Behind, and cut entirely in the rock, is the sanctuary-chamber, with its subsidiary chamber constituting a rudimentary *opisthodomus*.

The great and small temple of Ipsamboul belong to this type; they are especially characteristic from the colossi at the entrance (Figures 17, 18), which seem to take the place here of the pylons designed, in ordinary temples, to proclaim afar the grandeur and the majesty of the place.

In the hemi-speos, as at Derri, Wady Sabooah and Gerf Hosayn (Figure 19), the *secos* is subterranean; the hypostyle

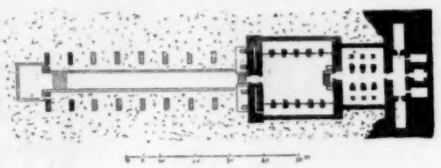


Fig. 19. Plan of the Temple of Gerf Hosayn 15th Century B. C.'. After Prisse.

hall is sometimes cut into the rock and sometimes it is external; the fore-court is generally out in the open air.

The temple of Dayr-el-Baharee, near Thebes, restored by M. Brune (Figure 20), is the only known example of a temple wherein the fundamental dispositions are essentially modified. It belongs to the eighteenth dynasty. A sphinx alley, constituting the *dromos*, leads up to the entrance. There are three successive terraces one above the other; the *secos*, which consists

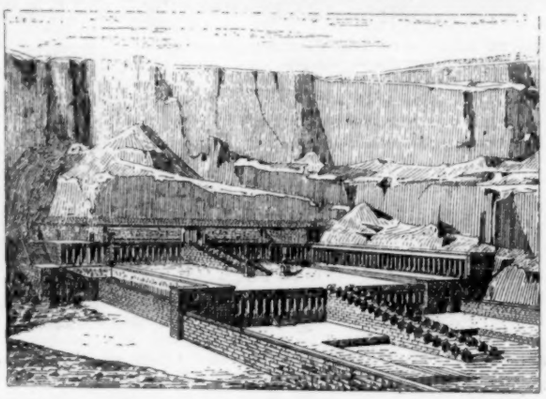


Fig. 20. Temple of Dayr-el-Baharee (15th Century B. C.). After M. Brune.

merely of a Holy of Holies, with a few small subsidiary rooms, alone remains underground; the rock has been cleared away everywhere else to make place for the broad terraces preceding this sanctuary. It is difficult to account for the peculiarity of this construction; Ebers[2] has attempted the following explanation: "Is it, in fact, a matter of chance," he asks, "that the step-temple of Dayr-el-Baharee was erected only a short time after the date when, under Thothmes, an Egyptian army first trod the soil of Mesopotamia and saw there, in the chief cities, edifices built in terraces? The Egyptians so delighted in repeating themselves that they lost the art of devising new forms, and why should they not have imitated from elsewhere this imposing monument, unless, perchance, it would have recalled the foreigner to them, and would, consequently, have been repugnant to them?" It is, in fact, possible that the aspect of the Assyrian monumental structures had, at some moment, impressed the imagination of the Egyptians, and that they had been led to copy in one of their edifices a part of one of these foreign designs; such an isolated attempt would not be apt to find imitators, in view of the mental characteristics of this eminently religious, tradition-enslaved nation.

Beside the temples which have just been described, there existed a certain number of much smaller edifices, dating from the eighteenth dynasty down to the reigns of the Ptolemaic sovereigns: "These were, as we have said,[3] chapels erected in honor of some local divinity or designed to recall, in an isolated spot, the passage of a conqueror and the homage which he had there rendered to the god who protected him and gave him the victory."

The plan of these chapels is the same as that which we shall find constantly recurring in Greece, that is, a cella, or naos, walled in, and surrounded by a portico. A short *dromos* preceded the entrance. The first of these to be described was one on the island of Elephantine (Figures 21, 22); this was at the time of the Egyptian expedition and it has since disappeared.

[1] From the French of P. Planat, in Planat's "*Encyclopédie de l'Architecture et de la Construction.*" Continued from page 38, No. 747.

[2] "*From Cairo to Philæ.*"

[3] Perrot et Chipiez. "*Histoire de l'art dans l'antiquité: l'Egypte.*"

A portico of two columns accompanied both the anterior and posterior entrances; there were antæ at the angles, and on the sides the columns were replaced by square pillars. The substructure and flight of steps recall antique Grecian dispositions, and it has often been said that the origin of the peripteral

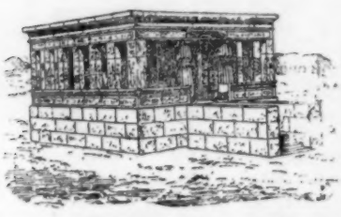


Fig. 21. Temple at Elephantine (16th Century B. C.). *Description de l'Egypte.*

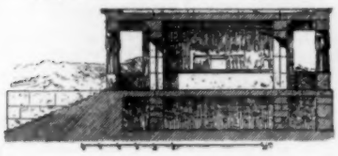


Fig. 22. Section of the Temple at Elephantine. *Description de l'Egypte.*

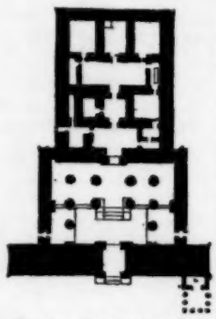


Fig. 23. Plan of the Temple of Philæ. After Ebers.

temple of Greece is to be sought in the temple of Elephantine. We leave the reader to judge of the likenesses and differences in them, which can easily be established.

Similar edifices exist at Semneh in Nubia and at El-Kab.

It remains for us, finally, to speak of the small temple (Figures 23, 24) on the island of Philæ, known as the temple of Isis. It is almost contemporaneous with the conquest of Egypt by the Greeks. Erected so near a period of complete transformation, it is not to be wondered at that it has none of the primitive dispositions of the Egyptian religious edifice; moreover, notwithstanding its name, the destination of the structure is not determined with any great certainty. "According to all the plans which have been given of it,[1] there could have been but one hall in it, or rather a rectangular court bounded by fourteen columns, with a low, richly decorated wall, forming a sort of screen in the lower part of the intercolumniations; in the upper portion, the spaces between the columns are open more than half the way, and there was never any roof." Some archæologists, considering the proximity of the stream and the presence of broad flights of steps leading down to it, are inclined to think that the temple of Philæ was a mere waiting-room.

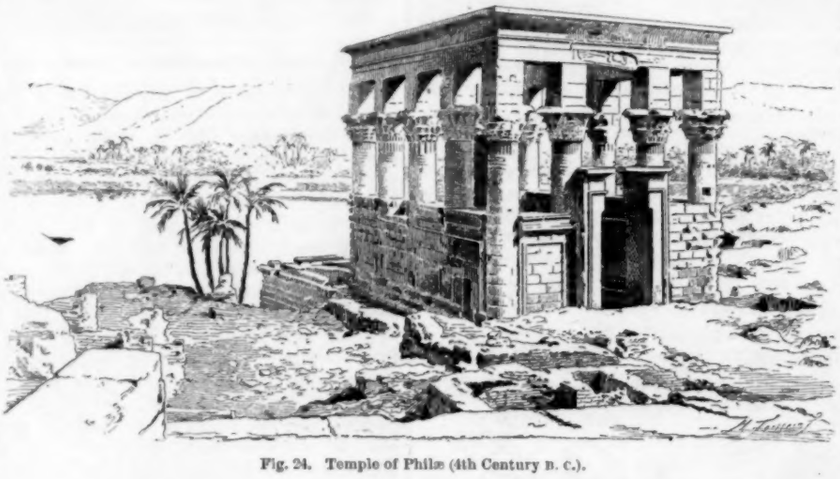


Fig. 24. Temple of Philæ (4th Century B. C.).

Without going into the details which do not properly come within the range of this general sketch, we will briefly indicate the building materials used by the Egyptians, and the peculiarities of their constructional system.

Granite, sandstone and limestone, with alabaster for facings, were generally employed in large edifices; all works of minor importance were built of either burnt or unburnt brick. In great structures the courses are carefully horizontal; the upright joints are not always vertical. The Egyptians also often made use of rubble-work between two faces of cut-stone.

The chief problem presented to the architect, namely, to cover vacant spaces, was solved by them in the simplest, if not the least costly, manner. They early adopted the plan of erecting at intervals pillars, and, afterward, columns, which were connected by beams or lintels, and these were in their turn covered by paving-slabs. When vast spaces had to be spanned, these stones were necessarily of enormous size and great weight; but building material of all dimensions was at hand, and there was no need to economize in manual labor, as is proved by the number of workmen represented on the bas-reliefs. The mechanical means in use appear to have been very simple, consisting of the lever and perhaps a rude crane. In general, the results, which still seem to us amazing, were obtained by the employment of men in extraordinary numbers; the wedge and roller were almost their sole aids.

The vault, with all forms of intrados — surbased, surmounted, semicircular and triangular — was, however, known to them. With heavy material, the vaulting was effected by means of corbelled courses. This sort of false vault offered no serious resistance, a fact recognized by the Egyptians, for they seldom made use of it except where two strong girders, buttressed against each other, formed above it a kind of discharging arch.

They built vaults with unhewn stones, which approached more nearly to the correct construction; they used small, roughly rectangular stones for these, introducing wedges to make up for the obliquity of the joints. The key-stone alone seems to have been voussoired. This imperfect construction must, of course, have been confined to minor uses.

With brick, on the contrary, which was easily moulded, the Egyptians constructed vaulting that left no room for criticism; the joints were convergent. When the superincumbent weight so required, successive beds were regularly laid one above the other.

It was, therefore, in no way through ignorance or incapacity that they employed the vault so little in important works; but the fact must be recognized that they did not know how to use it with any suitable assurance of stability and permanence, except on condition of building with small material. In vast structures, for which they hoped to realize an almost eternal durability, and which, moreover, admitted of a solemnity of aspect impossible to produce with brick alone, it was, therefore, perfectly natural that they should construct with ponderous material massively put together, and for this the proper form was the pillar and beam.

Mariette has, moreover, observed that the vault bears in itself a germ of death, since it thrusts and toils continuously; while the beam or lintel represents everlasting stability. There is, indeed, a grain of truth in this remark, but too much importance should not be attached to it; stability is just as much of a reality in a well-proportioned vault as in an architrave; its permanence is just as well assured. If one cares to examine the matter, he easily perceives that materials work in a vault under at least as rational conditions as in trabeated constructions, and that they wear out less, perhaps, since the kind of toil imposed upon them, namely, compression, is more in harmony with the kind of resistance which they are capable of offering than flexion is.

Mariette also sets forth the opinion that the vault possessed a symbolical character among the Egyptians: "that it represented the nocturnal vault of the sky, of the sky of Amenti." It was for that reason that the Egyptians reserved it for their funerary architecture. It is true that symbolism was carried to great lengths in Egypt, but, if Mariette's conclusions were right in this matter, we should expect to find all Egyptian tombs with vaulted ceilings. This is not the case, however;

[1] Perrot et Chipiez. "*Histoire de l'art dans l'antiquité: l'Egypte.*"

in the same necropolis the roofings are sometimes flat and sometimes vaulted. And, again, the vault, if thus symbolical, would have been reserved exclusively for cemeteries, which is not the fact either; it occurs likewise in the subsidiary structures of palaces and temples. The only legitimate conclusion left for us is that the Egyptians relegated the use of the vault to constructions of minor importance, as they employed only small material in building it.

As regards architectural decoration in Egypt, we have little new to add to all that has been previously written about it. Here, as in all other countries of the sun, color is, we may say, a necessity. The white tone of stone is almost painful under the burning rays of the sun; white may be employed outside to repel light and heat in an ordinary passageway, but it would be intolerable on interior walls, which are constantly under the eyes. In their bright, transparent shadows, which, with us, would be dull and wholly ineffective, color plays such a splendid rôle that its use can never be neglected in Southern countries. The Egyptians, like the Assyrians, Greeks, Persians and Arabs, made liberal use of it, and it was all the more a necessary part of their decoration, because of the extremely sober character of other ornamentations.

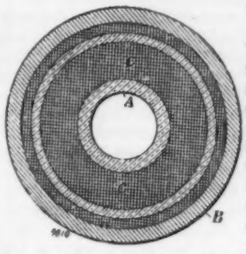
The vast surfaces of the pylons and of the great, naked, unbroken walls were adorned with occasional mouldings, including the characteristic cavetto, the fillet, the torus and a few channellings. The vegetable world supplied a few ornamental forms, as palm-leaves and lotus-buds; decorative *fauna* was called into requisition; geometric figures furnished curves, volutes and various patterns of scroll-work, which have been perpetuated from age to age. These slightly varied though elegant ornamental elements would have been inadequate for the embellishment of such extensive surfaces. Egyptian art devoted itself especially to the reproduction of purely human scenes, and these were multiplied indefinitely.

It has often been said that the Egyptians were an eminently materialistic people in the better acceptation of the word. They dwelt but little on mystical conceptions, and less still on the mysteries of the beyond. They were satisfied to see accurately and to seize rapidly, under characteristic lineaments, the present and real world around them. Man interested them more than all else in creation. In more than one way, and especially in this last peculiarity, Greece may be said to have fallen heir to the patrimony of Egypt. The differences between the two nations in this respect are, however, important. The Egyptian was content to *summarize* the physiognomy, or what is called the character of an object, in a simple stroke of extreme precision, which took in only the salient points. The Greek went farther; he expressed everything, but subordinated the secondary element, keeping it within its own sphere, and never allowing it to come into conflict with what should remain predominant. The Greek had a very keen perception of perfection; that is to say, the perfect harmony of *ensemble* and details, without ever departing from nature and truth. The native instinct of elegance was equally pronounced in both peoples. Both possessed the same delicacy and keenness, and as the Egyptians were the first to spring out of barbarism and attain a brilliant civilization, of which we still have only a very incomplete notion, we may naturally suppose that they would have been the first to reach the loftiest summits of art, had not their devotion to tradition definitely arrested the development of their admirable qualities. Unfortunately for them, when once an extremely pure and already very beautiful type had been created, they held to it, and, owing to their unparalleled veneration for the past, they fell into what may be termed official repetition, which made all fresh effort, all search after greater perfection, all subsequent progress, impossible.

[To be continued.]

Statuary. — Statuary is to be employed as an element in the decoration of the Panthéon in Paris. The first works of the kind that have been commissioned are statues of Victor Hugo and Mirabeau. The models have been submitted to the committee. M. Injalbert has represented Mirabeau in an attitude as if thundering against the evils of Monarchical Government. Behind him is a figure that is to be taken as the Genius of Eloquence. M. Rodin shows Victor Hugo seated on a rock, and in that way recalls the poet's exile. His head rests on one hand, and the other is extended as if towards France. Behind are figures of women, who represent the various sorts of literature which occupied the poet, but from their attitudes they are likely to be considered as more suggestive of the Three Graces. — *The Architect.*

THE DANGERS OF ELECTRIC-LIGHTING.[1] — II.



In order to use the electrical current two mains or conductors are required, an out-main, from the central station, and a home-main (and one intermediate or third main is also required where the three-wire system is used), and each lamp that has to be lighted has one end of the filament joined to the one main (say the out-main) and the other end to the other main (say the home-main), the passage of the current from one main to the other, through the carbon filament, causing ing the filament to incandesce, and to give light. Now, if the mains from the central station are constructed with one tube of copper within another, and with insolation between, as shown in the figure, the central ring, marked *A*, being the out-main, say, and the outer ring, *B*, being the return or home main, the shaded part between the two being the insulation, the only leakage of current that can ever take place is, say, from *A* to *B*, if there is any defect in *C*, and the current returns to the station through the leak by *B*, without passing through a lamp, or doing any work, and if the leak is so serious between *A* and *B* that it causes a larger quantity to go back to the station than the bridge there will stand, the bridge melts before any damage is done to *A* or *B*; and if another main or wire actually comes in contact with *B* the current will not leave *B* and find a way back by the earth (as it would do if two separate out and home conductors were used), but it is controlled by *A* and any leakages can only be to *A*. Hence, with a conductor, constructed, as above shown, with a current passing through it of 10,000 volts, any one may hold *B* in their hands and they will receive no shock, and no current will pass into them. This has been practically demonstrated by a test on the Underground Railway, where one of the writers of this article held, as many others did, *B* in their hands, while a current of great pressure was passing through it, a pressure that would have meant instant death if it had been possible for the current to leak from *B* and pass through the body to earth. Thus we have the double safety, the bridge and nature of the conductor used, this safety being not only, as the reader will observe, a safety against fire but it is an absolute safety to human life. And thus a man may work in close proximity to a conductor constructed as suggested, in fact, he may sit on it while he is working, and he will be out of all danger, and he is no longer, as Mr. Edison suggests, in fear of a "death-dealing current," for the current, whatever the pressure, whatever its quantity, is so controlled as to be absolutely harmless. Thus, to sum up the meaning of the above concentric mains, we may say that, whatever fault may occur, the whole effect is produced and contained in the main itself, and it is impossible that there can be and there is, in fact, no danger, and no damage done outside. We have thus a perfect protection for life and property from all forms of current.

Again, Mr. Edison says, there is "no known insulation which will confine these high-tension currents for more than a limited period"; and again he says, "the influence of the air or of gas or other agents renders it (the insulation) finally very susceptible of being pierced by a spark of static electricity." Mr. Edison would have been more accurate if he had said that there was no insulation known to him which would confine these high-tension currents for more than a limited period; and again, how can the air, gas, or other agent get at the insulation if it be confined between two tubes in the way suggested and they are properly joined the one tube to the next? Again, if the mains be constructed according to the figure and a spark of static electricity did pierce the insulation, what would be the effect? There would be no danger, no external damage; too great a quantity of current would flow over the bridge and the bridge would give way, and as before explained, no detrimental effects would be produced. But there is an insulating substance known which was manufactured before the commencement of the Christian era, of which specimens that have been exposed to the air for centuries still exist in perfect preservation. How will such an insulator stand when hermetically sealed between two tubes? Then again, Mr. Edison says, "the risk, too, is greatly increased by the fact that consumers who are supplied with current from a low-tension system are accustomed to handle their electrical appliances freely, knowing them to be harmless; I say nothing of the injustice to vendors of harmless supplies of electricity." Here again, Mr. Edison knows, and no one better, that even if the current is sent out from the central station at a tension of 10,000 volts the tension is lowered at distributing stations by a suitable device, and that current the consumer has to handle is only at a pressure of 100 volts, and the pressure is so lowered and controlled that by no possibility whatever can the higher pressure get into any house. What, therefore, is the difference in the danger to the consumer whether the current has an initial pressure of 100 volts or 10,000?

Mr. Edison speaks of the alternating current as being more dangerous to life, and no doubt it is, if a high pressure were used in the customers' houses; the writers were however, both present when Colonel Armstrong, as the representative of the Board of Trade,

[1] By S. Z. de Ferranti and Francis Ince, in *Engineering*. Continued from No. 746, page 28.

called upon them, for the purpose of trying the effect of shocks from an alternating current at varying pressures, and in our presence he first of all took a shock from an alternating current machine at 50 volts, he then had the pressure increased to 100 volts, and then to 150 volts, and then to a pressure of 200 volts, at which pressure he said he was satisfied, and he could bear the 200-volt shock with perfect ease, being a pressure of twice that used in consumers' houses; in fact, in the Board-room of the London Electric Supply Corporation there are two openly exposed terminals, and the directors constantly take hold of these, the effect of the 100-volt alternating shock being hardly perceptible, and being rather pleasant than otherwise. Further, we have had several accidents where men in the station have received a shock direct from the machine with a 2,400-volt alternating current, but not in one instance has death resulted. Mr. Edison speaks of the danger to life of alternating currents at low pressure, but it should be borne in mind that the specimens experimented on at Mr. Edison's laboratory were pickled and prepared so as to make the effects of the current as deadly as possible, and were therefore placed in an unnatural condition.

This article shows that the saving of copper in the mains or conductors is enormous as the tension increases, and what this means may be made more clearly apparent by a statement of the fact that if the pressure from the station was 100 volts only, the stations to light London could not be placed at a greater distance than a mile apart, each station lighting a half-mile radius, as otherwise the copper mains would have to be of such an enormous size to carry the quantity of current that would be required at this low pressure, that the cost of mains alone would render the price at which the current could be supplied so high as to make lighting by electricity impossible.

Again, it is much more costly to build a large number of small stations than one large station, and every small station requires its staff, its engine-drivers, etc. In a large station one man can drive a 10,000 horse-power engine which will light 200,000 10 candle-power lights, whereas with small stations and small engines, say of 250 horse-power each, which would light 5,000 10 candle-power lamps, each engine must have its attendant; and the question is not, as Mr. Edison would suggest, a mere question as to saving a few pounds "in investment in real estate and copper;" it is a question of saving so much as to make the difference between success and failure, where it is necessary to compete with gas at a low price. But this is not all: in large cities it is impossible to buy land at every mile, and to put up a central station for the manufacture of electricity, for the station is a nuisance, and one is perpetually harrassed with litigation; application after application is made for injunctions; the taking of coal in the large quantities required is a nuisance; the smoke is a nuisance, and only high-priced steam coal can be used, and that, too saddled with the heavy expense of cart-carriage; the vibration and noise from the engines is a nuisance, and stations in the residential parts of any city will be stopped one after the other by injunction.

Again, at these small stations, spread over a city, to get water is a difficulty, and in consequence power can only be obtained at a very high rate of coal consumption; whereas, with a suitable site at a distance, the quantity of coal used can be reduced enormously, making a saving which will alone go far towards a dividend on the capital expended.

These are all circumstances that require most serious consideration, and Mr. Edison's argument on these points is in fact a mere argument in favor of a monopoly for his low-tension system, a system which can exist and be carried on profitably in America, where the price of gas is enormous; a system which would render electric lighting impossible in London with gas at 2*s.* 5*d.* per 1,000 cubic feet, and a system which makes the people of America pay a price for their lighting unnecessary to give a good return on capital invested on a better and a less costly system.

Mr. Edison points out that a larger number of fatal accidents have occurred through electricity in New York than in any other city in the world, and gives the reason that New York has a greater number of wires overhead than any other city in the world. No doubt this is the reason, coupled with the fact that probably in no other city in the world are the overhead wires arranged more negligently and with more disregard for the care of human life. There can be no doubt but that overhead wires, whatever the care may be that is taken with them, are, and always must be, a danger, but with conductors placed underground, and with due care, and properly constructed, there can be no danger whatever. Mr. Edison has pointed out that in this country the safety of the people is placed in the hands of the Board of Trade, a body we have found most obliging and most reasonable in their requirements, while insisting with the utmost severity that no system shall be adopted which does not give absolute safety to human life, and who, after seeing our work, have been perfectly satisfied to advise the Government to pass our Act, which enables us to deal with a 10,000-volt current.

Mr. Edison does not deal with the transmission of power from those sources which nature gives us for nothing at certain centres; we refer to water-power, and from which by aid of high-pressure electricity, and high-pressure electricity alone, can the force be transmitted to a distance and utilized for the purposes of man; according to Mr. Edison these forces are to run on unutilized forever as they have done for ages past. His argument that because a nitro-glycerine factory is dangerous on the surface of the earth we should not think of putting it underground, is not applicable to the subject of electricity or to the putting of electric mains underground, though we cannot say that the idea of the nitro-glycerine factory underground is so absurd as Mr. Edison appears to think; for it will be within the memory of many of our readers that about fifteen years ago a barge laden with gunpowder on the Regent's Canal exploded at the bottom of the Avenue-road, where the canal is in a deep cutting, and the opinion of one of our great experts was that this fact saved London, serious as the damage was in the immediate neighborhood. It is clear beyond a doubt that if mains are properly placed underground there can be danger to no one, and no accident can take place.

We think we have said enough to show that the dangers of electric lighting are no more in the high tension system than the low, provided both systems are carried out with equal care and all proper safety devices are used in the one case and in the other; without these devices and without this care neither system is safe, and it is clear beyond a doubt that the low-pressure system is not safe as at present carried out in New York and it never will be until the State steps in and the use of electricity is regulated there by well-devised rules and under the supervision of competent officers; but Mr. Edison is as far behind the time when he suggests that no station shall send out a current at a pressure exceeding 100 volts as the alarmists were when railways were first introduced, and it was considered that no train could, in safety, ever run at a rate exceeding twenty miles an hour.

No doubt if a train ran at only ten miles an hour an accident would not have such serious results as with a train running at fifty miles, but is this an argument why trains should not run at fifty miles per hour? We have to consider the percentage of risk, and this we find has not been materially increased by the increase of speed. So it is with electric pressure. As the pressure increases, extra precautions have to be taken with regard to safety, and we believe with Sir William Thomson, who stands as an authority in the world of science as high as Mr Edison, that it is not a question whether a pressure of 10,000 volts (the highest pressure yet utilized) is to be used or not. The pressure may be anything so long as proportionate precautions are used, and we think it may be that in a few years time people will think as little of 10,000 volts as we do now of 1,000, and will laugh now at the present alarmist idea that in a pressure of 100 volts the limit of safety has been reached.

Mr. Edison says in his article, "The public would scarcely be interested in the details leading up to the conclusions to which I have come, for the reason that it would involve a mass of matter such as they have been attempting to digest during several months past." We have not adopted Mr. Edison's dogmatic method of dealing with the subject, and do not know to what mass of matter he refers. We have avoided attempts to give results the weight of our opinions without giving reasons; we have explained as clearly as we are able our views, giving such reasons as would enable the general public to follow our arguments, without, we hope, too much trenching on the land of technical science, and we trust our readers will see that there are other arguments besides those of Mr. Edison, and that there are reasons why the dangers of electric lighting under a high-pressure system are no greater, if they are so great, as those of a low-pressure system, for which Mr. Edison clearly claims (while he disclaims) a monopoly.

Mr. Edison very properly gives great weight to facts. Let him then consider that in New York the deaths through electric shocks have been very frequent, with a tension, we believe, never exceeding 2,000 volts, and rarely exceeding 1,000; while in London, where for years we have been using a tension of 2,400 volts with miles of both overhead and underground conductors, we have never had a single accident with our mains or a single death. Why this difference between London and New York? The reply is that here our work is done properly, there it is not. Our work is put up to last, theirs in New York to serve the purpose of the moment.

If the reader has followed us so far and will allow us in closing this article to be prophetic, we will say that in the future our railways will be worked, our lighting will be done, our power will be transmitted to a great distance; all this will be done entirely by the aid of high-pressure electricity; it is high pressure in electricity like high pressure in steam, which is going to carry — which is carrying — everything before it, and this high pressure will be used, and will be doing the work of the world, when the low-pressure system Mr. Edison now so strongly advocates, has passed away and been forgotten.

A New Source of Portland Cement. — A new source of supply of Portland cement has been opened up by the recent discovery of the immense deposit of carbonate of lime and cement clay underlying the former in the county of Grey, Ontario. The deposit is, according to the *Builder*, only two miles from the Grand Trunk Railway of Canada, and only nine miles from Owen Sound of the Georgian Bay. The carbonate of lime is stated to be purer than the European chalk, and the clay much the same as the well-known Medway clay, and contains 62 per cent of soluble silica. Canada imports about 100,000 barrels of Portland cement annually, and the United States procure from Europe over 1,000,000 barrels. Not a barrel of Portland cement of commerce has, so far, been made in America, although an inferior kind of cement or water-lime is manufactured. The reason is obvious, no carbonate of lime having heretofore been found on the American continent pure enough to make superior Portland cement. It is believed that a cement superior to any imported can be produced as cheaply as European manufacturers are able to place the raw material on the ground. — *Invention.*

COLORADO'S MINERAL PALACE.

"All the Modern Improvements." — No. 6.

WHAT Colorado should have an exhibition building worthy of its size and resources has long been the desire of its leading citizens. Many plans have been discussed and locations suggested. In point of fact, the question of location has had a good deal to do with the project not being carried out some time ago. At length, however, the question has been settled. Denver has gracefully acceded, and the building is fast approaching completion in Pueblo. Looking at it all round, there is no cause for wonder at the selection of this city. Pueblo is situated upon the Arkansas River, where the rich valley mingles with the plains. To Pueblo comes immense quantities of ore to be smelted, and the Bessemer steel-works there, the largest of their kind in the United States, promise to extend their operation until a second Pittsburgh seems certain to have existence at no distant date. At present it is a city of between 40,000 and 50,000 inhabitants, and is growing rapidly.

The site for the building having been determined upon, the question of design only remained for the promoters to decide. It was important that the building should be suggestive of Colorado products, and it must be admitted that for uniqueness of conception and appropriateness of architecture the Mineral Palace will stand as a model. The style of architecture is early Egyptian, and Mr. Bulow, the architect, has produced a massive structure, which has at the same time lightness and symmetry. It is rather difficult to convey to any one a just idea of the beauty of the building, especially of the interior. Outside it is surrounded by massive stone columns 5 x 7 at the base and tapering to 3 x 5 at the top. The columns will be all constructed of native stone. Gray granite from Georgetown, Silver Plume and Gunnison, red granite from Platte Cañon and sandstone from Manitou, Fort Collins, St. Vrain, and Castle Rock, together with marble from Crystal, will be used in these columns. These, however, are only a few of the many quarries which will contribute their quota. Every quarry in the State will be represented, regardless of location and distance. The walls of the building proper are back of the columns which, however, form the principal support of the roof. A corridor twenty-one feet wide between the pillars and the walls runs entirely around the building. Those walls will be constructed of wood and covered with designs in crusted ores and minerals — native gold, platinum, silver, mercury, copper, etc., and the various ores of the same. Specular and magnetic iron, chromic iron, pyrites, galena, quartz, mica, beryl, tourmaline, garnet, asbestos, brucite, fluorspar, coal in all its varieties, etc., etc., will be used as pigments. "Pilasters of white or colored marble, alabaster, onyx, agatized wood, obsidian, and everything of a mineral nature that can be used with artistic effect, including fossils and other petrifactions, will find a place both inside and outside of the edifice."

There will be no windows in the building, so that electricity will light the interior both day and night, and the lamps will be arranged so as to add splendor to the glittering walls. Removed from the walls a distance of fourteen feet are pillars fourteen feet apart, supporting an interior dome beneath the roof. These pillars and the corresponding pilasters against the walls are closed to a height of ten feet with plate-glass, behind which will be displayed the rich and valuable specimens to which it would be dangerous to permit free access. The central dome is one hundred feet in diameter, and will be a marvel of brilliancy when the thousands of polished facets of copper, steel and crystal flash with prismatic colors under the brilliant electric lights, hidden from view under the frieze at its base. A fountain playing under the dome will add beauty to the scene. At one end of the building will be a platform which will be used for public addresses, concerts, etc.

The contracts which have been been made for the erection of this remarkable building amount to over $250,000, and Secretary Nelson informed your correspondent that when the mineral exhibit was placed in position and the interior decorations were finished, the whole value would approximate $1,000,000. Viewing the project from a business point-of-view, one cannot but be struck with the energy and enterprise of people who are ready to invest such a large sum in a building which is almost purely for the benefit of the State generally. It is not a money-making scheme; it is simply a bold, original plan to show the world what Colorado is and what it is capable of doing.

A well-known Western writer has said regarding it: "The Mineral Palace will be one of the most remarkable buildings ever erected, and it is doubtful if at any previous time it was possible to construct such a building. Nothing but the unequalled resources of Colorado could supply the materials. . . . One may have a hazy idea of what Colorado has stored in her mighty mountains; but this will be an object-lesson that will impress the mind as no amount of reading or description of the boundless resources of the Centennial State would do. To enumerate the materials of which this unique building will be composed would be to make a list of the minerals of Colorado, which would also be a list of the minerals of the world. No words can adequately describe the cunning workmanship and artistic beauty that is being wrought in this Mineral Palace. It is a thing that must be seen to be understood, studied to be appreciated." — *W. L. A., in the New York Evening Post.*

SAFE BUILDING.[1] — XL.

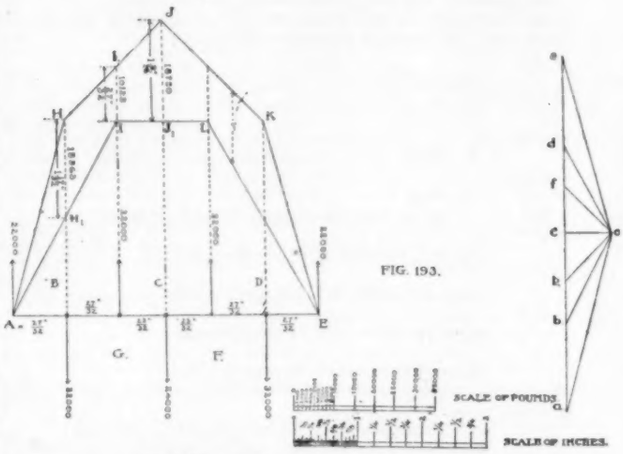


FIG. 193.

Graphical method more simple. THE graphical method of obtaining bending-moments is frequently much more simple than the arithmetical method; in important calculations both should be used so as to check each other.

All the rules for formulæ given in Chapter VII for the calculation of transverse strains by the graphical method will apply equally well for pins; the only difference will be that where there are more than two forces on each side of the pin, the base line of the polygonal figure between reactions p and q will no longer be straight, but will be composed of several lines.

Thus, if we take the pin and forces shown in Figure 189, we should change the notation to that adopted for the graphical method, which would be as shown in Figure 193. That is force E (22000 pounds) of Figure 189 would be known as $A\ B$ in Figure 193; again force C, (32000 pounds) of Figure 189 would be called force $E\ F$ (*not* $F\ E$) in Figure 193.

Example solved graphically. Proceeding now to the calculation, we lay off along the vertical load line $a\ e$, the following forces:

$a\ b = A\ B = 22000$ pounds.
$b\ c = B\ C = 22000$ pounds.
$c\ d = C\ D = 22000$ pounds.
$d\ e = D\ E = 22000$ pounds.

and in the opposite direction, we lay off:

$e\ f = E\ F = 32000$ pounds.
$f\ g = F\ G = 24000$ pounds.
$g\ a = G\ A = 32000$ pounds.

which will, of course, bring us back to the starting point a, as the opposing forces must aggregate the same sum.

We now select our pole o. This we remember can be arbitrarily located, or else at a distance $o\ c = \left(\frac{k}{f}\right)$; in our case we will make the distance, say, 12000 pounds.

Pole distance. The distance (of pole from load line) being arbitrary we shall multiply the verticals v (inch-scale) in Figure 193, by this pole distance (pounds-scale) to obtain the bending-moments at the points of pin immediately below verticals. If the pole distance from load line had been made $= \left(\frac{k}{f}\right)$, then the length of verticals v measured at inch-scale would have been the *required* moments of resistance of the corresponding points of pin below verticals; and each respective v multiplied by $\left(\frac{k}{f}\right)$ would be the bending-moment at each point. We will, however, make in our case the pole distance, arbitrary, *viz:* $c\ o = 12000$ pounds. We now begin at any point of line $A\ B$ and $A\ I$ paralell $b\ o$ till it intersects $B\ C$ at I; next draw $I\ L$ parallel $c\ o$ to intersection with $C\ D$ at L; and similarly draw $L\ E$ parallel $d\ o$; $E\ K$ parallel $o\ e$; $K\ J$ parallel $o\ f$; $J\ H$ parallel $o\ g$ and $H\ A$ parallel $o\ a$; the last line must intersect the first at point of starting A or some error has been made.

Strain diagram. It will be noticed that the individual outlines of $A\ I\ L\ E\ K\ J\ H\ A$

[1] Continued from page 201, No. 744.

cover the capital letters in Figure 193, corresponding to small letters from which their respective parallel lines started in strain diagram. Thus, for instance $A\,I$ covers letter B and is parallel to $b\,o$; similarly $I\,L$ covers C and is parallel to $c\,o$; $L\,E$ covers D and is parallel $d\,o$; $K\,J$ covers F and is parallel $o\,f$; $J\,H$ covers G and is parallel $o\,g$; similarly we can consider $E\,K$ as covering E and it is parallel $o\,e$; and $H\,A$ as covering A and it is parallel $o\,a$.

Curve of bending-moments.

We now measure the verticals through the figure $A\,I\,L\,E\,K\,J\,H\,A$, the longest, of course, will give the greatest bending-moment. This happens to be the central one $J\,J_1$ it measures $1\frac{9}{16}''$, therefore

$$m_J = 1\tfrac{9}{16}.12000 = 18750$$

which corresponds to m_B of Figure 189.

Similarly we should have:

m_1 (formerly m_{E_1}) $= \frac{13}{16}.12000 = 10125$ pounds-inch.

m_H (formerly m_C) $= 1\frac{7}{32}.12000 = 18563$ pounds-inch.

Had we analyzed the strains on pin as shown in Figure 192 graphically, our verticals would have measured,

at E:

$$v_E = \tfrac{5}{16}''$$

at C:

$$v_C = 1\tfrac{3}{16}''$$

at E_1:

$$v_{E_1} = \tfrac{11}{32}''$$

and at B:

$$v_B = 1\tfrac{3}{8}''$$

The corresponding bending-moments would have been:

at E:

$$m_E = \tfrac{5}{16}.12000 = 2250 \text{ pounds-inch.}$$

at C:

$$m_C = 1\tfrac{3}{16}.12000 = 21750 \text{ pounds-inch.}$$

at E_1:

$$m_{E_1} = \tfrac{11}{32}.12000 = 11625 \text{ pounds-inch.}$$

at B:

$$m_B = 1\tfrac{3}{8}.12000 = 16500 \text{ pounds-inch.}$$

which are very close to the correct moments, which we found arithmetically to be:

$m_E = 2250$ pounds-inch; $m_C = 21637$ pounds-inch;

$m_{E_1} = 11617$ pounds-inch; and $m_B = 16648$ pounds-inch.

Simplest method use curve of moments of resistance.

The simplest method of calculating pins, as a rule, will be — after calculating (or ascertaining from Tables) the safe bearing and shearing stresses of the pin, — to calculate the actual moment of resistance of the pin, see Table I, Section No. 7, fourth column. Now proceed graphically, being sure to make the pole distance in every case equal to the safe modulus of rupture $\left(\frac{k}{f}\right)$ of the material of pin.

After this it will only be necessary to see that none of the verticals through the different polygonal figures (corresponding to $A\,I\,L\,E\,K\,J\,H\,A$ of Figure 193) — that none of these verticals measure at inch-scale *more* then the actual moment of resistance of the pin. If this is done the calculation and selection of the best arrangement becomes very simple and easy. After the final and best arrangement has been determined on, it would be well to calculate arithmetically the moments as per this final arrangement, thus checking the graphical solution.

Contractors claim of no bending-moment ridiculous.

The writer has frequently been told by contractors that owing to the friction due to the pressure of the nut and head, that it was impossible for any bending-moment to take place on a pin. As well it might be claimed that owing to the pressure of the walls, there is no bending-moment on a built-in beam. The safe modulus of rupture of a built-in beam can be assumed higher same as we do for pins, but the beam will break across if too heavily strained and so will the pin. Besides it must be remembered that the heads of eye-bars necessarily cannot fit the pins perfectly; and even if the argument were correct, (which it is not,) that friction offsets the bending-moment, the least rusting of the joints would diminish the pressure between nut and head, thus destroying its value.

Again, contractors will admit that there exist bending-moments on pins, but will deny it in the case of rivets, though the cases are precisely analogous; this latter argument though, if sifted, will generally lead the contractor to admit that its real basis is the large number of rivets it frequently requires; and the less rivets he can get along with, the happier will your contractor be.

Louis DeCoppet Berg.

[To be continued.]

The Illustrations

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

HOUSE OF EDWARD STANWOOD, ESQ., HIGH STREET, BROOKLINE, MASS. MR. CLARENCE S. LUCE, ARCHITECT, NEW YORK, N. Y.

[Helio-chrome issued only with the International and Imperial Editions.]

The plans and some of the details of this house were published in the *American Architect* for February 28, 1880.

"BOULDER-POINT," A HOUSE AT TUXEDO, N. Y. MR. BRUCE PRICE, ARCHITECT, NEW YORK, N. Y.

A reference to this house will be found on page 46 of our last issue.

CHURCH AT OAKLAND, CAL. MESSRS. WALKER & BEST, ARCHITECTS, BOSTON, MASS.

HOUSE ON R ST., WASHINGTON, D. C. MR. W. CLAUDE FREDERIC, ARCHITECT, WASHINGTON, D. C.

NEW CLUB-HOUSE OF THE JUNIOR GERMANTOWN CLUB, GERMANTOWN, PHILADELPHIA, PA. MR. GEORGE T. PEARSON, ARCHITECT, PHILADELPHIA, PA.

PHILADELPHIA BITS. DRAWN BY MR. FRANK E. MEAD.

BUILDING FOR THE "PETER B. BRIGHAM ESTATE," CORNER OF CAUSEWAY AND PORTLAND STS., BOSTON, MASS. MESSRS. HARTWELL & RICHARDSON, ARCHITECTS, BOSTON, MASS.

[Additional Illustrations in the International Edition.]

STUDY OF M. F. SPITZER, PARIS, FRANCE.

[Copper-plate Etching.]

THIS plate represents a room in the house of one of the richest, as well as the most amiable collectors of bric-à-brac in the world, M. Frederic Spitzer, whose possessions in the way of beautiful objects of mediæval and early Renaissance domestic art surpass in value those of most of the great European Museums. The room shown is the "Cabinet de travail," the first of a series of apartments, which contain, in all, more than four thousand precious works. The chimney-piece facing the spectator comes from the Château of Arnay-le-Duc, and is illustrated in Sauvageot's book, the "*Palais, Châteaux, Hôtels et Maisons de France du XV^e^ au XVIII^e^ Siècle.*" The two carved oak doors, of which only one is shown, are Spanish, and date from 1541. The painted panels in the frieze are from the ceiling of the grand hall in a palace at Cremona. The large picture near the door is Flemish tapestry. The plaques on the walls are of Hispano-Moresque faience: the furniture is from Burgundy and the Lyonnais, and from Spain: and the bronzes, majolica and marble statuettes are by Peter Visscher, Riccio, and other scarcely less distinguished artists. Very recently, M. Spitzer has published a catalogue of his treasures, illustrated with three hundred and fifty plates, half of which are colored, and eight or nine hundred smaller cuts, all executed by the aid of photography, which seems likely to become the most important work on the minor arts which has ever been issued.

PROJECT FOR ADDITION TO THE CITY-HALL, FÜNFKIRCHEN, HUNGARY. HERR RUDOLF KLOTZ, ARCHITECT, VIENNA, AUSTRIA.

[Gelatine Print.]

This design was placed first in competition, about two years ago, but the execution of the work was confided to a Hungarian architect.

SECTION THROUGH NEW PORTION OF SAME.

PLANS OF SAME.

[Gelatine Prints.]

ADDITIONS TO SHANDON, TUNBRIDGE WELLS, ENG. MR. M. E. MACARTNEY, B. A., ARCHITECT.

STABLES: SHANDON, TUNBRIDGE WELLS, ENG. MR. M. E. MACARTNEY, B. A., ARCHITECT.

PENCIL SKETCHES: THAXTED; ECKYNGHAM CHURCH, SUSSEX; CHURCHYARD CROSS, ST. JOHN'S, NITON, ISLE OF WIGHT; ST. JOHN BAPTIST, BREDGAR, KENT; THE TOMB OF EDMUND LANGLEY. BY MR. H. P. BURKE DOWNING, ARCHITECT.

A few short notes descriptive of the subjects of these sketches may prove interesting.

Thaxted, in Essex, is a town of considerable antiquity, and formerly of some importance, though now diminished and diminishing. It contains, besides the church, which is here sketched, many buildings of interest. The church itself, sometimes designated the "Cathedral of Essex," is notable for its size, as well as its beauty and antiquity, being some 183 feet long and 87 feet wide inside, and

its tower and spire are 180 feet high, and visible for many miles. The building is supposed to have been commenced in the reign of Henry III, and subsequently added to by many hands at several times, which makes the uniformity and excellent proportions exhibited all the more remarkable. The list of contributors to the beautiful edifice includes the families of Clare, Mortimer and Edward IV. William de Burgh gave the nave: the porch was added by Lionel of Clarence, and the transepts by the last Earl of March. For architectural students its buttresses, canopies, pinnacles, tracery, sculpture, tower and spire are worth careful study.

Eckyngham Church, Sussex, is a most beautiful example of fourteenth-century work, having been rebuilt in its present form, in honor of God and the Blessed Virgin Mary and St. Nicholas, as we learn from a brass in the chancel floor, by William of Eckyngham, who died in 1389. The thirteenth-century trefoil-headed doorway in the south side of the chancel and the font — both clearly of an earlier date than the rest of the building — plainly indicate the existence of a previous church, which seems confirmed by the Latin inscription on the same brass mentioned above. The present church has nave, north and south aisles (the east end of each dedicated as a chantry), and a very long chancel. There is a central tower, but no transepts. The window tracery is throughout very striking and beautiful, and the windows were all formerly filled with painted-glass, though but few and unimportant fragments have survived.

Churchyard Cross, St. John's, Niton, Isle of Wight. — The singularly beautiful churchyard cross, of which a sketch is given, stands in front of the south entrance of the church of Niton, a pleasant, sheltered village at the head of the valley leading down to the sea at Reeth Bay. The church, as well as the cross, is ancient, being one of the six founded by William Fitz Osborne.

St. John Baptist, Bredgar, Kent. — The church at Bredgar, close by Sittingbourne, consists of nave, chancel, north and south aisles, western tower and south porch. The character is partly Perpendicular, partly Decorated; but a Norman doorway, as is often the case, has been reinserted in the west side of the tower, and is, in fact, the only trace of ancient work. The walling is of flints, which is abundant in this chalk district, with stone quoins, and, as might be expected from the nature of this material, remains in excellent preservation. The embattled tower is divided into three stages. It has square-headed belfry windows of two lights, and on the west face a single-labelled, trefoiled light below. At the southeast angle is the Kentish octagonal turret, with steps leading to the belfry.

The Tomb of Edmund Langley in All Saints' Church, King's Langley, by St. Albans, is supposed to have been removed here in about 1575 from the Priory Church, which had existed up to that date. It is now placed in the Langley Chapel at the east end of the north chancel aisle, to which it has been quite recently removed from the north side of the sacrarium, which had been its first resting-place in this church. The tomb has coats-of-arms on three of its faces, on each of the north and south ends being three shields, and on the side face seven.

THE ENTOMBMENT.

FROM a cartoon by G. Guffens.

SOCIETIES

NEW YORK CHAPTER OF THE AMERICAN INSTITUTE OF ARCHITECTS.

A REGULAR Monthly Meeting was held at the Chapter office in the Welles Building, 18 Broadway, on Wednesday, April 9, 1890, at 3 P. M.

President Littell in the chair.

The minutes of the last two meetings were presented and approved.

The following reports were read and laid on the table for future reference:

From the Executive Committee, being an excerpt from the minutes of a meeting held by it on the 4th instant, as follows:

President Littell said he had not considered it necessary to make a special call for a full meeting of the Chapter, but that this special meeting of the Executive Committee had been called by himself and the Secretary to confer as to the best procedure for carrying out the spirit of the instructions given at the last meeting of the Chapter to a Special Committee charged with the duty of communicating with the proper State officials at Albany in relation to a proposition embodied in Assembly Bill, No. 853, entitled, "An Act fixing the salary of the Commissioner of the Capitol." In view of current statements of the newspapers on the subject, it was a question with him whether the Chapter at that meeting had full possession of the facts of the case. The question was whether, by the proposed Bill, the functions of the Commissioner of the Capitol would be confined to existing Government buildings or whether they would extend to those to be designed in the future. The Special Committee, consisting of himself and Messrs. Kendall and Wright, had already prepared the draught of their communication to the authorities. The said draught was then read, and Mr. Littell proceeded to say that if the proposed Bill was to be understood, as it evidently was by some of the newspapers, as referring only to existing buildings, the protest embodied in the draught would seem to be unnecessary.

The Secretary read some newspaper slips on the subject.

Discussion followed and Assembly Bill, No. 853, was read.

The Secretary said the wording of the Bill was ambiguous, and might be interpreted in both of the ways mentioned.

Moved by Mr. Wright that after amendments in the discretion of the Special Committee the protest be forwarded first to Mr. Sloan, Chairman of the Senate Committee on Finance, and then to the other parties named by the Chapter. Carried.

From a Special Committee as follows:

April 9, 1890.

TO THE NEW YORK CHAPTER, AMERICAN INSTITUTE OF ARCHITECTS.

Your Special Committee to prepare a communication to the authorities at Albany in relation to Assembly Bill, No. 853, respectfully report that they prepared the following draught which, after amendments suggested at a conference of the Committee with the Executive Committee on April 4, 1890, was forwarded first to the Chairman of the Senate Finance Committee, and the Lieutenant-Governor, and afterwards to the other members of the Senate; while a further supply, including printed copies, awaits further legislative action for distribution at the proper times.

The New York Chapter of the American Institute of Architects beg to protest against the proposed legislation now before the Ways and Means Committee of the Assembly of the State of New York, entitled "An Act fixing the salary of the Commissioner of the Capitol," for the following reasons:

1. The result of this Bill would be to throw the design and construction of all State buildings into the hands of one man, selected, as a rule, for reasons other than the highest æsthetic and constructional ability.

2. The people of this State have a right to be properly represented in their buildings, which are the monuments by which they themselves are judged, and they cannot be so represented by any single person, whether selected mainly for political or any other reasons.

3. The Bill deprives the people of the State of the services of the best members of the architectural profession, and provides an insufficient substitute.

4. The Bill deprives the architects of the State of the natural rewards of eminence in their profession.

5. The Bill would repeat in this State the evils surrounding the constitution of the office of the Supervising Architect of the Treasury in Washington, as admitted in official report for 1874, pp. 14 and 15.

6. The Bill would create a centre for the distribution of patronage with all its attendant evils, to some of which the attention of the people has lately been directed.

7. The scheme of an official architect is more expensive to the taxpayers than if the State engaged the services of the best architects at the usual rates of compensation.

We respectfully submit that the appointment of an architectural commission or advisory board, consisting of three architects and two officials of the State, would better serve to secure the best architectural results; the commission to exercise in general all the functions of a building committee where work is being done for a private corporation, and to be remunerated for their services.

Respectfully submitted,

EMLEN T. LITTELL,
EDW. H. KENDALL,
F. A. WRIGHT.

The Secretary stated that inquiries had been made as to what action had been taken in regard to the letters of Messrs. Holly and Goodhue, referred, at a former meeting, to the Special Committee on Increase of Membership. The Secretary was instructed to communicate with the Chairman of that Committee on the subject.

The following communications were read and received with thanks:

A letter from Mr. James G. Cutler, President Western New York State Association of Architects, March 29, 1890, thanking the Secretary for enclosures and desiring closer union between the New York Chapter and his Association, which would undoubtedly soon be reorganized as another Chapter of the Institute.

A letter from Mr. Root, Secretary American Institute of Architects, March 18, 1890, enclosing copy of blank form of application for membership in the Institute, and asking the assistance of the Chapter in distributing such. The Secretary said he had already issued to reputable architects, non-members of the Institute, some of the few copies of said application form received from Mr. Root.

A circular letter from the Boston Architectural Club, stating its intention to hold an exhibition of architectural work in Horticultural Hall, for the three weeks beginning May 12, 1890, and requesting contributions from all interested in art and architecture. A blank form for contributors to fill up accompanied the circular.

The following resolution, moved by the Secretary, was adopted:

"*Resolved*, That the New York Chapter, American Institute of Architects, receives with pleasure the notice of the Boston Architectural Club for an exhibition of architectural works to begin May 12, 1890, under its auspices. The Chapter is in sympathy with such movements everywhere, not only because successful results from them tend toward the promotion of art on its architectural plane, but because they materially assist to obliterate the provincial spirit which sometimes stands in the way of fraternal intercommunication and union, and the public support that is gained thereby."

A letter from Mr. Root, Secretary American Institute of Architects, of March 18, 1890, calling the favorable attention of the profession to an enclosed circular from the Council of the Archæological Institute of America, asking contributions toward a fund to secure

the expropriation of the village of Kastri, now covering the site of the Delphi of ancient Greece. Laid on the table for future reference.

A letter from Mr. A. J. Davis, Corresponding Member of the Institute, of April 4, 1890, thanking the Secretary of the Chapter for "sundry pamphlets" and making a donation to the library of two quarto volumes, John Howard the philanthropist, being the author of both, one on "*The State of the Prisons in England and Wales*," 1777, and the other "*An Account of the Principal Lazarettos in Europe*," 1789. A vote of thanks was unanimously passed to Mr. Davis for his rare and interesting contribution.

The statement being made that in the recently issued proceedings of the last or Consolidating Convention of the Institute there is an omission of the annual report of the New York Chapter, as of the other Chapters, as well as of reports of some of the special committees and of minor matter, the Secretary said he understood there was to be a supplementary issue of the missing list of Honorary and Corresponding Members of the Institute; and perhaps it was the intention to issue all the missing matter in such supplementary form.

The Secretary was instructed to write to the editor of the proceedings for information on the subject.

Mr. Le Brun, Chairman of the Committee on Examinations, mentioned that Mr. Upjohn, of the same committee, had gone to Albany yesterday, to be in readiness to give any information that might be required of him in regard to the amended Building Law just submitted to the Legislature.

A. J. Bloor, *Secretary.*

ENGINEERS' CLUB OF PHILADELPHIA,

At the regular meeting, April 5, 1890, the Secretary reported the special meetings of the Board of Directors and Past Officers to take action with regard to the death of Mr. Frederic Graff. The following announcement had been prepared by the Committee whose names are appended thereto:

To the Engineers' Club of Philadelphia:

With much sorrow we announce officially the decease of our late fellow-member, Frederic Graff. Mr. Graff was President of the Club during the the third year of its existence, and has been active as a director of its business affairs, and, as a member, participated in the discussions and proceedings of its meetings, for which his extensive knowledge, not only of professional matters, but of those having general interest, eminently fitted him.

The most responsible office filled by him in his native city, that of Chief Engineer of the Water Department, to which he was elected upon the death of his father, was marked by honesty of purpose, executive ability and a through acquaintance with the requirements of the position; and the successful discharges of its onerous duties added to his renown as an Engineer. As a man, his genial nature endeared him to his associates, and his loss to them will be a cause for deep regret.

Respectfully submitted,
Washington Jones, *Chairman,*
Henry G. Morris,
Thos. M. Cleemann,
Rudolph Hering.

On motion of Mr. Henry G. Morris, one of Mr. Graff's nearest friends, the foregoing report was adopted and ordered to be printed in the Record of Meeting and a copy thereof transmitted to the family of Mr. Graff.

The Secretary presented, for Mr. Frank Cooper, "Notes on Railroad Engineering Drawing." The author treats of kinds of drawings required, paper, tracing cloth, inks, tinting, lettering, plotting topography, scales, railroad curve patterns and filing drawings.

Mr. Edward Hurst Brown stated that it was the practice in his office, instead of making drawings on paper and then tracing them upon linen, to use smooth surface Crane's Bond Paper, which comes in sheets of various sizes. The drawings are made in pencil on this, and when correct are inked in at once, avoiding any chance of errors arising from the tracing linen slipping after a tracing has been begun. Blue prints are made directly from the finished drawings, requiring, with a moderately sensitive paper, from seven to eight minutes to make a print in bright sunlight. This method of making drawings not only saves the time usuallly required in making the tracing, but is a considerable saving of expense, as linen is by no means an inconsiderable item in office expenses.

Mr. Edwin S. Crawley described a new form of steam valve, in which packing is used instead of a ground seat. He exhibited a model and drawings.

Howard Murphy, *Secretary and Treasurer.*

ROCHESTER ARCHITECTURAL SKETCH CLUB.

The annual competition of the Rochester Architectural Sketch Club, an architect's office on an isolated lot, was decided, January 13, with the following results:

First Prize: Imperial Edition *American Architect*, E. S. Gordon. Second Prize: Regular Edition *American Architect*, Claude F. Bragdon.

The above competition, which the constitution of the club provides for, was the first of the club's annual competitions and was very satisfactory in its results.

The judges were three well-known architects, J. G. Cutler, O. K. Foote, Thomas Nolan.

THE SKETCH CLUB OF NEW YORK.

At a meeting of the Sketch Club of New York, held at No. 80 Clinton Place, New York City, on Saturday evening, April 5, the following Executive Committee was elected for the ensuing year: J. Addison Johnson, A. L. C. Marsh, Bertram G. Goodhue, Joseph J. Hall, Charles H. Israels.

This committee subsequently organized by electing J. Addison Johnson, *President;* Charles H. Israels, *Secretary;* and A. L. C. Marsh, *Treasurer.*

The club has just celebrated its first yearly anniversary, and its success during its short existence has been very encouraging and forty-three names are now upon its roll of members.

The Secretary may be addressed at 99 Nassau Street, Bennett Building, New York City.

COMMUNICATIONS

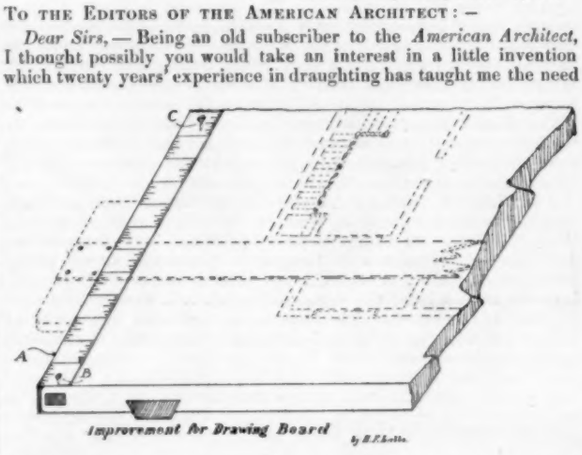
[*The editors cannot pay attention to demands of correspondents who forget to give their names and addresses as guaranty of good faith; nor do they hold themselves responsible for opinions expressed by their correspondents.*]

AN IMPROVEMENT FOR DRAWING-BOARDS.

Des Moines, Iowa, March 15, 1890.

To the Editors of the American Architect: —

Dear Sirs, — Being an old subscriber to the *American Architect*, I thought possibly you would take an interest in a little invention which twenty years' experience in draughting has taught me the need



Improvement for Drawing Board by H.F.Liebbe.

of. You will doubtless comprehend it all by a mere glance at the enclosed tracing.

Where *A* shows a metallic angle-iron provided with spurs at *B* and *C* so that said angle can easily be set at the end of any drawing-board or table, and thus provide for a perfectly true edge for the guidance of the head of the T-square. The outer edge being mathematically true, obviates the constant necessity of straightening up the edge of the boards, which never stay straight.

The top flange of the angle is quite thin, $\frac{1}{32}''$, while the reverse flange may be any desired thickness. A scale cut on the surface, and the manner of its arrangement will often obviate the use of ordinary scale.

A few angles of say 30″, 36″ and 42″ long would only be needed in the general drawing-room. Being portable, as soon as a board is filled, the angle can be placed on the edge of a new one, also can be replaced on the old, by setting spurs in the old holes.

The cost is but nominal, and the satisfaction of having a true run to the T-square, without any deviation, makes it an invention that will doubtless find favor with all who use the T.

Yours truly, H. F. Liebbe.

BOOKS ON WATER-COLOR AND PEN-AND-INK DRAWING.

Atlanta, Ga., April 17, 1890.

To the Editors of the American Architect: —

Dear Sirs, — Please be so kind as to recommend to me a good everyday book on Water-color Drawings and Sketches for Beginners, also one on Pen-and-ink Drawings, and oblige.

Yours respectfully, H. H. Walker.

[Get Ruskin's "*Elements of Drawing*," and go faithfully through all the exercises. Next to this, take up Aaron Penley's "*System of Water-color Painting*," or any of the little Winsor & Newton handbooks, on water-color painting and sketching. For pen-and-ink, Maurice B. Adams' pamphlets on architectural drawing, or Pennell's new book, are useful, but after training the eyes and hand by Ruskin's exercises, there is no better

way of learning conventional tricks than to take one of Pennell's, Gregg's, Deane's, Norman Shaw's or Raffles Davison's drawings, and trace it, line for line. — EDS. AMERICAN ARCHITECT].

BEAMS.

BOSTON, MASS., March 26, 1890.

TO THE EDITORS OF THE AMERICAN ARCHITECT: —

Dear Sirs, — Figure 142, page 216, *Safe Building*, and Figure 64,

FIG 1.

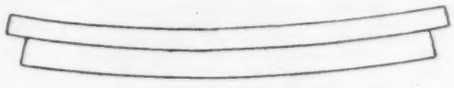
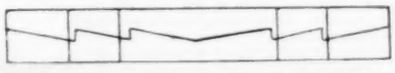


FIG. 2.

FIG. 3.



page 89, *Building Superintendence*, disagree as to which is the upper side of a notched built beam. Which is right?

Respectfully, W. L. P.

[Rankine, who is good authority, prefers the form given in *Building Superintendence*, on the ground that two superposed beams, under a load, tend to bend independently thus, Figure 1, and notching like Figure 2, prevents this sliding both by the bolts and the abutting surfaces of the indents, while with notching like Figure 3, the indents are drawn away from each other by the separate bending, and the bolts alone resist the tendency. If the tendency is not resisted at all, the strength of the compound beam is simply that of two beams, each of the net depth of one component part. If it is perfectly resisted, the compound beam is four times as strong as the weakest component. The actual strength, in practice, varies between these limits, according to the completeness of the resistance obtained. — EDS. AMERICAN ARCHITECT.]

WATER-TIGHT FLOORING.

NEWBURYPORT, MASS., April 18, 1890.

TO THE EDITORS OF THE AMERICAN ARCHITECT: —

Dear Sirs, — Will you kindly give me the benefit of your experience on a question of flooring. In a factory about to be built it is very desirable to have smooth and tight top floors of wood. It is proposed to have under floors of 3″ spruce 8″ wide (market state), covered with ⅛″ birch 3″ wide (dry).

Would such a floor be likely to remain tight? If it did remain tight would a thorough wetting from automatic sprinklers be likely to swell it to the extent of bulging the walls, and if so what would be the best method of guarding against this possibility.

Very respectfully yours, GEORGE P. TILTON.

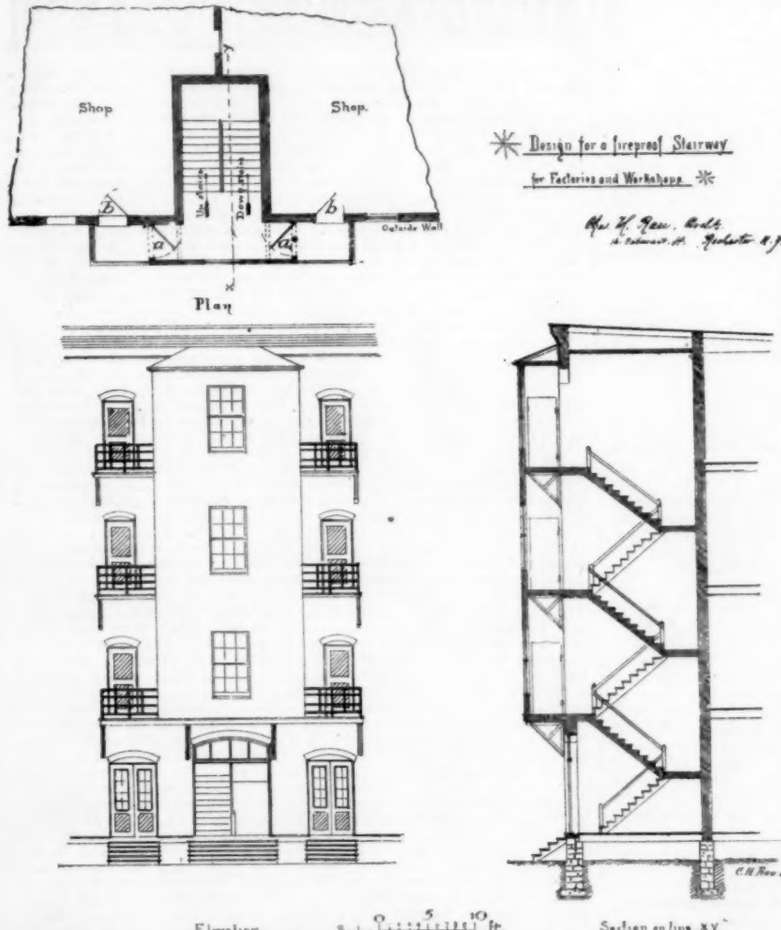
[The idea of making permanently tight floors in this climate with wood alone should be dismissed at once. It cannot be done. A smooth, neat floor, but not a tight one, can be made with three-inch under floor of spruce plank eight inches wide, covered with three-inch strips of seven-eighths inch maple or hard pine, *laid at right angles with the under floor*. If both floors run the same way, the under floor must be of narrow stock, three or four inch: otherwise each wide plank will draw up the narrow boards over it, so as to show joints over the joints of the under floor. If the upper floor were laid so dry, and so close, as to be approximately water-tight, the first warm, moist summer would swell it so as either to affect the walls, or force up the boards in ridges, according to circumstances. Wetting with sprinklers would have the same effect; and in either case the steam-heat of the next winter would cause the boards to shrink again to nearly their former dimensions, leaving open joints between them, and, of course, entirely destroying the water-tight quality of the floor. To get a floor which shall be perfectly water-tight, it will be necessary either to cover it with asphalt, which is good, but expensive, or to caulk it like a ship's deck, and have it looked after, and recaulked frequently; but a much less expensive floor can be made, which will be tolerably tight, by laying two plies of tarred felt over the under floor, mopping with tar, and laying the upper floor boards, matched in the hot tar. The nails will, of course, go through the felt, but if the work is done quickly, the hot tar will close around them. In any of these cases, it is important to pitch the floor to a gutter, with a drain-pipe and strainer, so that water will flow off at once. The floor may be laid only to within half an inch or so of the walls, to prevent any chance of bulging by swelling, and zinc flashing put around, just as in the case of a roof. — EDS. AMERICAN ARCHITECT.]

A FIREPROOF STAIRWAY.

ROCHESTER, N. Y.

TO THE EDITORS OF THE AMERICAN ARCHITECT: —

Dear Sirs, — A dreadful disaster in our city (where nearly forty workmen lost their lives by fire) suggested to me an idea for a safe stairway for factory buildings, which can be built at a reasonable cost. I send you herewith the drawings and explanation as the result of my efforts. This stairway is isolated from the shop on three sides by 12″ brickwalls. To secure the greatest safety, these walls *should not be pierced by any opening whatever* and should reach from the foundation to the top of the building. The stairs themselves are constructed of wood and plastered on the under side. At each story a platform about four feet wide is built out on four iron brackets, and is plastered on wire-lath on the underside and tiled or cemented on the upper surface. The fourth side of stairway (facing street or open space) to be closed by partitions, which can be made of angle-iron with wire-lath stretched over, or of wood lined on both sides with fireproof metallic furring or wire-lath and plastered thereon with Keene's Cement. Two coats of good oil paint will protect the plastering on the outside against rain and dampness.



The stairway is lighted by a window in each story which could be replaced by bulls' eyes or walklights set in iron frames, to prevent the flames from cracking the window panes. On each side of the landing a door *a* leads to an open balcony protected by a iron railing, and from there through door *b* in the shops. (See plan). It is evident, that in the case of fire, the whole stairway is *shut off* from the flames and smoke as the doors *a* are wire-lathed and plastered on both sides and *hung* in such a manner as *to close by their own weight*, thus preventing the flames from entering the stairway, after the doors *b* were burned. The latter doors might be wire-lathed and plastered on the inside to make them more fire-resisting. It would be advisable to have a door in the brickwall separating both shops (marked *y* on plan), so that in case the exit to the balcony should be barred by flames, the occupants could pass into the other shop and reach the stairway from the other side, where they will be in perfect safety.

The stairway should have a ceiling, made fireproof by wire-lath or metallic sheathing. The dimensions of the stairway should be in

accordance with the size of the workrooms and the number of people employed. Hoping that this device may be used freely for the safety of our workingmen, I wish only that it shall not be encumbered by any patent, gotten out afterwards by unscrupulous persons, trying to make money out of other people's ideas.

Respectfully yours, Charles H. Rau.

TO CEMENT A SLATE-ROOF.

New York, N. Y., April 21, 1890.

To the Editors of the American Architect: —

Dear Sirs, — Will you kindly inform me to whom to apply for a preparation of cement or roofing material, which can be laid upon a slate roof of a church and fill the interstices of the slate so as to preserve the character of the roof and at the same time prevent leakage. By forwarding this information you will greatly oblige.

Yours truly, C. M. Harris.

[The slates should be laid in cement, spreading the cement over the top of each course, before laying the next. Webster's Elastic Cement is generally used for the purpose. Portland or Rosendale Cement may be used, but will wash down to some extent over the roof, which the Elastic Cement will not. Most slaters understand how to do such work. — Eds. American Architect.]

NOTES AND CLIPPINGS

Utilizing the Power of the Niagara River. — At last there is a perfected plan, backed by money already subscribed, to utilize the power of Niagara — not of Niagara Falls, but of the waterhead of the river above the falls. Within a month the Niagara River Hydraulic Tunnel, Power and Sewer Company will begin the digging and blasting necessary for the building of its main tunnel, which will be about two and one-half miles long. The system by which the force of the river is to be used is familiar to all who have had occasion to interest themselves in the scheme. The ground above Niagara where the factories of the company are to stand has already been bought by the company. The estimate of cost for tunnel, twenty-four cross-tunnels, twelve raceways and bulkheads, and necessary masonry, timber, walls, etc., is 2,250,000 dollars. It is thought to be practical by the men who are undertaking to convey this power as far as Buffalo (twenty miles) for lighting that city with electricity, and new ways of using and conveying the inexhaustible force of Niagara River it is thought would be discovered in the future. One of the best-known banking-houses in Wall Street is deeply interested in this undertaking — *Invention.*

A Great Lighthouse. — The United States Lighthouse Board expects to open bids, according to the *Railroad Gazette*, next July for the erection of a lighthouse on the Outer Diamond Shoal off Cape Hatteras, which will be one of the most notable lighthouses in the world, on account of the difficulties in the way of its construction which have hitherto prevented the erection of any lighthouse there. The Lighthouse Board does not specify the method to be adopted by the builders, but it is generally understood that the design is for an immense caisson, 80 or 100 feet in diameter, which will be towed out to the shoal and sunk in place as rapidly as possible. The sand will be excavated from the caisson and it will be sunk until its edges rest upon the bed-rock, when it will be filled with concrete to a height some 30 feet above high water, and a lighthouse tower which will be 150 feet in height will be founded upon this mass. The caisson will be protected outside by a riprap of heavy granite blocks. The tower itself will be of steel. The placing of the caisson and the construction of the foundation will be exceedingly difficult on account of the constant interruptions which may be expected from rough weather, as the sea off Cape Hatteras is seldom long at rest. — *Invention.*

Picturesque Old Bogota. — This old Bogota somehow presents an appearance of unusual picturesqueness, though in a land where all things are as quaint as was Egypt in the days of Moses. Its narrow and crooked streets, winding uphill and down, are paved with the sharpest of small stones, that make pedestrians feel like penitential pilgrims on the way to Mecca with pens in their shoes, and in the middle of each street is cut a deep ditch or channel, through which the melted snows of the near-by mountains dance in noisy rivulets. The city has a population of something over 100,000, and in many respects is quite modern, in others fully two hundred years behind the times. Its white-walled casas are mostly of one story, with projecting roofs of red tiles and green-painted windows latticed like those of prisons, between whose bars one sees peering eyes — the beautiful, dark eyes of Colombian women, full of wondering curiosity at sight of "las estrangeras Americanas." Though built of adobe and unprepossessing in outside appearance there are many elegant homes in Colombia's capital, spacious and well furnished. The prevailing style of architecture is, of course, that which the Moors bequeathed to the early Spaniards, every house like a fort, its bare, blank walls built flush with the pavement, carefully concealing from the passer-by every trace of home life, while within are bloom and beauty, sunshine and cheerfulness. Those casas that exult in the luxury of a second story, and there are more of them in Bogota than one often finds in a Spanish-American city, have no windows on the ground-floor, the rooms fronting on the street being used for shops, warehouses and stables, for the proprietors and their families always prefer to live above. Even the biggest and grandest of these houses have never more than one entrance, and that consists of a pair of enormous double doors, often elaborately carved, opening upon a narrow passage paved like the street, which leads into the central court or patio, around which the house is built and with which all its apartments directly communicate. — *Washington Star.*

A Wealthy and Liberal Architect. — A Czech architect, Herr Hlavka, who some time ago contributed 200,000 florins towards the building of the Czech Academy, has now given half-a-million for a home for the orphaned and neglected children of Prague. — *Exchange.*

IN PRAISE OF VULCAN.

I. — THE FORTH BRIDGE.

When the wild men from Pentland's shaggy side
  Stared at the Fifeshire woodlands, did they dream
  This fiery dragon with its lungs of steam
Would make the heaven its pathway, and would glide
With cloud and sound above the wondering tide.
  Could they have hoped hot Haste would drive its team
  Straight for the gulf, and leap yon ocean stream,
High o'er Inchgarvie's isle, with double stride?
Nay, but the heart of iron was in the land,
  The soul of fire, the strength of lifted arm;
    The breath of wind was theirs; one thing alone
They knew not — this — how God himself had planned
    Mortals should conquer earth, and bind in one
  Our broken world, with commerce for a charm.

II. — THE EIFFEL TOWER.

The men who builded Babel day by day
  Saw the great city less, the plains more wide,
  Till God sent down confusion for their pride,
And tower and trench sank back to common clay.
Nor better fared the men who far away
  Beheld their harbor giant o'er the tide,
  For lo! earth trembled and the people cried,
And Rhodes' Colossus crashed into the bay.
But this transcendent tower of magic birth,
  That tames the lightning flash and mocks the thunder,
    Has set a star in heaven — with upturned eyes
  The nations meet, and pass in marvel under,
  And humbled, in the silence of surprise
They find a long-lost language of the earth.

— *H. D. Rawnsley, in Blackwood's Edinburgh Magazine.*

TRADE SURVEYS

Additional speculative tendencies have been developed during the past few days, due to the expectations of a general expansion of demand. Railroad stock cliques are scheming, syndicate agencies are active, representatives of foreign financial operatives are busy. More money is flowing into the coffers of those who are scattering accumulations into Western farm mortgages. New York money-lending interests are shaping their policy as far as they can to have capital for emergencies, which their shrewd instincts indicate may arise. In Eastern commercial circles complaint is renewed that post-dating is becoming a greater evil, and in manufacturing channels there is a stronger feeling in consequence of this, against permitting an accumulation of goods. Improving railway earnings are made to serve the interests of a few speculative cliques, but the time has not yet come, in the opinions of the controlling heads, to attempt a raid on the pockets of the investing public. Favorable as are many of the indications of a general expansion of demand, there are enough warning signals on the other hand to keep production under control, and trading as well. The tariff agitation and the labor question have been unsettling many plans and calculations, but despite the sensational coöperation of daily newspapers, the long talked-of disturbance will be less than was feared. Organized labor is now as anxious to avoid and escape strikes as it was anxious, a few years ago, to enter on them. Behind all the threats and demands now made, there is a secret understanding that no actual strike is to be made only as an unavoidable necessity. The labor leaders on both sides of the water are managing with genuine ability and shrewdness. Mischief-makers have been weeded out largely, and men of more than ordinary ability are now at the helm. The real scope of the work to be done is now pretty clearly understood, and the uselessness of strikes and loud-mouthed vociferation is discerned. It is true, and herein lies the danger, that the rank and file may break away from the calm and conservative councils of the few, but every year lessens the danger of revolt. Employers of large bodies of men are quietly resorting to such protective measures as are within their reach, to protect themselves from any outburst of discontent.

For instance, the anthracite coal companies are carrying in first and second hands over one million tons of coal, and in some way or other a large supply of cheap European labor is gathered at certain points. Railroad managers, in like manner, manage to have many more men within call than can be furnished with full employment. The same is true of numerous smaller industries in New England and elsewhere. The iron trade is an exception, as the bulk of the skilled labor in that industry comes from abroad. Employers generally are in a better shape than a few years ago to meet labor's demands, and labor is less disposed to make arbitrary and unjust demands than ever, and more disposed to conciliate as a matter of prudence and necessity. The business world is full of animation. Trade and financial journals complain of low prices, narrow margins, lower freight rates and the like, forgetting that the prosperity of the masses is not always to be measured by the magnitude of middlemen's profits. The common people are living well, building their own homes and advancing in all that goes to make up manhood. The savings bank reports in a dozen States show this fact in bold relief. The great work being done through building associations' capital is inclined to be frightened at times. Investors scare at trifles. Just now there is need of saying a few words. The masses of the people are accumulating wealth. The middlemen, purely, are not having quite as good a time of it. Little firms and concerns are springing into existence faster than commercial agencies can keep track of them. The extraordinary railroad construction of the past five or six years has made a panic, otherwise probable, impossible. The energy and capital which has started ten thousand industrial beehives in a dozen new States opened up by railroads would have resulted in a congestion and an unbalancing of forces and activities that would have resulted disastrously. The railroad-builders have unwittingly done the country a great service.

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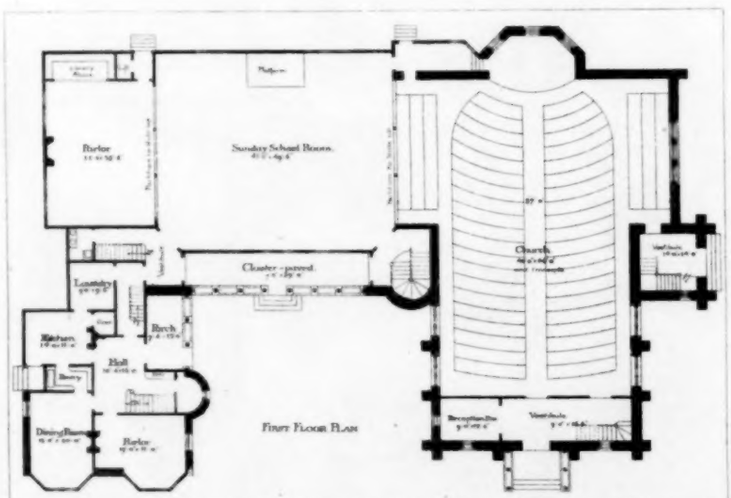

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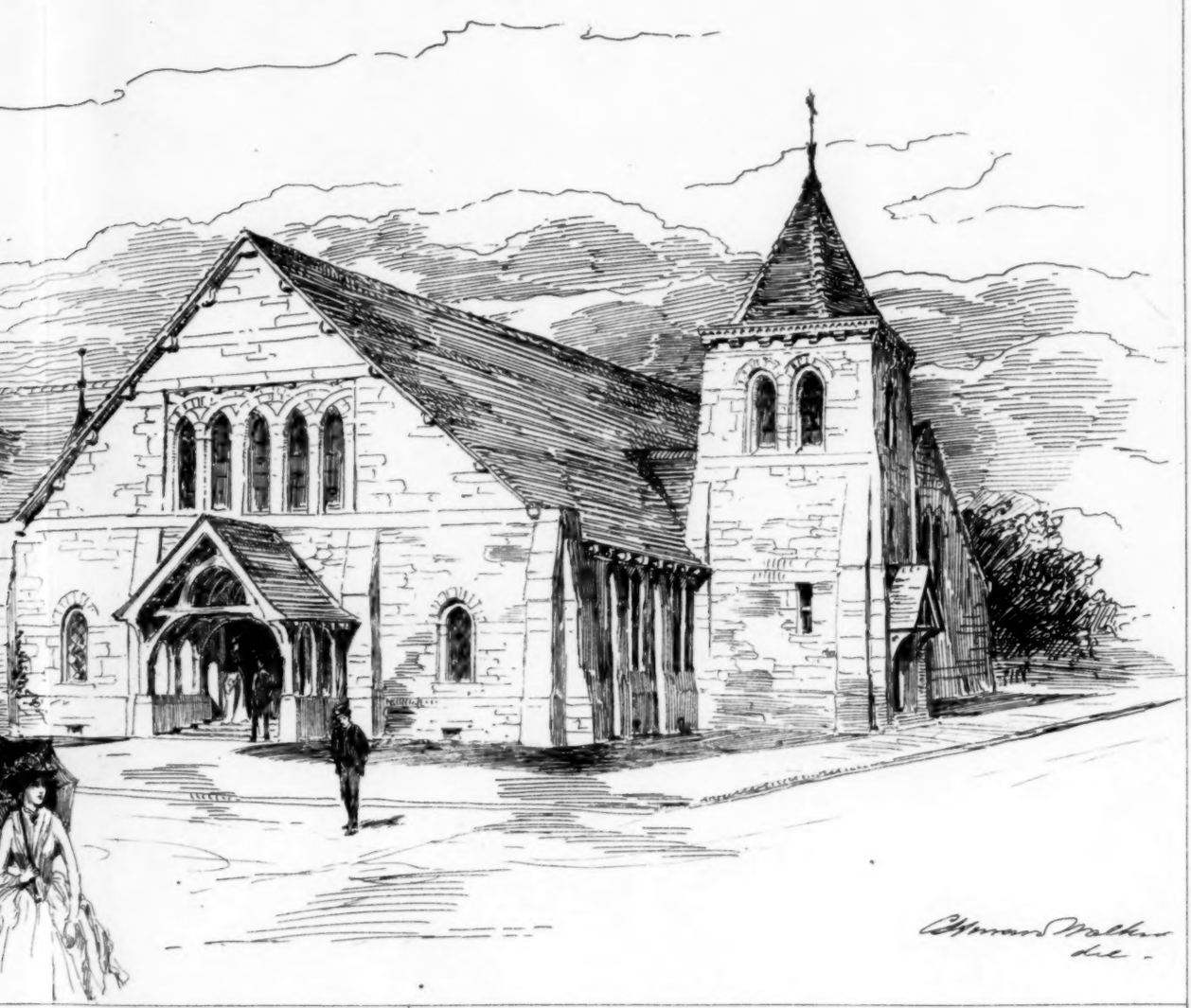

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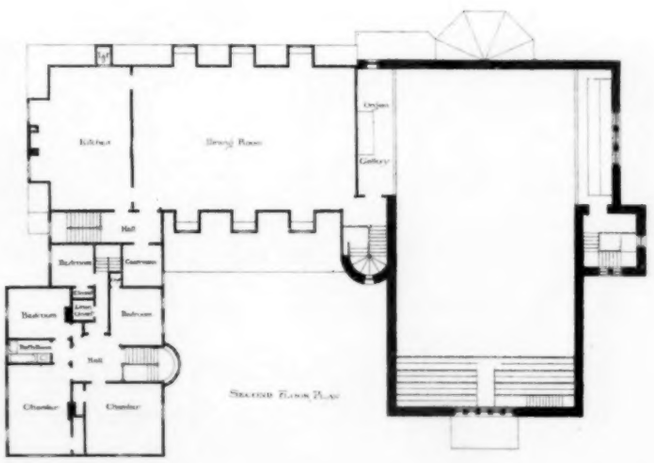

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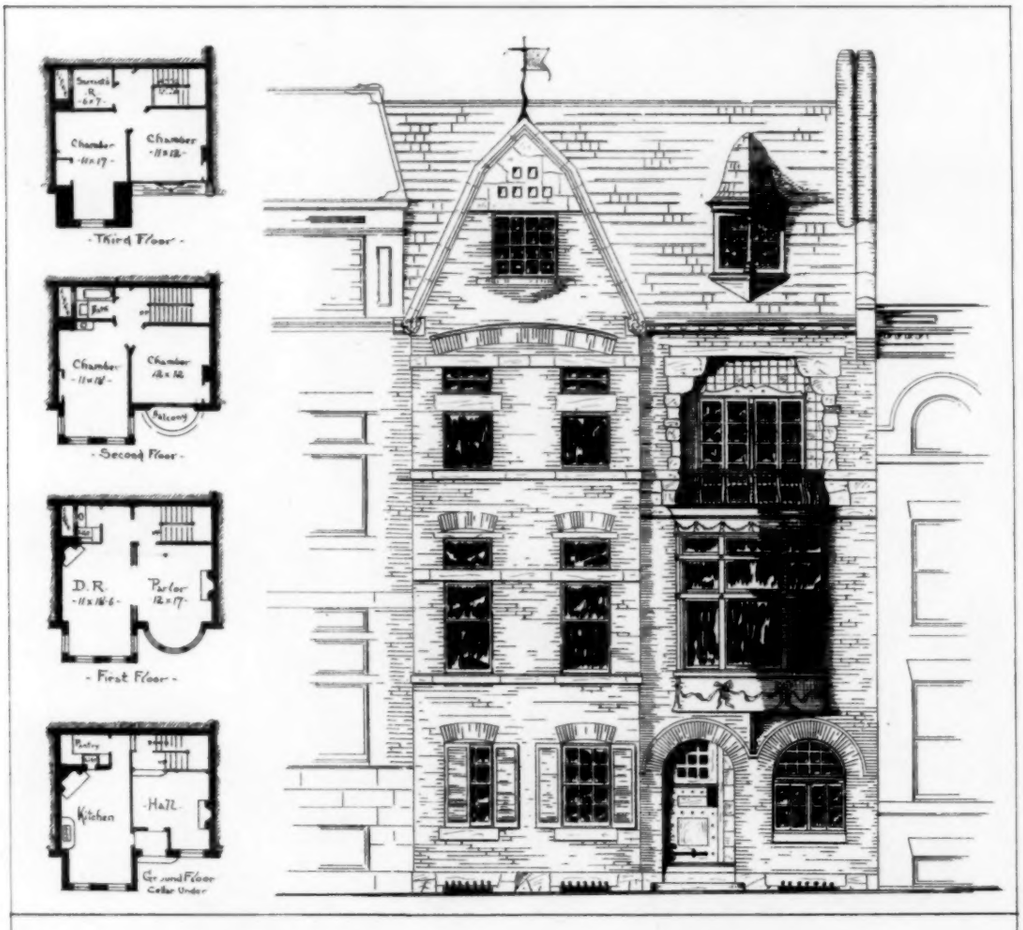

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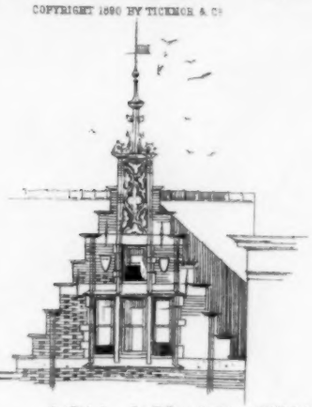

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DORMER - NEAR CITY

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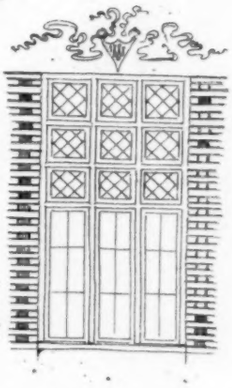
Architect



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No. 743. AMERICAN ARCHITECT AND BUILDING NEWS, APR. 26. 1890.

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