PRICE 15 CENTS.

MAY 13, 1893.

THE AMERICAN ARCHITECT AND BUILDING NEWS

VOL. XL. * REGULAR EDITION * NO. 907.

ARCHITECTVRE

ENGINEERING

DECORATION

CONSTRVCTION

TICKNOR & COMPANY

BOSTON, MASS.

CONTENTS.

ILLUSTRATIONS.

Additional Illustrations in the International Edition.

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

WE trust that building-committees and architects who think that the established customs and opinions of the profession are entitled to no respect will learn a useful lesson from the history of the Philadelphia Bourse competition. It will be remembered that the committee appointed by the subscribers to arrange for the erection of this very costly building saw fit to invite competitive designs, under conditions which few, if any, architects of proved skill and responsibility would be willing to accept. As soon as the programme of the committee was published, and while there was yet ample time to modify it, the reputable architects of Philadelphia, almost to a man, joined in a respectful communication to the committee, showing that the competition, under such conditions, would not attract the better part of the profession, and pointing out how the conditions could be modified to conform to the requirements which architects of standing in all civilized countries look upon as necessary. The Bourse committee, in reply, made a small modification of one of their conditions, but declined to change their programme further. The competition was therefore carried out substantially in accordance with the original programme, and, as the committee had been warned, was participated in by few, if any, of the better-known architects of the city. However, some designs were submitted, and the award was duly made to the author of the best of these, Mr. David Evans, who was appointed architect of the building under the terms of the programme, with, as it appears, certain additional conditions, one of which was that the committee should have the right to discharge him at any time, on payment of specified sums proportioned to the amount of service which he should actually have rendered at the time of his discharge.

BEFORE matters had gone very far with Mr. Evans, the committee thought fit to call in Messrs. G. W. & W. D. Hewitt, as consulting architects. Soon afterwards, it is reported, one of the subscribers to the enterprise on being called upon to pay the amount of his subscription refused, saying that he had subscribed under a written agreement that everything in connection with the construction of the Bourse building should be carried out in a strictly first-class manner, but that this condition had been violated in the manner in which an architect had been selected, and that he was therefore not bound by his subscription. He explained further that he had no personal objection to Mr. Evans, and that, for aught he knew, he might be the greatest architect in the world, but that he did not consider that he had been selected under proper circumstances. This view of the matter is said to have caused the committee some serious reflections, and their minds were by no means relieved when, on reporting the defection of the subscriber to the Board of Directors, one of the latter expressed the opinion that the subscriber was quite right in the ground he took. It is obvious that if an example of this sort should prove contagious among the subscribers to the stock, the consequences might be disastrous to the enterprise, and the committee seems to have taken promptly such measures as seemed open to it. Mr. Evans was summarily discharged, the consulting architects, the Messrs. Hewitt, were engaged to take full charge of the construction of the building, and the right which the committee had reserved to appoint an engineer, to have equal authority with the architect, was waived, authority being given to the Messrs. Hewitt to appoint their own engineer.

IT does not appear whether the subscribers to the Bourse stock were satisfied with this new arrangement, but Mr. Evans was not at all satisfied, and, a few weeks later, commenced an action against the Bourse to recover the substantial sum of $65,500, which he claimed to be due him. This amount was made up of several items. According to his petition, after having been duly chosen and appointed as architect of the building, in pursuance of the conditions of the competition, and his design having been awarded the first place, he was, in September last, requested to make an entirely new design for the building. He did so, devoting to the work several months' time of himself and his assistants, but, after the new design had been considered, it was decided to return to the old one, and in December he was instructed to prepare complete working-drawings in accordance with it. He made these drawings as rapidly as possible, working on them at times night and day, but in March last he received notice from the committee that they considered three months' time enough for making the drawings, and that he must have them all ready by March 13. The petitioner said that he could not possibly have finished them by that time, but he proceeded with all practicable speed, and delivered the drawings by sections during March, the last set having been completed April 3 and delivered April 10. Meanwhile, however, on March 20, the committee paid him the balance due on the first instalment of his fee, as agreed, and notified him that they had decided to terminate their contract with him. He, however, completed and delivered the drawings, and claimed the additional sum which, under his contract, was then to be paid him, and offered and requested that an arbitrator should be appointed to pass upon this claim; but the committee refused to accept the drawings, or to make any further payment, or to appoint an arbitrator. He therefore requested the court to collect for him ten thousand dollars, the additional sum which should, under his contract, have been paid him on delivery of the drawings, together with twenty thousand more, as damages for breach of the contract; thirty-three thousand dollars, as compensation for making the second design, being two per cent on the estimated cost of execution, and twenty-five hundred dollars for services in procuring, at the request of the committee, the passage of an ordinance by the City Council changing certain street-lines, by which the Bourse would make a saving of twenty-five thousand dollars in the cost of its building. The suit has not yet come up for trial, but Mr. Evans seems, so far as can be judged from his petition, to have a pretty strong case. We imagine that architects would agree that three months was a very short time for preparing all the contract drawings of a building to cost nearly two million dollars; and if it is proved that the committee really notified him, for the first time early in March, that three months was long enough, and that he must have them all done by March 13, and refused to pay him for any of his work on them because he did not have them entirely complete until about three weeks after the time thus unexpectedly and arbitrarily set, he ought to get his ten thousand dollars, and probably will do so; and if it should appear that the sudden imposition upon him of a

demand which he could not possibly comply with was a trick on the part of the committee to get rid of him without paying him what he was fairly entitled to, most people, including most jurymen, would be disposed to award him at least a large part of his claim of twenty thousand dollars as damages for such treatment. As to the justice of his claim of thirty-three thousand dollars for making the second set of drawings, and of twenty-five hundred for arranging the street-lines with the City Councils, it is not so easy to form an idea; but, whether he receives the whole amount of his claim or not, we hope that some Bourse stockholder with a turn for book-keeping will take the trouble to add up all the judgments, costs, legal expenses and fees paid out on account of architects, and compare them with the usual and reasonable commission paid to men of the highest ability and experience, and publish his balance-sheet for the benefit of future building-committees; and, in the present case, it might be well also to add a supplementary list of the deficiencies in subscriptions, depreciation of stock, interest on cost of land and loss of rental incurred through the committee's action in trying to get plans for a costly building upon terms which the architects of reputation in the city almost unanimously refused to consider; in spending nearly four months, after a design had been procured and its author appointed architect, in having a different design made and abandoned; in dismissing abruptly, if not unjustly, an architect who seems to have done his best to serve them; in defending suits for heavy damages consequent upon this proceeding, and eight months after the selection of the design and appointment of the architect, in throwing aside and refusing to receive the complete working-drawings made by him, and employing new architects to make them all over again.

IT will be remembered that, in a recent controversy in England between an architect and his client, where the Institute Schedule of Charges was quoted by the architect's counsel, the judge, Lord Coleridge, took occasion to say that he "would not allow the Institute to dictate to juries what sum was to be paid for work not done," and also that "it was a most unjustifiable attempt by a body of men for their own advantage and to increase their own emolument." The Royal Institute of British Architects, although it is reproached with moving rather slowly, is very much alive to the dignity and reputation of the profession, and it did not take it long to send to Lord Coleridge, by means of its President, Mr. J. McVicar Anderson, a respectful, but forcible remonstrance against what he had said. As to the hypothetical case which Lord Coleridge invented to illustrate his remarks, in which an imaginary architect, after being instructed to make plans for a house to cost fifty thousand pounds, and producing some which would cost a hundred and fifty thousand to carry into execution, demanded that the Schedule percentage should be paid him on a hundred and fifty thousand pounds, whether his plan was carried out or not, President Anderson said, just as we did at the time, that "Clause 9 of the Schedule was never intended to justify, and does not appear to me to justify, such an imaginary case as that by means of which your lordship illustrated its supposed application. It necessarily assumes that the architect has performed the work entrusted to him in reasonable compliance with the limitations imposed upon him by his client, and mutually agreed to with regard to expenditure." Mr. Anderson went on to say that "learned counsel" constantly misinterpret the Schedule by referring to its clauses as the "rules" of the Institute of Architects, wrongly assuming that they are obligatory; and he thought it probable that it was through such erroneous interpretation on the part of counsel that his lordship was led to make the remarks referred to, which, coming from so eminent a source, "could not fail to be prejudicial to the high character which it should be the ambition of every architect to maintain, and which it is the leading aim and object of the Royal Institute of British Architects to promote."

LORD COLERIDGE appears to have taken this remonstrance in very good part. In his reply to President Anderson, he acknowledged that he had "long and strongly" entertained the opinion of the Schedule which he had expressed at the trial, but he said that if, as reported, he really asserted that the Schedule clause in question was devised "by a body of men for their own advantage, and to increase their own emolument," he regretted these words, as he had "no right to confound the consequences of a rule, though very plain, with the motives of those who passed it." "Further than this," said he, however, "I am unable to go. With the terms of contracts, however absurd and unjust they may appear when both parties are free, and know what they are about, I think it unwise and improper to interfere. But to justify the addition of preposterous terms to a contract on the ground of rules made by a body to which one of the contracting parties belongs and the other does not, and of which the last-mentioned party has never heard, is a very different matter. So far as any authority and influence of mine extends, it never shall be done. I am obliged occasionally to say this in public, in consequence of counsel, as you yourself state, endeavoring to justify charges utterly indefensible by citing the rules of the Institute in their defence. Where there is no specific sum for payment agreed upon, the law implies a contract to pay what is reasonable, and what is reasonable is for the jury, and not for the Institute of Architects." Lord Coleridge then went on to relate a story of a "great nobleman" who employed "an architect of great eminence" to make plans and estimates for certain work. The estimates were far beyond what the noblemen could afford, and he abandoned the undertaking and paid the architect several hundred pounds for his trouble. More than ten years afterward he went to another architect, who planned and executed an entirely different building at less than half the cost estimated by the former architect. When the work was completed, the first architect sent in a bill for two-and-one-half per cent on the cost of the second architect's building, and justified this peculiar demand by the Institute Schedule. Lord Coleridge said that he was consulted by the nobleman as to the demand, and advised him to resist it, which he did, and it was not further pressed. This, he said, though perhaps the worst, was not the only case that had come under his observation where architects, and eminent ones, too, had used the Schedule to support extortionate demands.

PRESIDENT ANDERSON answered Lord Coleridge's letter with a polite acknowledgment, adding, however, that, although the Schedule might not be perfect in point of phraseology, it was certainly never intended to be used as a lever for claiming extortionate charges, and such use, if resorted to, was "perfectly unjustifiable"; and it was surprising to him that any amount of ingenuity could extract from it any justification for such a demand as Lord Coleridge had described in his story. On the whole, President Anderson and the Institute seem to have come out very well from the correspondence, while Lord Coleridge's disclosure of the private experience which has colored his treatment of architects ever since will not add much to the authority of the precedents which his decisions have set. His statement of the law, that "where there is no specific sum for payment agreed upon, the law implies a contract to pay what is reasonable, and what is reasonable is for the jury, not for the Institute of Architects," is so misleading as to indicate that he was inwardly rather ashamed and embarrassed at the recollection of his official expressions. Every one knows that, while the law, in the absence of a specific sum, implies a contract to pay what is reasonable, it holds that custom is admissible to show what is reasonable. People who deal for the first time with real-estate agents rarely know anything more about the rules of the real-estate exchange than clients do about the Institute Schedule, yet real-estate agents collect their fees without difficulty in accordance with their rules, which the courts hold to be of more authority than the arbitrary whim of a jury, although, in many cases, they award to the real-estate agent more money for less work, than any architect was ever able to collect by any process of "extortion" whatever. Of course, we do not defend anything but the honest use of the Schedule, and we have had Coleridge's own assertion that the dishonest use of it is generally attempted by "counsel," not by architects; yet Lord Coleridge's various deliverances on the subject, instead of applying to the lawyers, who would be none the worse for having their ingenuity curbed, have at least appeared to be aimed at the Institute of Architects, to its serious injury, and to the injury of the honorable members of the profession which it represents.

RAILWAY-STATIONS.[1] — II.

THE Gare d'Orléans, by Renaud, was once considered a veritable masterpiece. In spite of the changes which the service has undergone, the building is still convenient, and one need but glance at the plan shown in Figure 7 to get an idea of the talent exercised in its conception. [See also "Civil and Domestic Architecture," Fig. 39, *American Architect*, for February 8, 1890.] All the outgoing services are concentrated on the side toward the Quai d'Austerlitz, the incoming along the Boulevard de l'Hôpital; the space included between the Quai, the Place Walhubert and the Boulevard has been very successfully utilized for the administration buildings.

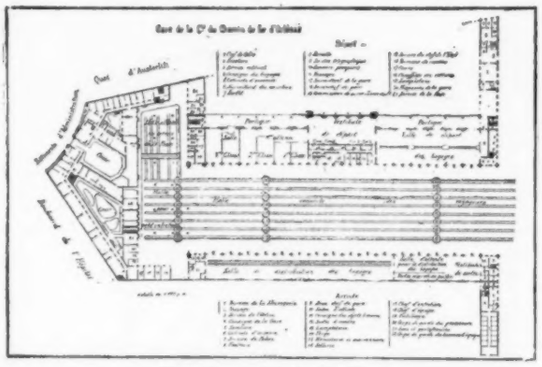

Fig. 7. Gare d'Orléans, Paris.

Fig. 8. Paddington Station, London.

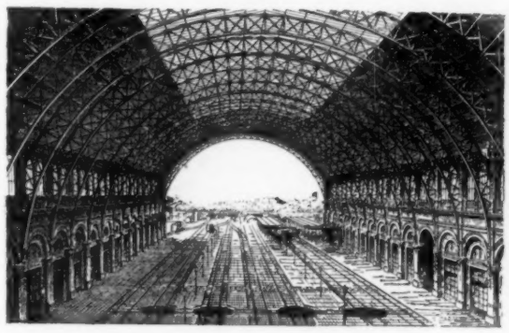

Fig. 9. Train-house of the Station at Turin.

Fig. 10. Station at Turin.

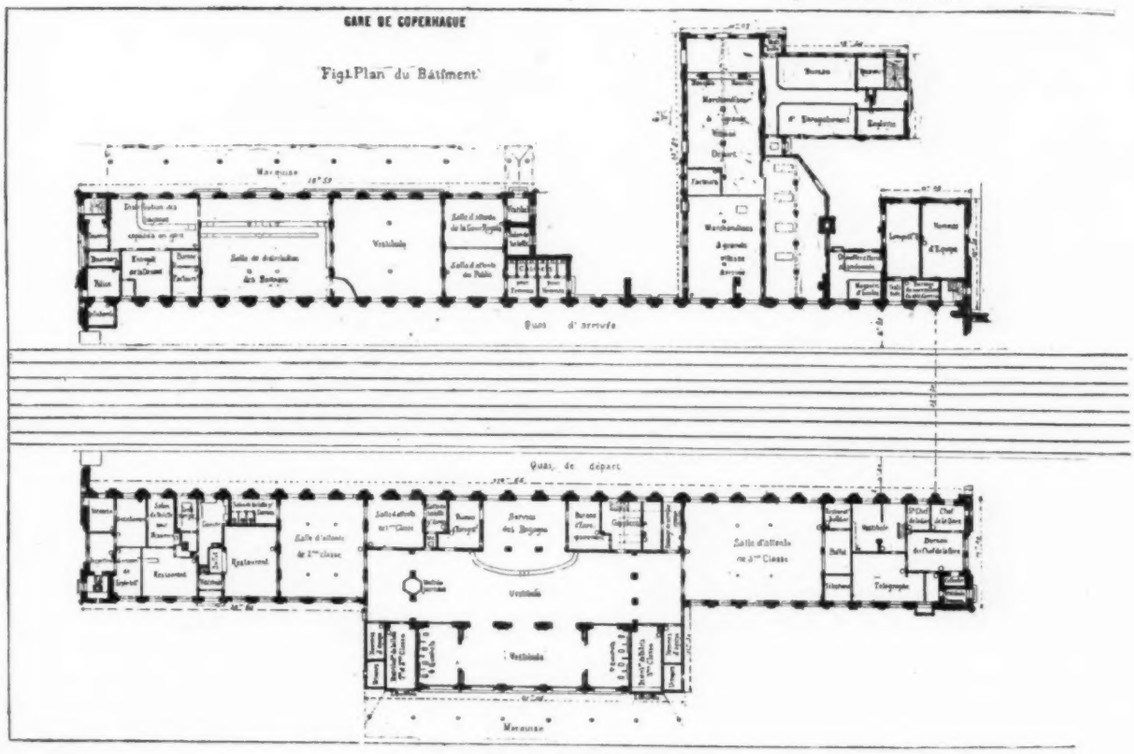

Fig. 12. Station at Copenhagen.

The train-stalls at the Gare d'Orléans are connected after the Polonceau system; we are now abandoning this method and using either riveted trusses or the riveted Polonceau, as

[1] From the French of Léon Benouville, in Planat's *Encyclopédie de l'Architecture et de la Construction*. Continued from No. 906, page 82.

at the Gare Saint-Lazare, a system which has not the advantages of riveted roofs and which does not present the graceful appearance of the jointed Polonceau roof.

In England, many train-houses are built of cast-iron (Fig. 8, Paddington Station, London). This makes it necessary to diminish the distance between the supports, and constructors

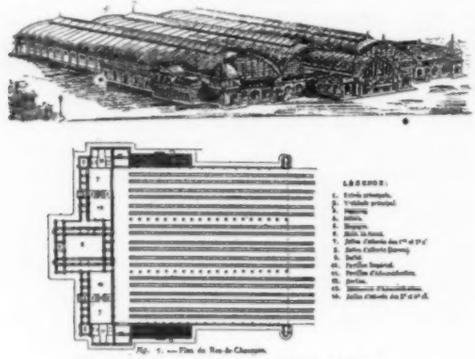

Fig. 11. Station at Frankfort-on-the-Main.

are obliged to resort to awkward dispositions like those shown in Figure 8.

The new station at Turin (Fig. 9) is a terminal station of fine general aspect, the train-house of which is much like that of the Gare de l'Est at Paris: the façade is reproduced in Figure 10. Figure 11 represents the station at Frankfort-on-the-Main.

Let us turn now to the subject of intermediate stations. Their importance varies with the size of the towns and with the place which they occupy in the railway system. The simplest must always include a ticket service, provisions for the registration of baggage, and a shelter for passengers while waiting for trains; also lodgings for the station-master and his family. The whole is often in a single structure, with the travelling service on the ground-floor and the apartments of the station-master's family in the story above.

In stations of greater importance, the incoming service is usually on one side of the tracks, the outgoing on the other; if the reader will refer to the plan of the Gare d'Orléans at Paris, imagining the tracks prolonged toward the Place Walhubert, with the administration buildings removed, he will have an example of a station thus arranged.

Fig. 14. Strasburg Station.

The station at Copenhagen (Fig. 12) is built on this general plan, which has, moreover, been employed in France ever since the origin of railroads; so common is it that we need not multiply examples farther. But it is feasible only when the tracks are not on the same level with the streets of the town and when, either by passage-ways above or below them, the circulation of vehicles from one side to the other of the station can be assured; grade crossings are possible only in small places and where there is but little railway traffic. The ser-

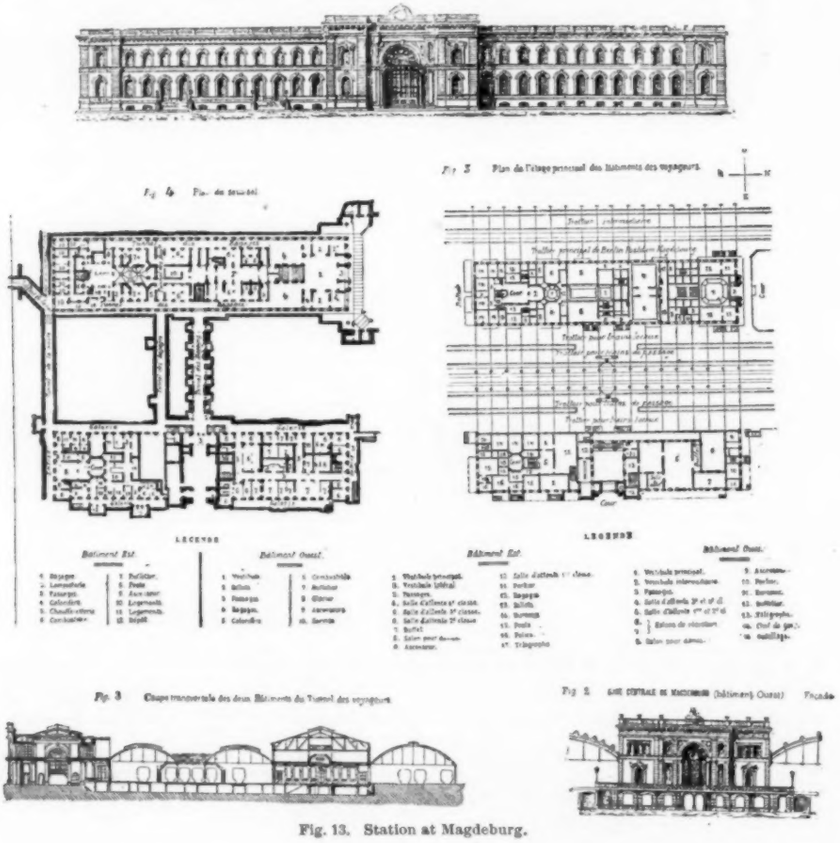

Fig. 13. Station at Magdeburg.

vices are often, therefore, all on the same side of the tracks, the side toward the town. These dispositions possess one great disadvantage; at least a half of the travellers and baggage must cross the tracks, which is either obstructive or dangerous; moreover, it complicates the working of the trains, for, as soon as a train is in, it must be broken to make a passage-way.

In Germany, if this difference of level does not exist, it is created; the basement of the station is utilized for the baggage-service, the lamp-service and the car-heating arrangements, at the very least — in a word, for all the cumbersome services; tunnels place the different platforms in communication with has been shown by the works executed at the point where the Chemin de fer du Nord quits Paris for the purpose of avoiding the crossing of tracks at the same level; and as has been shown by the abolishment of grade-crossings on the Paris Chemin de fer de Ceinture. But the utility of the system can

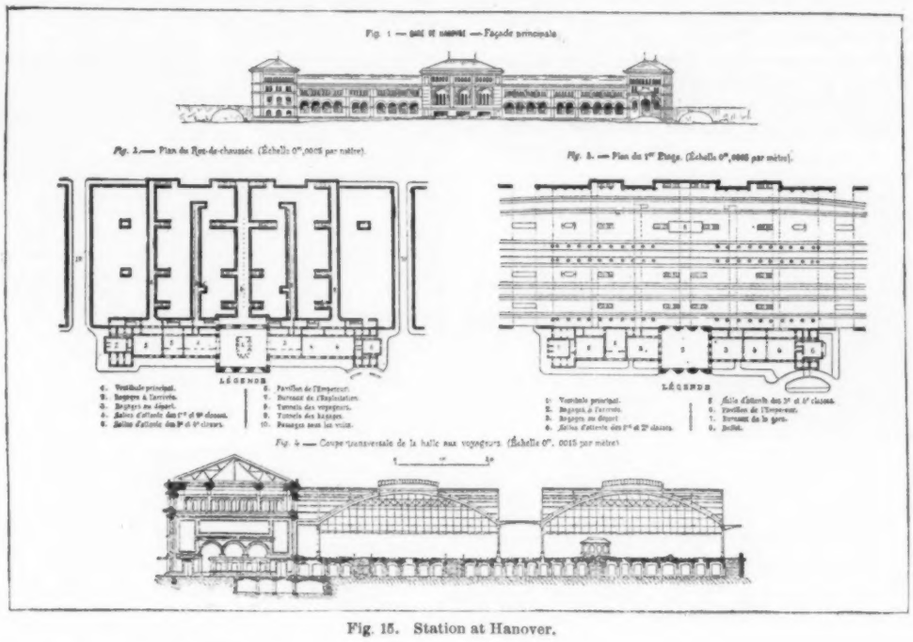

Fig. 15. Station at Hanover.

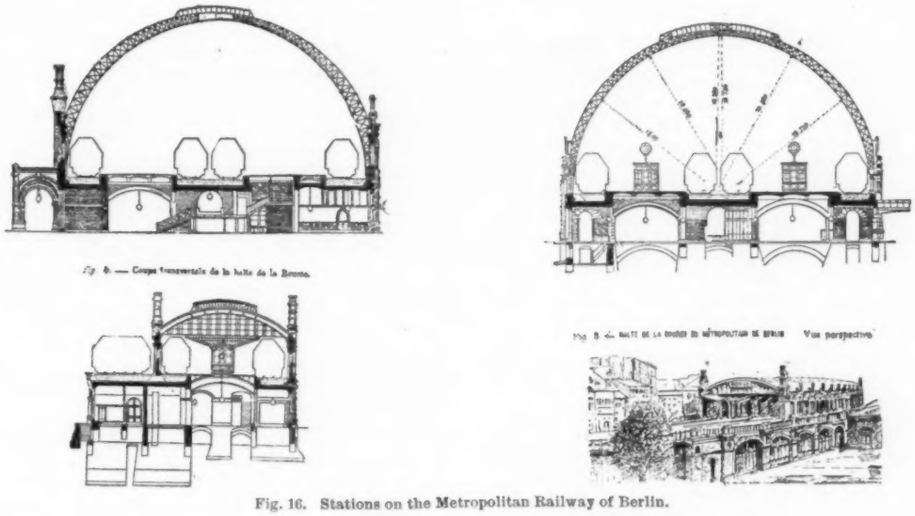

Fig. 16. Stations on the Metropolitan Railway of Berlin.

one another. Such is the disposition of the great station of Magdeburg (Fig. 13). The section given in Figure 3 of this plate explains the management of the baggage-service; bridges thrown over the tracks enabled passengers to cross without danger.

In the new Strasburg station, built by the Germans, the principle is carried still farther, as is also the case in the station of Hanover; all the services connected with the public are combined in the ground-story; tunnels and stairways make it possible to go from the Salle des Pas-Perdus to every platform. The track and train services proper are all that are found on a level with the tracks (Figs. 4, 5).

It does not require the eye of an expert to see at a glance the great advantages of this system; the Compagnie de l'Ouest will regret ere long not having employed it more radically at the new Gare Saint-Lazare.

In a city where land is dear, it is especially desirable to be able thus to superimpose the different services and at small expense to establish exits that can be made as spacious as necessary; if the difference of level does not exist, it can be created; after all, only a height of four or five metres is required, and this can be attained with comparative ease, as

Fig. 17. Station in the Alexanderplatz, Berlin.

best be judged on the Metropolitan railway of Berlin; there are four tracks in each large station; as appears in Figure 16, the viaduct is enlarged merely to allow for a platform between

the tracks; all the services are located under the viaduct, and broad stairways give access to the platforms. Figure 16 also shows the disposition of the Bourse Station, where only two tracks enter the train-house; the ground-space is here reduced to a minimum. Figure 17 gives the perspective of one of the most important stations of the road and proves that the disposition in question may contribute not only to comfort and convenience but to decorative effects.

We will not discuss here the subject of freight depots, in which the disposition of the tracks is everything and covered platforms and small offices constitute the only constructions. These can be disposed in the manner described under the word "*Dock*." Leon Benouville.

ARCHITECTURAL SHADES AND SHADOWS.[1]—XVIII.

CHAPTER XII. — (*Concluded.*)

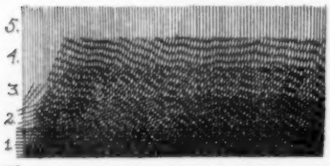

Fig. 155. Superposed flat Tints; the narrowest laid first.

240. It was remarked in Chapter I, that diffused light casts no shadows, since no object can intercept from a neighboring surface more than a small part of the scattering rays. But when rays of a given direction predominate in the diffused light the proportion intercepted by the intervening object is manifestly increased, and a somewhat vague and pale shadow results, its intensity and definiteness depending partly on the relative amount of light so intercepted, and partly on the nearness of the surface of incidence to the intervening object. As in architectural drawing we assume the reflected light to take a well-defined predominant direction, we are justified in representing with some distinctness the secondary shadows which projecting or intervening objects cast upon surfaces already in shadow.

241. The direction assumed for the predominant reflection determines a series of secondary shadows precisely the reverse of the shadows in direct light. These secondary or reflected shadows are cast upwards and to the left of objects or members projecting from the surfaces in direct shadow, as by the modillions in Figure 145, the archivolt and the main cornice in Figure 148, and the dentils in Plate IX. In the transverse section of M. Parent's "Hôtel à Paris," in the *American Architect* for November 12, 1892 (International Edition), the sunlight is assumed to come from the right instead of the left, and the reflected shadows of the pediment, archivolts, rustications, etc. are cast upwards and to the right on the wall in shadow. It is obvious that there are no reflected shadows on the illuminated surfaces, since the reflected light, whose interception is the sole cause of reflected shadows, is itself utterly imperceptible when thrown upon surfaces lighted by the sun.

242. The effect of these secondary shadows is both to brighten the main shadows by contrast, and to bring out the architectural detail which would otherwise be lost in the direct shadow. The light reflected upwards into this shadow illuminates certain parts of the detail, which is reënforced by the reflected shadows of its projecting portions. The egg-and-dart moulding in Figure 145 and the archivolt in Figure 148 (in No. 892 of the *American Architect*), will help to make this clear.

243. The phenomena of *contrast* come next in importance to those of reflected light. The darkness of the shades and shadows and the brilliancy of the light are apparently more intense along the lines which separate them than elsewhere, by reason of the violent contrast between them. Hence on rounded surfaces, like columns, the shade is darkest along the line of shade; and this effect of contrast is further enhanced by the effect of reflected light in diminishing the darkness of the remoter portions. This is illustrated by Figures 151 and 153, and by the columns in Figure 148. On flat surfaces, as in the case of prisms, the effect is purely that of contrast, and in no way due to reflected light, which would equally affect every portion of any flat shaded surface, except as it might be somewhat stronger near the ground. Thus in Figure 152 the tint is stronger near its left hand edge, where it meets the light than towards the right hand edge, solely because of the contrast with the lighted face; for the nearer portions of the shaded side really receive just as much reflected light as the remoter parts, being parts of the same plane.

244. Narrow shadows should, in general, be made darker than broad shadows under the same conditions, since the contrast with the surrounding surfaces in light affects the whole of a narrow shadow, but only a small portion of a broad one. This is illustrated in Plate 10 by the narrow shadows of the edges of the panels and window-architraves of the second story. For the same reason, the upper part of the triangular shadow cast by a projecting wing or bay, where it begins in a point, is usually made the darkest part of the whole.

245. In rendering any given shadow there is often necessary a nice balancing between conflicting considerations. Thus it may be a question whether the lower edge of a shadow near the ground should be made stronger than the upper part by reason of contrast with the light, or less intense on account of reflected light from the ground. There can be no universal rule or principle for such cases, which must be decided according to general harmony of effect. The very existence of such contradictory possibilities leaves the draughtsman the freer to adapt his treatment to æsthetic requirements, unhampered by rigid scientific rules.

246. Effects of contrast depend not alone upon the depth of the shades and shadows, but also upon the intensity of the light; and this, in its turn, depends upon the direction and the texture of the illuminated surface. The left-hand front "corner" of a column, for example, is its most brilliantly-lighted element (§§ 95 and 97 in No. 745 of the *American Architect* for April 5, 1890). The shadow of the corner of the abacus, falling on this most brilliant element, is, consequently, by the greater contrast, made to appear darker than the rest of the shadow, as is seen in Figure 153; in Plate 2 (No. 698 of the *American Architect* for May 11, 1889) and in the Doric order of the lower story in Plate 10. The phenomena which determine the variations of intensity of illumination have already been explained in the first chapter, but will bear restatement here, with special reference to their application in rendered drawings.

247. As a general rule, the brightness of a given surface is supposed to vary with its angular position relative to the sun, being greatest when it is perpendicular to the direction of the light, and least when it is parallel thereto, *i. e.*, in shearing light. As a matter of fact, however, this is only true of surfaces in diffused light and of surfaces in sunlight which have a dull or granular texture. Smooth and semi-polished surfaces show but little variation of brightness in the sunlight with varying angles of incidence, the lighted part of a smooth white marble column presenting to the eye an apparently flat area of brilliant light, in spite of its rounded surface. On the other hand, a highly-polished column reflects no sunlight to the eye except from the one element placed at the proper angle to do it. A polished shaft should, therefore, be rendered very dark, with one brilliant line or element a little to the right of the left-hand corner;[2] all the rest of its surface bringing to the eye only reflections of diffused and already-reflected light, so that light and shade upon it are almost indistinguishable.

248. If the shaft, however, be of granite, sandstone, or other substance having an unpolished surface and granular texture, the light will diminish in intensity in both directions from the "corner" element, which receives the light in a vertical plane normal to its cylindrical surface. This gradation of the light is really due to the microscopic anfractuosities of the surface, whose minute shadows, varying in breadth with heir angular position, mingle varying amounts of black or gray with the light. And since very smooth surfaces are exceptional in architecture, the draughtsman may safely follow the general rule of varying the brilliancy of the lighted surfaces according as they receive the light at an angle more or less nearly perpendicular to them. Figure 154 illustrates a series of surfaces on a block-elevation of a bay-window or oriel, somewhat exaggerated to make the application of the principle clearer. Such great variations in the illumination suggest a structure in sandstone, coarse granite, plaster, or similar material; if white marble is to be represented, the lighted surfaces should be made much more nearly uniform in brightness.

249. The effect of varying distance from the eye upon the apparent brightness of lighted surfaces is hardly perceptible, except with unusual differences of distance, or in a hazy or murky atmosphere. Under ordinary circumstances there is no perceptible difference in brightness and color between the main front of an edifice and the front of a wing projecting fifteen or twenty feet from it. What is called "aërial perspective" in a drawing, that is, the rendering of the remoter planes of a building with diminished intensity of light, shade and color, although based on the actual absorption of light by the atmosphere, is, in reality, a palpable exaggeration of a phenomenon whose effects are never perceptible except in the case of extraordinary distances, such as the draughtsman rarely, if ever, has to deal with. Mr. Ruskin has visited upon this conventional exaggeration one of his most sarcastic diatribes.

250. In the case of architectural rendering, however, even so extreme an exaggeration may be justified, if thereby the draughtsman succeeds in conveying a truer impression of the form and aspect of his design than representations by plan and elevation would otherwise permit. Moreover, the toning-down of the remoter planes of the drawing is not merely intended to represent diminished illumination. It suggests also the diminished appeal which those parts make to the eye of the spectator, by their greater indistinctness of detail. The nearer parts of a building "jump at the eyes," as the French say: they compel one's attention, and reveal all their detail with perfect distinctness. The more distant parts are reduced in apparent scale by perspective, and their details appear less distinct and clear, even if not toned-down through the absorption of light by the intervening atmosphere. Neither this reduced scale nor increased indistinctness

[1] By A. D. F. Hamlin, Adjunct Professor of Architecture in the School of Mines, Columbia College. Continued from page 57, No. 892.

[2] That is, the element whose normal bisects the angle of 45° between the horizontal direction of the light and that of the projecting lines, which, in an elevation, take the place of visual rays.

of detail can be reproduced in an elevation, which is a *map* or *diagram*, and not a photograph, and must show all parts on the same scale and with equal detail without. The corresponding impression can, therefore, only be produced by lightening the shadows, toning-down the lights, and diminishing the contrasts and gradations, of the remoter planes of the drawing.

251. But this rendering of "aërial perspective" cannot be carried out with absolute consistency. Rigidly observed, it requires that shades, shadows, color and illumination all be made stronger on the nearer than on the more distant surfaces. When the planes are numerous, the gamut of tones capable of being produced by washes of ink or color is soon exhausted, while the intermediate variations are too slight to be perceptible. Here, as in all else, the ultimate general truthfulness of the effect of the drawing is the paramount consideration, and when a pilaster or column in the shadow can be made to stand out from the wall better by making the shadow on the wall a little darker than that on the pilaster instead of the reverse, or when a distant façade can be "thrown back" by giving to it a darker and, hence, stronger local color than to the nearer wings, it is right and proper so to do. Taste and experience must guide the draughtsman, and the phenomena of light and shade be made his servants, not his masters.

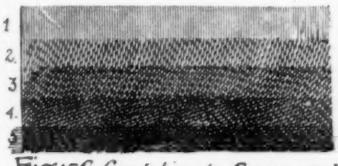

Fig. 156. *Gradation by Superposed flat Tints, the broadest laid first.*

252. In rendering all these various grades of tone in light and shadow, there are two distinct methods in general use. Some draughtsmen work entirely by superposed flat tints, grading their washes by a series of steps, instead of by a gradual toning-down. Others endeavor to secure by one or two washes the effect desired, grading the tints by the addition of water or of color to the puddle as it is carried downwards by the brush. Each method has its advantages, and the most experienced draughtsmen make use of either as occasion requires. For long narrow tints, graded *across* their width, as on mouldings, column-shafts and other long cylindical surfaces, successive flat tints are used to advantage, each narrower than the preceding, or wider, according to the artist's preference. Figures 155 and 156 explain both variations of this process. To begin with the narrowest tints, and add washes successively wider, as in Figure 155, usually produces softer gradations than the reverse method, illustrated in Figure 156, in which the edges of the successive washes are harder and sharper with a consequently more angular effect. For broad shadows and tints on flat surfaces graded washes are better, though it often happens that such a wash has to be repeated more than once in order to produce the necessary depth and smoothness of tint. In this case each successive wash should be carried very slightly beyond the edge of the preceding one, in order to avoid the hard black edge which results from stopping both on precisely the same line.

253. In order to avoid a similar edge or streak when a shade comes against its shadow, it is wise to carry the tint required by the shade entirely across both shade and shadow. The shadow may then be darkened by a second wash stopped against the edge of the shade.

254. In rendering complex gradations like those on a torus or scotia, it is a good plan to draw in pencil the limits of equal intensity, that is of the flat tints to be superposed, and to follow these carefully in laying the washes (Fig. 157). The resulting hardness of effect is precisely what is needed to give vigor and brilliancy to such details as the bases and astragals of columns and similar features in a drawing.

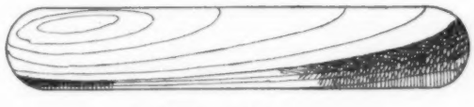
Fig. 157.

255. It is beyond our province to enter farther into the details of architectural rendering, or to discuss the technique of color, India-ink, brush-work, puddles, and the like. These belong more properly to a text-book on architectural draughtsmanship, and have no direct relation to the geometry or physics of shades and shadows. A few words on the plates with which we close this final chapter are, however in order, since these plates illustrate many of the points made in the foregoing paragraphs.

256. Plate 10 is reduced from the drawing by R. Pfnor of the portal of the Château d'Anet, and is more or less familiar to students of the French Renaissance. While the gradations of tint in the shadows are not as marked as in most French drawings rendered by the brush, the shadows cast by the columns of the upper order are seen to be distinctly stronger than those cast by the Doric order of the lower story; and in general the rendering of the details above the upper cornice is particularly sharp and strong. Attention may also be called to the exaggeration of aërial perspective by which the masonry between the upper columns is made to appear more remote than the stylobate-block on which each pair of columns rests. These blocks are almost white, the wall between the columns is stippled to a light-gray, and an effect of strong relief is thus given to the stylobate. This plate also illustrates the effect of shadows cast on leaded semi-transparent glass, as suggested in § 231 (in No. 892 of the *Architect*). It also suggests admirably the modification of the tone or "value" of shadows by the color of the surfaces of incidence. Those portions of shadow that fall upon the inlaid panels of dark marble which are so conspicious a feature of de l'Orme's beautiful design are made proportionately darker than those that fall on the limestone of which the structure is mainly built.

257. Plate 11, representing the court of the Strozzi Palace, is an example of intentional exaggeration of reflected light in a section. This is done with the object of avoiding the heaviness and gloominess incident to a too literal rendering of a subject almost wholly in shadow. It may fairly be objected that the luminousness of the spandrels and plane surfaces of the arcade in shadow has been exaggerated beyond measure. Certainly there would be in nature no such intense shadows caused by the light reflected from the pavement and adjacent walls as is here cast by the architraves, archivolts and key-stones upon the wall-surfaces from which they project. On the other hand, it was doubtless, the intention of the artist to indicate, by the brightness of these walls and spandrels, that they are finished in white plaster contrasting strongly with the darker color of the stone arches, architraves and cornices. This contrast, as a part of the architectural effect of the court, was justly considered of greater importance than a scientific adjustment of absolute values in the shades and shadows. Such considerations, as suggested in §§ 245 and 251, often compel a disregard of principles of rendering which in other cases one is justified in adhering to rigidly.

258. There is, however, an absolute error in the rendering of the soffit of the lower arch in section in the left-hand lower corner of the plate. This should have been made like its opposite fellow on the right-hand side of the court. It is a half-arch in light, the shadow of its own upper portion falling across it as in all the other arches in section in the plate. The error is apparently an oversight on the part of the draughtsman.

259. In conclusion, it is well to remind ourselves of the real object and significance of careful and artistic rendering of architectural drawings with shadows accurately cast at the conventional angle. There would be no justification for the long series of papers here brought to its close were the labor and pains required to master the rules and principles they set forth to result in nothing more than an increased knowledge of descriptive geometry. To study a design in plan and elevation alone is only to half-study it. To carefully elaborate each detail in perspective in order to ascertain the true relations of its parts to each other from various points of view would be a laborious process, and in many cases valueless unless very accurately done. Perspective studies have the further drawback that they tell nothing about light and shade, and are apt to be equally misleading from the thinness of mathematically-projected outlines, and from the fictitious picturesqueness of a sketchy, freehand rendering based on a carefully-pencilled block-perspective. Indeed, the showing of almost all our recent American architectural exhibitions demonstrates the tendency of our draughtsmen and designers towards a wholly picturesque and unmonumental conception of mass and detail: a fondness for the accidental in architectural rendering; for tricks and *tours de force* of the pen; for suppression or mere suggestion of detail, and for a kind of design that lends itself to such picturesque and clever treatment. Such drawing and such design lack *seriousness*. Proportions of parts are neglected; details are not adequately studied in their relation to the whole composition.

260. But by the careful treatment of a design in elevation and section with shadows carefully cast, the draughtsman combines the advantages of the absolute geometrical accuracy of orthographic projection, with the suggestion — almost the complete expression — of the third dimension which the perspective can only give in a garbled and partial manner. And to these advantages is added the very signal gain of showing the voids as dark areas in the pattern of the façade, and of seeing the decorative forms spring into light and relief by their shades and cast shadows. Moreover, such a treatment of the tentative studies for a design compels attention to many details that would otherwise elude notice. It forces upon the draughtsman the necessity of correct proportions and careful drawing. In working out the shades and shadows he is compelled to take account of distances, slopes, projections, relations of form and distance which even a perspective study might fail to develop. Thus, for purposes of study in designing, the rendering of shades and shadows is of great value.

261. It is, however, in its application to finished drawings that this so-called "academic" system of representation finds its highest usefulness. There is no other method of picturing an architectural design so thoroughly satisfactory in its results. There is hardly a fact or feature capable of representation in perspective that is not even more adequately and completely shown by judiciously-rendered plans, sections and elevations. These do not, it is true, give the photographic aspects of the building. They present the design in a conventional manner, with the light at a conventional angle. But every detail of the design, all its facts, features and phenomena, appear in their true relations, both of size and relief. Color and material may be treated as accurately and truthfully as in a perspective. Form and detail must be given with absolute fidelity, and every dimension is capable of instant and absolute verification. A poor design stands

a better chance of being made presentable in a perspective than when thus shown up in its true proportions. For this very reason, an "academic" rendering is apt to furnish a better test of the quality of a design than any other method of portraying it. As it is capable of almost any amount and degree of elaboration, of breadth or delicacy of treatment, of refinement or vigor, it offers to the true artist the utmost scope for his abilities. And when once its principles and methods have been mastered, it furnishes to the practised draughtsman and designer the most delightfully obedient, flexible and artistic, as well as the simplest and most ready to his hand, of all means for the expression of his architectural conceptions, amply repaying him for all the time and pains expended in becoming its possessor.

A. D. F. Hamlin.

[The end.]

RULES FOR SAFE WIRING.[1]

CENTRAL STATIONS. — CLASS A: FOR LIGHT OR POWER.

From the Musee de Lille, France. From *La Construction Moderne.*

These rules also apply to dynamo-rooms in isolated plants connected with or detached from buildings used for other purposes; also to all varieties of apparatus of both high and low potential.

Generators or motors must be:

1. Located in a dry place.
2. Insulated on floors or base frames, which must be kept filled to prevent absorption of moisture, and also kept clean and dry.
3. Not exposed to flying or combustible materials.
4. Each covered with waterproof cover when not operating.

In no case must a generator be placed in a room where any hazardous process is carried on, such as the working-room of a cotton, jute, flax, woollen or flour mill.

Care and Attendance. — A competent man must be kept on duty in the room where generators are operating.

Oily waste must be kept in metal cans and removed daily.

Conductors. — From generators, switchboards, rheostats or other instruments, and thence to outside lines, conductors must be:

1. In plain sight.
2. Wholly on non-combustible insulators, such as glass or porcelain.
3. Separated by non-combustible insulating tubes from contact with floors, partitions or walls through which they may pass.
4. Kept rigidly so far apart that they cannot come in contact.
5. Covered with non-inflammable insulating material sufficient to prevent accidental contact.
6. Ample in carrying-capacity, to prevent heating. (See "Capacity of Wires" Table.)
7. Connected by splices or joints equal in carrying-capacity to the conductors themselves, soldered, if necessary, to make them efficient and permanent.
8. When under floors or in distributing towers, placed in spaces ample for inspection and ventilation, and provided with special insulating covering.

Switchboards must be:

1. So placed as to make it impossible to communicate fire to surrounding combustible material; accessible from all sides when the connections are on the back, or may be placed against a brick or stone wall when the connections are entirely on the face.
2. Kept free from moisture.
3. Made of non-combustible material or of hard wood, filled to prevent absorption of moisture.
4. Equipped with bars and wires in accordance with Rules 1, 2, 3, 4, 5, 6 and 7 for placing conductors.

Resistance boxes and equalizers must be:

1. Equipped with metal or non-combustible frames.
2. Treated as sources of heat.
3. Placed on the switch, or a distance of a foot from combustible material, or separated therefrom by asbestos or cement.

Lightning-arresters must be:

1. Attached to each side of every overhead circuit connected with the station.
2. In plain sight.
3. On the switchboard, or in an equally accessible place, away from combustible material.
4. Connected with at least two earths by separate wires of large size.
5. So constructed as not to maintain an arc after the discharge has passed.

Testing. — All series and alternating circuits must be tested every two hours while in operation, to discover any leakage to earth, abnormal in view of the potential and method of operation.

All multiple-arc low-potential systems (300 volts or less) must be provided with an indicating or detecting device, readily attachable, to afford easy means of testing where the station operates perpetually.

Data obtained from all tests must be preserved for examination by insurance inspectors.

CLASS B. — ARC (SERIES) SYSTEMS.

Overhead Conductors. — All outside overhead conductors (including services) must be:

1. Covered with some insulating material not easily abraded.
2. Firmly secured to properly insulated and substantially built supports, all the wires having an insulation equal to that of the conductors they confine.
3. So placed that moisture cannot form a cross-connection between them, not less than a foot apart, and not in contact with any substance other than proper insulating supports.
4. At least seven feet above the highest point of flat roofs, and at least one foot above the ridge of pitched roofs, over which they pass or to which they are attached.
5. Protected, whenever necessary, in view of possible accidents to conductors or supports, from possibility of contact with other conducting wires or substances to which current may leak, by *dead insulated guard irons or wires.* Special precautions of this kind must be taken where sharp angles occur, or where any wires might possibly come in contact with electric light or power wires.
6. Provided with petticoat insulators of glass or porcelain. Porcelain knobs and rubber hooks are prohibited.
7. So spliced or joined as to be both mechanically and electrically secure without solder. They must then be soldered to insure preservation, and covered with an insulation equal to that on the conductors.

The following formula for soldering fluid is approved:

Saturated Solution of Zinc	5 parts.
Alcohol	4 parts.
Glycerine	1 part.

Conductors should not be run over or attached to buildings other than those in which light or power is being or is to be used, but on separate poles or structures always easily inspected.

Service blocks must be covered over their entire surface with at least two coats of waterproof paint, and so maintained.

Telegraph, telephone and similar wires must not be placed on the same arm with electric or power wires, and *should not* be placed on the same structure or pole.

INTERIOR CONDUCTORS.

All interior conductors must be:

1. Where they enter buildings from outside terminal insulators to and through the walls, covered with extra waterproof insulation, and must have drip loops outside, preferably slanting upward toward the inside, and bushed with waterproof and non-combustible insulating tube.
2. Arranged to enter and leave the building through a double contact service switch, which will effectually close the main circuit, and disconnect the interior wires when it is turned "off." The switch must be so constructed that it shall be automatic in its action, not stopping between points when started, and prevent an arc between the points under all circumstances; it must indicate on inspection whether the current be "on" or "off," and be mounted on a non-combustible base in a position where it can be kept free from moisture and easy of access to police or firemen.
3. Always in plain sight, never covered, except in special cases, where an armored tube may be necessary.
4. Covered in all cases with a waterproof non-combustible material that will adhere to the wire, not fray by friction, and bear a temperature of 150° F. without softening.
5. In dry places, kept rigidly apart at least ten inches, except when covered (in addition to insulation) by waterproof, non-conducting and non-inflammable tubing, which must be strong enough to protect the insulating covering from injury. Conductors thus placed may be run not less than three inches apart, and be fastened with staples, under which are placed mechanically rigid insulating strips or saddles of greater width than the metal of the staple, by which possibility of injury to the tube may be prevented.
6. In damp places, attached to glass or porcelain insulators, and separated ten inches or more.
7. When passing through walls, floors, timbers or partitions, treated as in central stations under like conditions.

LAMPS AND OTHER DEVICES.

Arc lamps must be, in every case:

1. Carefully isolated from inflammable material.
2. Provided at all times with a glass globe surrounding the arc, securely fastened upon a closed base. No broken or cracked globes may be used.
3. Provided with a hand switch, also an automatic switch, that will shunt the current around the carbons should they fail to feed properly.
4. Provided with reliable stops to prevent carbons from falling out in case the clamps became loose.

[1] Adopted by the National Electric-Light Association at their Fourteenth Convention, held at Montreal, Canada, September 7, 8, 9, 10, 1891. Revised at their Fifteenth Convention, held at Buffalo, N. Y., February 23, 24, 25, 1892.

5. Carefully insulated from the circuit in all their exposed parts.

6. Where inflammable material is near or under the lamps, provided with a wire netting around the globe and a spark-arrester above, to prevent escape of sparks, melted copper or carbon.

Incandescent lamps in series circuits, having a maximum potential of 350 volts or over, must be governed by the same rules as for arc lights, and each series lamp provided with a hand switch and automatic cut-out switch; when lights are in multiple series, such switches and cut-outs must not control less than a single group of lights. Electro-magnetic devices for switches are not approved.

Under no circumstances will incandescent lamps on series circuits be allowed to be attached to gas fixtures.

CLASS C. — INCANDESCENT (LOW PRESSURE) SYSTEMS. 300 VOLTS OR LESS. — OVERHEAD CONDUCTORS.

Outside overhead conductors must be:

1. Erected in accordance with general rules for Arc (Series) Circuit Conductors.

2. Separated not less than six inches, where they enter buildings as service conductors, and be provided with a double pole fusible cut-out, as near as possible to the point of entrance to the building, and outside the walls when practicable.

UNDERGROUND CONDUCTORS.

Underground conductors must be:

1. Provided with suitable protecting devices at the ends of tube or conduit services inside the walls of buildings, as a guard against moisture and injury.

2. Terminated at a properly placed double-pole house cut-out.

3. Of specially insulated conductors after leaving the tube or conduit, and separated by at least ten inches, until the double-pole cut-out is reached.

INSIDE WIRING.

Wire should be so placed that in the event of the failure or deterioration of their insulating covering the conductors will still remain insulated.

At the entrance of every building there shall be a double-pole switch placed in the service conductors, whereby the current may be entirely cut off.

Conductors must not be:

1. Of sizes smaller than No. 16 B. & S., No. 18 B. W. G., or No. 3 E. S. G.

2. Lead or paraffine covered.

3. Covered with soft rubber tube.

4. Laid in mouldings of any kind in damp places.

5. Laid in mouldings with open grooves against the wall or ceiling.

6. Laid in mouldings where less than half an inch of solid insulation is between parallel wire, and between wires and walls or ceilings.

7. Laid in plaster, cement or similar finish, without an exterior metallic protection.

8. Mouldings, where admissible, must have at least two coatings of waterproof paint, to be impregnated with a moisture repellent.

Cleatwork is not desirable, and cleats must *not* be used unless:

1. In a very dry place.

2. In a place perfectly open for inspection at any time.

3. They are of porcelain, or well-seasoned wood, filled, to prevent absorption of moisture.

4. They are so arranged that wires of opposite polarity, with a difference of potential of 150 volts or less, will be kept at least two and one-half inches apart, and that where a higher voltage is used this distance be increased proportionately.

5. There is a backing provided of wood at least half an inch thick, well seasoned and filled, to prevent absorption of moisture.

Metal staples must never be used to fasten conductors unless:

1. Provided with an insulating sleeve or saddle rigidly attached to the metal of the staple, and having such strength and surface as to prevent mechanical injury to the insulation of the conductor.

2. Under conditions in which cleatwork would be acceptable, or where driven into a moulding specially adapted for open work.

SPECIAL WIRING.

Wherever conductors cross gas, water, or other metallic pipes, or any other conductors or conducting material (except arc-light wires), they should be separated therefrom by some continuous non-conductor at least one inch. In crossing arc-light wires the low-tension conductors must be placed at a distance of at least six inches. In wet places an air-space must be left between conductors and pipes in crossing, and the former must be run in such a way that they cannot come in contact with the pipe accidentally. Wires should be run *over* all pipes upon which condensed moisture is likely to gather, or which by leakage might cause trouble on a circuit.

In rooms where inflammable gases may exist, or where the atmosphere is damp, the incandescent lamp and socket should be enclosed in a vapor-tight globe. This is not to be understood to include rooms where illuminating gases are used in the ordinary manner.

In breweries, stables, dye-houses, paper and pulp mills, or other buildings specially liable to moisture, all conductors, except where used for pendants, must be:

1. Separated at least six inches.

2. Provided with a durable, moisture-proof covering.

3. Carefully put up.

4. Supported by porcelain or glass insulators.

Moisture-proof and non-inflammable tubing may be accepted in lieu of such construction.

No switches or fusible cut-outs will be allowed in such places.

Interior conduits must not be:

1. Combustible.

2. Of such material or construction that will be injured by plaster, cement, or other surrounding material, or that the insulation of the conductor will ultimately be injured or destroyed by the elements of its composition.

3. So constructed or placed that difficulty will be experienced in removing or replacing the conductors.

4. Subject to mechanical injury by saws, chisels or nails.

5. Supplied with a twin conductor in a single tube where a current of more than ten ampères is expected.

6. Depended upon for insulation. The conductors should be covered with moisture-proof material.

The object of a tube or conduit is to facilitate the insertion or extraction of the conductors, to protect them from mechanical injury and, as far as possible, from moisture.

Twin tube conductors must not be separated from each other by rubber or similar material, but by cotton, or other readily carbonizable substance.

Conductors passing through walls or ceilings must be encased in a suitable tubing, which must extend at least one inch beyond the finished surface until the mortar, or other similar material, be entirely dry, when the projection may be reduced to half an inch.

Double-pole safety cut-outs must be:

1. Placed where the overhead or underground conductors enter a building and join the inside wires.

2. Placed at every point where a change is made in the size of the wire (unless the cut-out in the larger wire will protect the smaller). This includes all flexible conductors. All such junctions must be in plain sight.

3. Constructed with bases of non-combustible and moisture-proof material.

4. So constructed and placed that an arc cannot be maintained between the terminals by the fusing of the metal.

5. So placed that on any combination-fixture no group of lamps requiring a current of six ampères or more shall be ultimately dependent upon one cut-out.

6. Wherever used for more than six ampères, (or where the plug or equivalent device is not used), equipped with fusible strips or wires, provided with contact surfaces or tips of harder metal, soldered or otherwise, having perfect electrical connection with the fusible part of the strip.

Safety-fuses must be so proportioned to the conductors they are intended to protect that they will melt before the maximum safe carrying-capacity of the wire is exceeded.

All fuses, where possible, must be stamped or otherwise marked with the number of ampères equal to the safe carrying-capacity of the wire they protect.

All cut-out blocks when installed must be similarly marked.

The safe carrying-capacity of a wire changes under different circumstances, being about forty per cent less when the wire is closed in a tube or piece of moulding than when bare and exposed to the air, when the heat is rapidly radiated. It must be clearly understood that the size of the fuse depends upon the size of the smallest conductor it protects, and not upon the amount of current to be used on the circuit. Below is a table showing the safe-carrying capacity of conductors of different sizes in Birmingham, Brown and Sharpe and Edison gauges, which must be followed in the placing of interior conductors.

Brown & Sharpe.		Birmingham.		Edison Standard.	
Gauge No.	Ampères.	Gauge No.	Ampères.	Gauge No.	Ampères.
0000	175	0000	175	200	175
000	145	000	150	180	160
00	120	00	130	140	135
0	100	0	110	110	110
1	95	1	95	90	95
2	70	2	85	80	85
3	60	3	75	65	75
4	50	4	65	55	65
5	45	5	60	50	60
6	35	6	50	40	50
7	30	7	45	30	40
8	25	8	35	25	35
10	20	10	30	20	30
12	15	12	20	12	20
14	10	14	15	8	15
16	5	16	10	5	10
		18	5	3	5

Switches must:

1. Be mounted on moisture-proof and incombustible bases, such as slate or porcelain.

2. Be double pole when the circuits which they control are connected to the fixtures attached to gas-pipes, and when six ampères or more are to pass through them.

3. Have a firm and secure contact, must make and break readily, and not stick when motion has once been imparted by the handle.

4. Have carrying-capacity sufficient to prevent heating above the surrounding atmosphere.

5. Be placed in dry, accessible places, and be grouped as far as possible, being mounted, when practicable, upon slate or equally indestructible backboards.

MOTORS.

In wiring for motive power, the same precautions must be taken as with the current of the same volume and potential for lighting. The motor and resistance-box must be protected by a double-pole cut-out and controlled by a double-pole switch.

Arc-lights on low potential circuits must be:

1. Supplied by branch conductors not smaller than No. 12 B. & S. gauge.
2. Connected with main conductors only through double-pole cut-outs.
3. Only furnished with such resistances or regulators as are enclosed in non-combustible material, such resistances being treated as sources of heat.
4. Supplied with globes protected as in the cases of arc-lights on high-potential circuits.

FIXTURE-WORK.

1. In all cases where conductors are concealed within or attached to fixtures, the latter must be insulated from the gas-pipe system of the building.
2. When wired outside, the conductors must be so secured as not to be cut or abraded by the pressure of the fastenings or motion of the fixtures.
3. All conductors for fixture-work must have a waterproof insulation that is durable and not easily abraded, and must not in any case be smaller than No. 16 B. & S., No. 18 B. W. G., or No. 3 E. S. G.
4. All burrs or fins must be removed before the conductors are drawn into a fixture.
5. The tendency to condensation within the pipes must be guarded against by sealing the upper end of the fixture.
6. No combination-fixture in which the conductors are concealed in a space less than one-fourth inch between the inside pipe and the outside casing will be approved.
7. Each fixture must be tested for possible "contacts" between conductors and fixture and for "short circuits" before the fixture is connected to its supply-conductors.
8. The ceiling-blocks of fixtures should be made of insulating material.

ELECTRIC GAS-LIGHTING.

Where electric gas-lighting is to be used on the same fixture with the electric-light:

1. No part of the gas piping or fixture shall be in electrical connection with the gas-lighting circuit.
2. The wires used with the fixture must have a non-inflammable insulation, or, where concealed between the pipe and shell of the fixture, the insulation must be such as is required for fixture-wiring for the electric-light.
3. The wires used with the fixture must have a non-inflammable insulation, or, where concealed between the pipe and shell of the fixture, the insulation must be such as is required for fixture-wiring for the electric-light.
4. The whole installation must test free from "grounds."
5. The two installations must test perfectly free of connection with each other.

PENDANTS AND SOCKETS.

No portion of the lamp-socket exposed to contact with outside objects must be allowed to come into electrical contact with either of the conductors.

Cord pendants must be:

1. Made of conductors, each of which is composed of several strands insulated from the other conductor by a mechanical separator of carbonizable material, and both surrounded in damp places with a moisture-proof and non-inflammable layer.
2. Protected by insulating bushings where the cord enters the socket.
3. So suspended that the entire weight of the socket and lamp will be borne by knots above the point where the cord comes through the ceiling-block or rosette, in order that the strain may be taken from the joints and binding screws. All sockets used for wire or cord pendants should have openings at least equal to one-quarter-inch gas-pipe size.
4. Allowed to sustain nothing heavier than a four-light cluster, and in such a case special provision should be made by an extra heavy cord or wire as a mechanical reinforcement.
5. Equipped with keyless sockets, as far as practicable, controlled by wall-switches. In no case may a lamp giving more than fifty-candle power be placed in a key socket on a flexible pendant.

CLASS D. — ALTERNATING SYSTEMS. — CONVERTERS OR TRANSFORMERS.

Converters must not:

1. Be placed inside of any building, except the Central Station, unless as hereinafter provided.
2. Be placed in any but metallic or non-combustible cases.
3. Be attached to the outside walls of buildings unless separated therefrom by substantial insulating supports.
4. Be placed in any other than a dry and convenient location (which can be secured from opening into the interior of the building, such as a vault) when an underground service is used.
5. Be placed without safety-fuses at the junction between main and service conductors, and safety-fuses in the secondary circuits where they will not be affected by the heat of the converter.

PRIMARY CONDUCTORS.

In those cases where it may not be possible to exclude the transformers and primary wires entirely from the building, the following precautions must be strictly observed:

1. The transformer must be located at a point as near as possible to that at which the primary wires enter the building.
2. Between these points the conductors must be heavily insulated with a coating of moisture-proof material, and, in addition, must be so covered and protected that mechanical injury to them or contact with them shall be practically impossible.
3. The primary conductors, if within a building, must be furnished with a double-pole switch, and also with an automatic double-pole cut-out where the wires enter the building, or where they leave the main line on the pole or in the conduit. These switches should, if possible, be enclosed in secure and fireproof boxes outside the building.
4. The primary conductors, when inside a building, must be kept apart at least ten inches, and at the same distance from all other conducting bodies.

SECONDARY CONDUCTORS.

The conductors from the secondary coil of the transformer to the lamps or other translating devices must be installed according to the rules for "inside wiring" for "low-potential systems."

CLASS E. — ELECTRIC-RAILWAYS: POWER-STATIONS.

All rules pertaining to arc-light wires and stations shall apply (so far as practicable) to street-railway power-stations and their conductors.

RAILWAY SYSTEMS WITH GROUND RETURN.

Electric-railway systems in which the motor-cars are driven by a current from a single wire, with ground or floor return circuit, are prohibited, *except* as hereinafter provided:

1. When there is no liability of other conductors coming in contact with the trolley-wire.
2. When the location of the generator is such that the ground circuit will not create a fire-hazard to the property.
3. When an approved automatic circuit-breaker or other device that will immediately cut off the current in case the trolley-wires become grounded is introduced in each circuit as it leaves the power-station. This device must be mounted on a fireproof base and be in full view of the attendant.

TROLLEY-WIRES.

Trolley-wires must be:

1. No smaller than No. 0 B. & S., copper, or No. 4 B. & S., silicon-bronze, and must readily stand the strain put upon them when in use.
2. Well insulated from their supports, and in case of the side or double-pole construction, the supports shall also be insulated from the poles immediately outside the trolley-wire.
3. Capable of being disconnected at the power-house, or of being divided into sections, so that, in case of fire on the railway route, the current may be shut off from the particular section, and not interfere with the work of the firemen in extinguishing the flames. This rule also applies to feeders.
4. Safely protected against contact with all other conductors.

CAR WIRING.

All wires in cars must be run out of reach of the passengers, and shall be insulated with a waterproof insulation.

LIGHTING AND RAILWAY POWER-WIRES.

Lighting and power wires must not be permitted in the same circuit with trolley-wires with a ground return, except in street-railway cars, car-houses and power-stations. The same dynamo may be used for both purposes, provided the connection from the dynamo for each circuit shall be a double-pole switch so arranged that only one of the circuits can be in use at the same time.

CLASS F. — BATTERIES.

When current for light and power is taken from primary or secondary batteries, the same general regulations must be observed as apply to such wires fed from dynamo generators developing the same difference of potential.

CLASS G. — MISCELLANEOUS.

1. The wiring in any building must test free from "grounds" before the current is turned on. This test may be made with a magneto-bell that will ring through a resistance of 20,000 ohms where currents of less than 250 volts are used.
2. No ground wires for lightning-arresters may be attached to gas-pipes within the building.
3. All conductors connecting with telephone, district-messenger,

burglar-alarm, watch-clock, electric-time and other similar instruments, must, if in any portion of their length they are liable to become crossed with circuits carrying currents for light or power, be provided near the point of entrance to the building with some protective device which will operate to shunt the instruments in case of a dangerous rise of potential, and will open the circuit and arrest an abnormal current flow. Any conductor normally forming an innocuous circuit may become a source of fire-hazard if crossed with another conductor through which it may become charged with a relatively high pressure.

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M. D. LAW,
STEPHEN E. BARTON,
WM. BROPHY,
T. CARPENTER SMITH,
} *Committee Reporting to 14th Convention.*

M. D. LAW, *Chairman*,
WM. BROPHY,
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: PARIS :

THE WATER-SUPPLY. — WHAT IS TO BE DONE WITH THE SITE OF THE RUINED COUR DES COMPTES.

I HAD occasion to speak at the end of last year (No. 884) of the works undertaken to bring to Paris the waters of the Avre. To-day this is an accomplished fact, and since the first of April the city has had the use of 100,000 cubic metres more of sweet water each year which raises the total to 500,000 cubic metres. The introduction of the water of the Avre, which is excellent and less calcareous than that of the Vanne and the Dhuys, is only the beginning of a scheme adopted January 26, 1885 by the Municipal Council, which provides for the diversion of the waters of the Avre, of the Loing, of the Lunain and of the Voulzie (Seine-et-Marne).

The first step in this undertaking is already realized. The appropriation of 35,000,000 francs made for the work has hardly been trenched upon, and there will need at least two years more work to bring this great undertaking to completion. The works consist of three distinct portions. First, protecting the sources and building the aqueducts which lead to St. Cloud; second, construction of the reservoirs at Montretout; and third, piping from the reservoir to the interior of Paris. The sources of the water-supply thus secured form two groups, that of the Breuil in the Department of Eure, and that of the Vigne, a little branch of the Avre, including also five other sources of supply in the Department of Eure-et-Loir. These different waters have been gathered by means of aqueducts into a group at one point, which serves as a general point of departure for the great aqueduct, with a capacity of 1,280 metres per second, leading to Paris. This aqueduct has a total length of 102 kilometres, 100 metres. It follows the hillsides as far as the Eure, which it crosses just beyond Dreux, near Montreuil; then cuts through the forest of Dreux, follows the plateau of Mantais, traverses several valleys and small rivers, penetrates at the northwest end the great park at Versailles, crosses the circuit railroad, and then, underground, passes to Marnes, near the Railroad of Etang-la-Ville for a length of eight kilometres, with a siphon under the road from St. Cloud to Vaucresson. It then continues once more underground for 1,600 metres under the town of Garches, and finally empties into the reservoirs at Montretout. The total amount of trenching amounted to 60,000 metres, of which 30,100 were subterranean tunnelling. Forty-seven hundred metres lie above ground, borne either in covered or on open arcadings, of which amount only 1,300 metres are carried on open arcades. To this must be added 7,640 metres for the siphon. The grade varies between 0m.40 and 0m.30 per kilometre.

The awarding of the work took place February 20, 1891, and work was begun in April, and was continued with an assurance and rapidity which was truly remarkable. Work advanced more than six kilometres a month. I have already spoken of the manner in which these conduits were arranged. The storage-reservoirs were built during the same time. They are built on the north slope of the hillside of Montretout, in the great plain which separates it from Mont-Valerien. Their capacity is 300,000 cubic metres, divided among the three compartments, only one of which is now finished: the others will be shortly. The type adopted at Montretout is the same as that at Menilmontant. The reservoir opened March 30, is 188 metres long by 145 wide. It is covered, as usual, by small vaults four metres square, resting on piers and themselves supporting a thickness of 0m.40 of greensward. The walls are six metres high, and their thickness varies between 2.95 metres at the foot and 1.50 metres at the crown. This reservoir is 107 metres above the sea level; that is about forty metres lower than the point of departure, which is 140.30 metres above sea level. The conduit leading from the reservoirs to Paris first passes under the Versailles railroad in a gallery supported on arches and arcades. It then crosses the Seine on an aqueduct just in front of the Porte du Bois de Boulogne, called the Porte de St. Cloud, descends into a trench, and following the Boulevard de Boulogne to Paris, it arrives at the Porte d'Auteuil. At this point the finished conduit passes along the Boulevard Suchet to Auteuil, arrives at the rond-point of La Muette, and from there passes to the Avenue Victor Hugo, where it is subdivided. One branch passes to the reservoirs in the Rue Copernic, another continues to the Place de l'Etoile, where it is connected with the main conduits containing the waters of the Dhuys. Two other branches are to be laid later.

The conduit to-day finished has been built in such a manner as to supply a volume of water amounting to 1800 metres a second at a velocity of one metre. The section of the conduit is equivalent to 1.80 metres square, with a diameter of 1.50 metres; that is, in that portion between the reservoir at St. Cloud and the Port d'Auteuil. Inside the walls of Paris the diameter diminishes to 1.10 metres as far as to the Place Victor Hugo, while the two branches which separate at this point are only 0.80 metres in diameter. This huge conduit is subject to a considerable pressure, which amounts to eight atmospheres at the banks of the Seine, and as no one could think of trusting to cast-iron under such circumstances, the conduit has been made of sheet steel.

This gives a general account of the great work which has just been finished, the plans for which were prepared by Mr. Bechmann, engineer-in-chief of the water service, and M. Humblot, inspector-general; and M.M. Bienvenue, Renaud, Geslein and Legouez are the engineers who have carried out the work.

The opening of the reservoir took place March 30, and gave the excuse for a little fête of a very original character prepared by the Municipal Council. The empty reservoir was brilliantly lighted by many rows of colored lights, which were strung along the arrises of the vaults. At the level of the canal one could see the newly captured water and admire its absolute limpidity. Perhaps the feasters would have enjoyed being the first to taste it; but in place of pure water the Municipal Council offered to its guests that more official and classic wine, champagne. The ceremonies were finished by crossing over the Seine on the metallic bridge which supports the conduit. A notion of the pressure of the water was here given to those present by allowing some of it to escape in splendid jets falling into the Seine, which must have been much surprised at receiving so near Paris water so fresh and pure.

Since 1871, the ruins of the Cour des Comptes, burned by the Communists, has reared its shattered and blackened walls, a mournful spectacle, a lugubrious souvenir. Grass has taken possession of the ruins. The seeds of shrubs have been borne thither by the wind and have sprouted and prospered until they are now veritable trees just now turning green with the spring sap. The discouraging persistence with which these ruins have been maintained has furnished a certain satirical journal the idea of saying that as Paris lacks a virgin forest, they desire in this way to secure one for the capital. Nevertheless, a bill was brought forward October 21, 1891, granting the site of the Cour des Comptes to the Union Centrale des Arts Décoratifs. Lately the Senate voted a meagre enough appropriation for the maintenance of civil buildings, amounting to 798,000 francs, and for certain extensive repairs amounting to 593,000 francs. On this, M. Hervé de Saisy asked leave to question the Minister of Public Works on the matter of the Cour des Comptes. He desired to know whether the arrangement concerning the Union Centrale des Arts Décoratifs still held good, and in case it did, whether it had been modified, and whether the Government had any idea tending to the adoption of another and more useful project, more in conformity with the advantages offered by the site. The reporter of the bill, M. Guerin, replied in the following words: "Gentlemen, I understand the haste of our honorable colleague, M. Hervé de Saisy, to see restored the monument on the Quai d'Orsy. I must inform the Senate that the financial committee has before it at this moment a two-fold project. The first one looks to the approval of the convention arranged between the Government and the Union Centrale des Arts Décoratifs. The second looks to the voting of 2,200,000 francs for the installation of the Cour des Comptes in the Pavillon de Marsan in the Tuileries. Your Committee on Finance has declared against both these projects and the report is upon the point of being disposed of, and I shall later, gentlemen, submit the conclusion of our deliberations to the consideration of the Senate." This informs us that a report is to be made shortly by the Committee on Finance of the Senate, and that this report condemns the project of installing the Musée des Arts Décoratifs on the Quai d'Orsy. But when, after all, will they free us from these lugubrious ruins? Parisians have had about enough of them.

NEW YORK CITY HALL. — Gov. Flower has approved the four bills providing for the removal of the City Hall to Bryant Park and establishing the Tilden Trust and transferring the City Hall to it. — *Exchange.*

COMPARATIVE MUNICIPAL BUILDING LAWS.—XXVI.

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

Wooden Buildings: Permits, Changes, Dimensions, Location.

Boston:—*a*. No alteration or repair to *Third-class Building within building-limits* without permit from Inspector.

b. No permit for increased height or area of such building.

c. No alteration or repair to *Third-class Building* to cost more than 50 per cent of cost of renewing building.

d. No *Third-class Building* moved to position within fire-limits.

e. *Used as dwelling*, maximum height above street-grade, 45′,

f. Not nearer than 1′ 6″ to lot-line unless

g. Made of brick at least 8″ thick, built up to under side of roof-covering, said covering imbedded in mortar on wall, or built 12″ above roof and covered with metal.

h. Not less than 3′ 0″ from dwelling-house on adjoining lot.

i. *Wooden L to dwelling*, maximum height, 25′; maximum area, 450 square feet. (Such L may be built without brick wall between it and main house.)

j. *Other than dwelling*, maximum height, 55′.

k. No wall thereof nearer than 4′ to any other wooden building less than 25′ in height, nor nearer than 10′ to any other wooden building more than 25′ in height (*exception*, unless made of brick not less than 12″ thick, built to under-side of roof-covering, which shall be imbedded in mortar of wall, or built 12″ above roof and covered with metal). Exception does not apply to stables.

Requirements *e*, *f*, *g*, *h*, *i*, *j*, *k* do not apply to buildings 50′ or more from every other building or public passage.

Baltimore:—*l*. No repairs or alteration of frame building exceeding 50 per cent of value of building, exclusive of foundation. No frame bath-room or shed erected within 5′ of any similar construction composed wholly or partly of wood unless end facing such structure shall be covered with fireproof material, and never less than 3′ between.

Brooklyn:—*aa*. Damaged by fire to one-half value of building shall be taken down.

Charleston:—

Chicago:—*m*. *Frame buildings having rear addition lower than main building*, permit may be given to raise addition to same height if area of building is not increased. (Permission first obtained from Commissioner). (*aa*).

Cincinnati:—*n*. Old building shall not be repaired or rebuilt exceeding one-half building (measured in cubic feet).

Cleveland:—(*n*).

Denver:—*o*. Wooden buildings within fire-limits may be altered in manner approved by Inspector, provided height and area are not increased.

p. No wooden building moved to position within fire-limits.

Detroit:—

District of Columbia:—*q*. Wooden building may be erected outside fire-limits, *provided* that on land plotted in town lots no wooden building shall be placed within 24′ of any house built of brick or other incombustible material.

r. Maximum size, two stories and mansard, or three stories to square thereof.

s. No wooden building for mechanical business or stable placed within 30′ of a dwelling, and subject to special restrictions by Inspector.

t. Inspector will give permit for repairs not to exceed one-half original value. A flat roof may be substituted for gravel or pitch.

Kansas City:—(*o*); (*p*).

Within fire-limits in certain localities, wooden buildings may be built, provided written consent is obtained from property-owners of two-thirds of frontage of block, and approved by Superintendent, City Engineer and Chief of Fire-department.

Outside fire-limits, wooden buildings are erected subject to regulation.

Dwellings, maximum height, 35′, external wall not less than 1′ 6″ from lot-line unless a brick is substituted according to regulations for brick buildings, built up to under-side of roof-covering, which shall be imbedded on wall in mortar.

External wooden wall shall be at least 3′ from wooden wall of dwelling already erected on adjacent lot.

Wooden L's connected to wooden dwellings shall not exceed, length, 30′, width, 15′, height, 25′, area, 450 square feet.

Other than dwellings, maximum height, 45′ from street-grade, not less than 10′ from any other wooden building exceeding 25′ high, or less than 4′ from any wooden building.

(The above restrictions do not apply to buildings 50′ distant from any other building and from street.)

Louisville:—No frame building enlarged or altered to exceed 50 per cent of valuation until written permission is obtained from all parties owning permanent brick or stone structures within 60′ from proposed location. Wooden structures not more than two stories high (or 28′ above grade) may be erected in rear of lot, with space of 2′ between walls and lot-lines, and, if flat roof, covered with metal.

Memphis:—

Milwaukee:—Frame building within fire-limits damaged to exceed 50 per cent of value shall not be repaired.

Minneapolis:—*Within fire-limits*, no frame building repaired when damaged to extent of 40 per cent of value.

Within city limits, no wooden building removed if building is worth less than 60 per cent cost of similar new building.

(*h*) except approved by Inspector and permit issued.

Nashville:—Permit for frame building outside fire-limits shall only be given upon written application accompanied by recommendation of at least one property-owner on each side of proposed location unless Commissioners judge such recommendation to be withheld maliciously.

All laws governing chimneys, trimmer-arches, proximity of wood to flues, setting steam-boilers, heating by steam or hot air, and other matters pertaining to fire-prevention within Fire-district, apply to all buildings outside.

Newark:—(*e*).

New Orleans:—

New York:—12th, 23d *and* 24th *wards*, frame buildings with shingle roofs and 12″ brick foundations permitted. No frame building to be occupied by more than two families.

No wooden building moved without sworn petition and approval. (*h*); (*e*).

u. No frame building used as dwelling shall be used for other purpose unless altered to conform to law.

Omaha:—*Outside fire-limits*, wooden *dwelling-house*, maximum height, 30′, and without basement, external wall not less than 1′ 6″ from lot-line unless brick external wall is substituted not less than 8″ thick, built to under-side of roof-covering, which is bedded in mortar. There shall not be less than 3′ clear between two wooden dwellings.

Other than dwellings, that distance not less than 4′.

Philadelphia:—

Pittsburgh:—

Providence:—(See "*Wooden Structures Allowed.*")

In Second District, frame buildings used for *dwellings* only, maximum height, 40′, no part of wall less than 5′ from lot-line nor less than 5′ from any adjoining building unless such wall shall be built of brick 8″ thick, or space between studs filled with incombustible material from sill to roof-boards.

Wooden buildings other than dwellings must conform to regulations (height, area and construction) for such buildings in First District, except that building must be 5′ or more from side or rear lot-line unless space between studs on sides and rear is filled with incombustible material.

No wooden building removed into First District from without.

St. Louis:—

San Francisco:—(*n*). Permits for frame buildings within *fire-limits* are void unless work is begun within ten days. Maximum height (except churches), 65′ from sidewalk-line through centre of façade. Roofs covered with fireproof material.

Wilmington:—

Wooden Buildings: Construction.

Boston:—*a*. Foundation to be of stone or brick carried up to surface of ground; if of brick, not less than 12″ thick, laid in cement-mortar; if of rubble-stone, not less than 16″ laid in cement nor less than 20″ laid dry; if of block-stone, not less than 16″, laid in cement.

b. Foundations not less than 4′ below surface exposed to frost, and upon solid ground, or upon at least one row of piles not over 3′ on centres, driven to solid bearing, tops cut off at proper grade, capped with footing-course of stone, or rest on other solid superstructure.

c. Building used as workshop or similar purpose, or temporary structure on soft land, foundation may consist of mud-sill or piles cut to grade, or as Inspector determines.

d. Built with posts, girts and plates, properly mortised, tenoned, braced and pinned at each story, supported by suitable studs not more than 32″ apart. If building exceeds 400 square feet area and 15′ in height, posts and girts not less than 4″ by 8″.

e. Wooden building, block of two or more *dwellings*, to have brick walls between houses not less than 8″ thick, built up to under-side of roof-covering, which shall be laid and imbedded in mortar upon wall, or built 12″ above roof and

f. Covered with metal.

g. Other than *dwelling*, in block, range of more than 50′ shall have intercepting wall not less than 12″, and finished off as specified in *e*.

h. Requirements in *e* and *f* and *g* do not apply to structures 50′ from other building or public passage.

Baltimore:—

Brooklyn:—

Charleston:—Wooden building erected on territory south of Calhoun Street shall be at least two stories high, and all inner walls and ceilings lathed and plastered and covered with slate or incombustible material.

Chicago:—

Cincinnati:—*i*. Wooden buildings in block of two or more shall have division or party walls of incombustible material, walls to extend up to under-side of roof-boards.

Cleveland:—(*i*).

Denver:—

Detroit:—

District of Columbia:—No wooden dwelling for dwelling purposes more than 50′ long without intervening brick partition-wall at least 9″ thick, and carried 6″ above roof whether flat or pitched. Wooden buildings shall be built upon stone or brick foundations.

Kansas City:—(*e*) at discretion of Superintendent.

Sills of wooden buildings shall not be laid below grade of street without special permit from Superintendent.

Restrictions do not apply to buildings 50′ or more from any other building or street.

Wooden buildings with cellars shall be built upon secure foundations of brick or stone carried up to surface of ground. Foundation of brick not less than 12″ thick, laid in mortar, or of stone not less than 16″ thick.

Wooden buildings without cellars may be built on suitable posts or piers set not less than 3′ in ground and at proper distances apart.

(*c*) *i. e.*, Superintendent decides.

Frame buildings over 25′ high, outside studding not less than 2″ by 6″, not more than 16″ on centres, well stud-braced throughout, covered with outside sheathing.

Altered and enlarged subject to these restrictions.

Louisville:—

Memphis:—*Frame buildings more than one story* high shall have brick foundations or piers of not less than 1½ brick or 13″ walls.

If one story, brick foundations or piers of not less than 1 brick or 9″ wall.

Distance between lower edge of sills or joists and ground not less than 2′, and space properly ventilated to prevent decay of timber.

Milwaukee:—

Minneapolis:—

Nashville:—Frame buildings damaged more than 50 per cent not to be repaired.

Newark:—

New Orleans:—Frame dwellings built or repaired shall have upper portions of joists not less than 3′ from surface of ground.

New York:—

Omaha:—Wooden buildings in blocks of two or more *dwellings* shall have intercepting walls not less than 8″ thick carried up and topped 12″ above roof with proper coping.

Sills laid at least 8″ above street-grade.

Wooden buildings built upon secure foundations of stone or brick carried up to surface of ground.

Buildings exceeding in area 25′ by 40′ shall have 12″ foundation-walls.

Frame tenements in blocks of two or more with basement or cellars shall have at least 12″ outside walls and not less than 8″ division-walls.

Frame buildings shall have solid timber sills of suitable dimensions, studding thoroughly braced.

Fire-stop cut around exterior wall below ribbon of thickness and width of studding.

Partitions more than 10′ high shall be bridged at least once in height same width of material as partitions.

Philadelphia:—

Pittsburgh:—

Providence:—(See "*Wooden Structures Allowed.*")

In First District, roofs, if nearly flat, covered with incombustible material, pitched roofs not to exceed 10′ above sides or 30′ from ground to highest part. Shingles on pitched roof, laid upon covering of good mortar not less than ¼″ thick.

Party or division walls between all adjoining wooden houses 35′ or more high of brick not less than 12″ thick to top of second floor above street and 8″ thick remaining height. Such walls less than 35′ high not less than 8″ thick. In dwellings, brick wall shall be built up to roof-covering, which shall be laid in mortar or cement upon wall.

St. Louis:—

San Francisco:—Foundations for frame buildings, if of brick, *one-story building*, 8″ thick; *two or three stories*, 12″; *four or five stories*, 16″.

If there are no cross-walls, piers shall project, maximum distance apart, 16′; minimum projection, 8″; minimum face, 2′ 4″. Chimney-breasts carried out are considered piers. Main longitudinal or bearing partitions underpinned same as outside walls.

Outer walls to be formed with studding covered with weather-boarding. Studding not placed against weather-boarding of adjacent building or against brickwork.

Minimum size of studding, for one-story building, 2″ by 4″; for two-story building, 2″ by 4″ and 3″ by 4″ alternately; for three-story building, 2″ by 6″; for four-story building, 3″ by 6″ for two stories and 2″ by 6″ above.

Foundations or underpinning formed with black-butt redwood, and underpinning in no case less than 3″ by full width of studding.

Joists shall rest on outside walls except where trimmed for stair and other openings.

Should it be impracticable to rest joists at each end on outside walls, the bearing partition or girder shall have same strength as outside wall.

For factories, studding of outside walls, minimum size, wall not exceeding 14′, 2″ by 6″; height 14′ to 18′, 3″ by 6″; height 18′ to 25′, 3″ by 8″; all properly braced and framed together.

Distance apart of studs for factories not to exceed 2′ 0″, well bridged and braced; for dwellings, 20″ on centres set upon the plates, upon which joists rest where it is practicable.

No framed building used as dwelling shall be used as factory or other purpose except it be altered to conform to ordinances.

When a wooden building is raised, it shall have 12″ foundation-wall placed beneath and built-up to curb-level.

Frame buildings shall have not less than two rows of *bridging* in each story, extending around outside frame and through all dividing partitions between two or more buildings or between tenements in large building. Bridging always same breadth as studding, flush on both sides. Intermediate partitions shall have one row of similar bridging.

If girths are used, a row of solid bridging at ceiling-line. If studding is cross-furred, bridging shall finish flush with face of furring.

Dividing partitions between buildings, close-boarded from lower floor to ground and from upper ceiling to under-side of roof-boarding. Such boarding of red-wood, and to effectually check all connection between buildings.

In a large building divided into tenements, the boarding shall be applied to dividing partition. Distance apart of each dividing partition not to exceed 25′.

Wilmington : —

Stand-pipes, etc.

Boston : — *a. Every theatre* shall have at least two 2″ high-service stand-pipes on stage, with ample provisions of hose and nozzles at each level of stage on each side, and water shall be kept turned on during occupation of building by audience. Said pipes shall have two gates, one above the other, with proper test and waste valve, the lower gate kept open at all times.

Baltimore : —

Brooklyn : —

Charleston : —

Chicago : — *b. Business buildings more than 56′ high covering area of more than 5,000 square feet, also all buildings exceeding 30′ high*, shall have 2½″ (or larger) metallic stand-pipe within or near front wall, extending above roof, arranged so that engine-hose can be attached at street.

c. All hose-couplings shall conform to size and pattern adopted by Fire Department.

d. Places of public amusement seating over 500, with platform and stage, using drop-curtains or shifting-scenery,

e. Shall have water stand-pipe and water-plug on stage or platform, or in immediate vicinity, connected with water-pipes or street-main, put in under direction and to the satisfaction of Fire Marshal and Commissioner. Hose attached to stand-pipe, of size directed by Marshal, with nozzle and stop-cock.

f. Hose of length to reach farthest limit of place of amusement, at all times in repair, filled with water and ready for use.

g. Public halls accommodating 1,000 or more shall have at least one stand-pipe in street or alley, on outside of building, from ground to roof, with hose attachments close to window or door on each floor or gallery.

h. Such halls provided with fire-alarm telegraph connected with headquarters city fire-alarm, or such other places as Marshal shall direct.

i. Such halls provided with fire-extinguishing apparatus of kind and position directed by Fire Marshal.

Cincinnati : — *j. Buildings used for public entertainment* (*e*).

k. Hose of length to reach farthest limit of building, kept in good order, ready for use.

l. Buildings used for public entertainment accommodating 1,000 or more, and all buildings more than 80′ high covering area of more than 5,000 square feet, shall have proper 2½″ metallic stand pipe on outside of building, accessible from street or alley, extending above roof, so arranged that fire-engines may be attached. (*e*).

Cleveland : — (*j*); (*e*); (*k*); (*l*); (*e*).

Denver : — *m. Buildings more than three stories high, except such as are used exclusively for private residences, and all public buildings and halls accommodating 1,000 or more*, shall have metallic stand-pipe not less than 2½″ diameter, extending above roof, arranged so that engine-hose can be readily attached from street or alley, with proper valves and hose-coupling on each floor.

(*e*). (See "*Theatres.*")

Detroit : —

District of Columbia : — *n. In all public places of amusement* shall be kept attached to plug or water attachment sufficient hose to extend to farthest limits of place of amusement, in good order and repair, ready for immediate use. (*e*). (See "*Fire-escapes.*")

Kansas City : — (See "*Fire-escapes.*") *o. In buildings where fire-escapes are required*, every story above second shall be supplied with means of extinguishing fire — either pails of water, portable apparatus, outside stand-pipes or hose attached to suitable water-supply, and capable of reaching any part of such story; all kept at all times ready for use. (*a*), except when testing upper gate to ascertain if it is in order to use.

Louisville : — *p. Theatres, school-houses, hotels, public halls and public buildings* shall have one or more water stand-pipes or water-plugs, with sufficient hose to reach farthest limits of building, not less than 2½″ diameter, with all necessary hose and fittings attached to plug or stand-pipe as Inspector, with advice of Fire Chief, may from time to time direct. (*b*); (*e*).

Memphis : — *Theatres, etc., q.* Stand-pipes with hose-attachments on every floor and gallery, on each side of auditorium in each tier,

r. Also one on each side of stage in each tier,

s. At least one in property-room and

t. One in carpenter's shop, if same be contiguous to theatre, and all kept free from obstruction.

u. Stand-pipes shall be kept constantly filled with water by automatic steam-pump or pumps of capacity to supply all lines of hose when operated simultaneously, said pump or pumps ready for immediate use during all performances.

v. Sufficient hose (not less than 50′) with nozzle attached, always attached to hose-attachment.

w. Buckets of water, hand-pumps and portable extinguishers and four axes kept ready on stage.

Milwaukee : — (*b*); (*e*).

(*d*); (*e*) nozzle and stop-cock attached,

(*f*) tested once a month and placed upon automatic reels. (*g*); (*h*).

Minneapolis : — *Theatres* (*e*). (For "*Commissioner*" read "*Inspector.*") Hose of length to extend to farthest limits of building or place of amusement, in good order and repair. (*g*).

(*q*); (*s*); (*t*); (*u*); (*v*); (*w*) and four axes on each tier or floor.

Nashville: —

Newark : —

New Orleans : —

New York : — *Buildings for public entertainments where stage scenery and apparatus are used*, (*q*); (*r*); (*s*); (*t*); (*u*); (*v*); (*w*).

Omaha : — (See "*Fire-escapes.*") Such buildings shall have water stand-pipe placed on stage platform, or its immediate vicinity, connected with water-pipes or street-mains, put in under direction of Chief of Fire Department and Superintendent of Buildings. Hose attached to stand-pipes as directed by Chief of Fire Department to have shut-off nozzles attached. (*f*); (*h*); (*q*); (*r*); (*s*); (*t*); (*w*).

Philadelphia : — *Arch St. Theatre, Walnut St. Theatre, Chestnut St. Theatre, American Theatre, Academy of Music, German Theatre* to keep attached to water-plug or attachment when open to public, hose to extend to farthest limit of place of amusement, in good order, ready for use. (*e*).

Pittsburgh : —

Providence: — *Buildings more than 50′ high or covering more than 5 000 square feet area, except dwellings and churches*, shall have at least one 2½″ metallic stand-pipe, with hose-coupling or hose and sprinkling-pipes, accessible from main stairway on each floor, extending above roof, and arranged so that engine-hose can be attached in street. (*e*), dwellings and churches excepted.

Hose-coupling and hose or sprinkling-pipes accessible from main stairway at each floor.

Building or hall for performances requiring use of inflammable materials, stage, etc., shall be provided with two or more stand-pipes at least 2½″ diameter, located as approved by Inspector, to each attached length of hose or sprinkling-pipe to reach every part of stage, audience-room and connections. When stage or hall is in use stand-pipes shall have water turned on and person stationed at hose ready for service.

St. Louis : — (See "*Fire-escapes.*")

On platform or stage of all *public halls, theatres and concert-rooms* there shall be maintained, in good working order, not less than two 3″ stand-pipes connected directly with water-pipe in adjacent street or alley. (*e*); (*e*).

San Francisco : — *Buildings more than three stories high used as stores, warehouses, hotels, lodging-houses or theatre* shall have 4″ metallic stand-pipe within or near front wall, extending from 4′ above sidewalk to line of roof, with proper branches and gate-valves at each story, and with Siamese inlet at line of sidewalk. (*e.*)

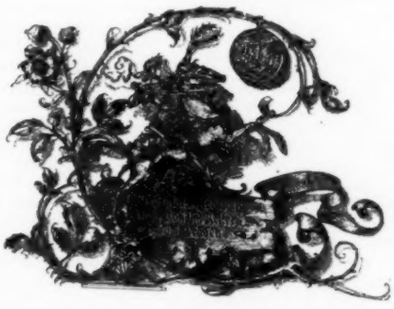
Theatres and places of public assembly, (*q*); (*r*); (*s*).

Stand-pipes not less than 4″ diameter, kept full of water, with pressure direct from street-main; 100′ of rubber hose with nozzles (*e*) at each hose-connection ready for use, and on stage on each side, twelve buckets of water, two Johnson pumps, six or more Babcock or other fire-extinguishers; also two axes and two fire-hooks all in full view.

Wilmington : —

Compiled by HENRY A. PHILLIPS.

EUROPEAN CANALS.



Emblem of the Corporation of Gold-beaters. From the *Revue des Arts décoratifs.*

AMONG the canals constructed for the purpose of establishing a shorter and quicker connection between different seas, the North Sea-Baltic Canal deserves special notice. As early as in the Middle Ages there was a question about connecting the North Sea with the Baltic by means of a navigable canal, whereby the long and dangerous sail round the Scaw could be avoided. During the years 1391–1398 the still-existing Stekenitz Canal was constructed; this connects the River Stekenitz, which enters the Trave at Lübeck, with the River Delvenau, which enters the Elbe at Lauenburg. In the year 1525 the Alster-Trave Canal was completed, only, however, to be again destroyed in 1550. These canals were only intended for river-boats, but Prince Frederick of Denmark succeeded in establishing a connection for sea-going vessels through the building of the Eider Canal (1777–1785). Still this canal was not of sufficient dimensions to be of any use for war-vessels and large merchant-vessels. When, however, Germany's desire to have an efficient connection for the use of her North Sea and her Baltic fleet became predominant, Herr Leutze, in 1865, produced a plan for such a canal, selecting for its two mouths St. Margarethe, on the Elbe, and the Eckernförde firth on the east coast of Sleswick. It having in the meantime been decided to make Kiel a naval port, Herr Leutze altered his plan accordingly. This plan was afterwards, with the permission of the Prussian authorities, further developed by a Hamburg merchant, Herr H. Dahlström, and, the State having taken up the matter, it was eventually completed by Herr Baensch, whose plan, entailing a calculated expenditure of 7,800,000*l.*, was almost unanimously passed by the German Parliament. In 1887 (June 3) the German Emperor, William I, laid the foundation-stone, and since then the work has progressed satisfactorily, in accordance with the original plan.

Of other similar canals only the Corinth Canal has been commenced. The plan of shortening the way for vessels coming from the western part of the Adriatic and the Mediterranean, and bound for the Greek Archipelago or the Black Sea (or *vice versâ*), by cutting through the Isthmus of Corinth, is a very ancient one. As early as B. C. 625 it was under contemplation, and was then allowed to rest for about a century, partly on account of the political disturbances of Greece, and partly from the belief that the level of the sea on the west coast was considerably higher than the level of the sea on the east coast. The conquest of Greece by the Romans gave a great impetus to the shipping from west to east, and again drew attention to the great benefits which a Corinth Canal would confer. Both Julius Cæsar and Caligula are understood to have seriously considered the matter, but Nero was the first to actually take the matter in hand, probably in A. D. 67, as remnants of work are still found. These include excavations extending over about a mile on the Ægina side, at the other terminus an aqueduct of about a mile's length, and in the centre holes from twenty feet to thirty feet deep. No doubt this large undertaking was started with considerable energy, but owing to political complications it was soon interrupted, and after Nero's death the matter was allowed to remain in abeyance for some 1800 years.

In 1881, General Pür read a treatise on the cutting through of the Corinth Isthmus before the Geographical Congress at Venice, the congress unanimously giving its verdict in favor of this canal being realized. General Pür the same year obtained a concession from the Greek Government, and the Hungarian engineer, Bela Gerster, worked out three plans, the one resembling Nero's plan being chosen. It is about four miles long, and cuts in an almost straight line through

the isthmus from northwest (Posidonia) to southeast (Isthmia). The calculated expenses were 1,200,000*l.*, which were to be raised through the Comptoir d'Escompte in Paris. The work was commenced in April, 1892, by the "Société des Travaux Maritimes et de Construction," but had to be discontinued on the occasion of the Comptoir d' Escompte's failure in 1889, at which time the calculations had already been far exceeded. A Greek company was, however, subsequently formed, and the time for the completion of the canal has been prolonged till December 31, 1894.

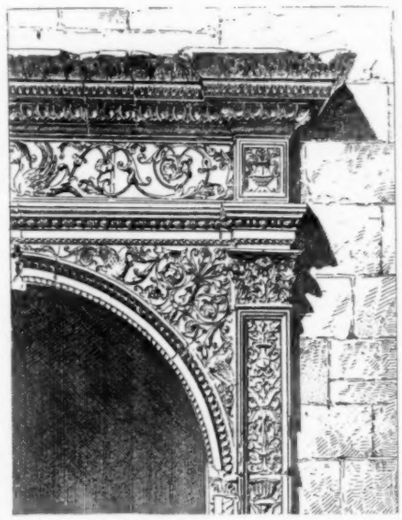
Among ambitious plans which are, perhaps, destined never to be realized, is the one having for its object to bring about a connection, through France, between the Atlantic Ocean and the Mediterranean. Such a canal would not only greatly shorten the road for all merchant-vessels, but it would enable France to establish a coöperation between the war-ships in the two oceans, without having to consider Gibraltar. The plan is on the basis of a north-south canal, proceeding from La Manche at Calais or Dunkerque, following the Upper Seine and Loire, at Lyons joining the Rhone, and, following this river entering the Mediterranean at Marseilles. A canal like this would pass through fertile country, and connect the two largest towns of the interior, Paris and Lyons, with both the coasts, with large quarries, and with the largest coal-mines in France. Another and simpler plan would employ the waterway which has for two centuries existed in Southern France between the two oceans, and which can be used by vessels of only slight depth; this route might be utilized for the building of a canal capable of accommodating the largest vessels. This waterway consists of the Gironde, which runs about fifty-five miles up the country, and which can be navigated by fairly-sized vessels; of the Garonne, which joins it, and is thirty-five miles long; of a canal proceeding from this river, about 120 miles long; and finally of the South Canal, about 145 miles long, proceeding from Toulouse to the Mediterranean. The first plan for this canal was in 1880 laid before the Government by M. Lipmay, director of the Bridges and Roads Department, but was criticised in a very different manner by the various authorities. The supporters of the canal, and a society comprising a number of engineers and large contractors (founded in 1883), produced a second plan, giving due consideration to the various objections, which was laid before the Government in 1884, by M. Hardy, the basis being a concession extending over ninety-nine years and a State grant. During the following year a considerable amount of preliminary work was done, but the result was no more encouraging than in the previous attempt. The society, however, did not give in; the plan was again overhauled and brought forward, although no definite results have been achieved so far. The length of the canal proper (Bordeaux-Narbonne) is about 250 miles, and of the two exits rather more than seventy-five miles; the depth would be about twenty-five feet, or between twenty-seven feet and twenty-eight feet in case the canal should also be navigable for large ironclads. The cost is, by the society, estimated at 30,000,000*l.*, but the official commissioners think this amount should be doubled. Recently fresh attempts have been made to realize this plan.

In Italy an engineer, M. Vittorio Bocca, has proposed a canal which is to connect the Tyrrhenian and the Adriatic Seas. This canal, which would be about 125 miles long, would proceed from Montalto di Castro, in the province of Rome, in a northeasterly direction, and reach the east coast at Fano. The breadth is proposed at 270 feet, and its depth at forty feet, so that it would be navigable for the largest war-ships. Besides vastly increasing Italy's defensive power, it would lay dry large boggy districts and the lakes of Bolsena, Chiusi, Montepulciano, and the Trasimenian Lake, whereby immense areas would be reclaimed. The cost is estimated at 24,000,000*l.* A less ambitious project is the one advanced by the contractors, Fazzori and Morandini. They propose to construct a canal, about twenty-four miles long, through Reggio, in the province of Cotenzaro, proceeding from the Bay of Santa Euphemia, to the Tyrrhenian Sea, following the rivers of Amato and Carace to the Bay of Squillace in the Ionian Sea. By using this canal the vessels would avoid the sail round Sicily or the passage through the Straits of Messina. The promoters are of opinion that the land which would be laid dry and made fit for cultivation would pay the expenditure.

In Russia much attention has been given to the plan of connecting the Baltic with the White Sea by means of a canal about 150 miles long. Of this distance there already exists a river-course for about half the distance, ten feet deep, which only requires deepening. This waterway is formed by the Neva, between the Finnish Gulf and the Ladoga Lake, the lake itself, the River Swir between Ladoga and Onega, and this latter lake. At the town of Powjenya, at the end of the Onega Lake, the canal would leave the lake and follow the River Powjenya to the Langen Lake, cut through the lakes of Matko, Telekino, and Wyg, and, finally, through the Wyg River, reach the White Sea. As far back as 1870 the Minister of Commerce pointed out the great importance of this waterway, which would not only connect the respective coasts, but also bring them in touch with the rich ore deposits in the Government of Archangel. The Minister's plan comprised a canal thirty feet deep; it was taken up by private enterprise, but has never been realized. In the year 1889 the Government again began to move in the matter, and some preparatory work was commenced. The expenditure was calculated at ten million roubles, but although this sum is not extravagant, it may prove more than Russia sees her way to spare at present.

A still older canal project in Russia is that of connecting the Black Sea with the Caspian Sea. This plan has been discussed for more than a hundred years, but although it would, of course, greatly facilitate shipping, its importance is somewhat discounted by the comparatively small depth of the Azov Sea (through which the canal must pass), and which is only navigable for vessels fifteen feet deep at the utmost. The connection between the Caspian and the Black Sea can be established in two ways. According to the one plan, the Volga would be used from the Caspian Sea to Zaripys, from whence a canal, with locks, fifty-four miles long, would proceed to the River Don, and finally the Don would be used as far as the Azov Sea. In the year 1885, the French engineer, Léon Drue, was commissioned to conduct the preliminary work in this matter. His plan, entailing a calculated expenditure of 2,800,000*l.*, proposes to commence the canal below Zaripys from the Volga, carrying it through the valleys of Prudowaja and Karpowka to the River Don. The canal, the highest point of which is to be some 280 feet above the level of the sea, and which would require twenty-one locks, would be passed in seventy hours by vessels of 500 to 600 tons, and in as little as twenty-four hours by smaller vessels. The Russian engineer, A. Danilow, who had investigated the former plan, in 1891 framed a new one, according to which the River Don would be used as far as the mouth of the Manitoch River; the canal would then follow this river to its springs, and subsequently follow the River Kumä to the Caspian Sea. A start in the direction of this plan was made in the year 1888 by the cutting through of the isthmus at Perekop, about ten miles, which connects the Crimea with the Continent. The waterway from Odessa to Mariapol is thereby shortened over 125 miles, but this has no real importance for the shipping generally until the Caspian sea has been connected with the Azov Sea by a canal. — *Engineering.*

RESTORING THE COLUMNS IN THE PIAZETTA, VENICE.



Detail of Doorway, Hotel Lallemant, Bourges, France.
From *La Construction Moderne.*

THE New York *Tribune* says that a very interesting piece of engineering has just been brought to a successful termination in Venice. This is the restoration of the celebrated granite columns of St. Mark and St. Theodore, that stand near the Mole in the Piazetta, forming a majestic gateway to this lovely City of the Lagoons. Like nearly all the campaniles in Venice, says a correspondent of the London *Globe*, these columns had, in the course of the long centuries that have passed since their erection, slowly tilted over until their tops overhung their bases by more than a foot. This in itself was dangerous, as the shafts are monoliths forty feet high, with a diameter of only four-and-a-half feet; but added to this was the fact that the huge abaci and capitals, as well as the statues that crowned them, were so shattered as to be a constant menace to the lives of the crowds of Venetians who make the steps at the columns' bases their favorite resting-places.

The peculiar conditions of the soil of this city of the sea created long ago a school of architecture of its own, and the architects of the present day seem to have inherited the genius of their early forbears. Signor Vendrasco, the Government architect, who has charge of the ancient monuments, first made himself a name by the clever and bold work of underpinning a large corner of the Doge's Palace and renewing its foundations, and he has now added to his reputation by his restoration of the twin Piazetta columns. That of St. Mark was dealt with a short time back, and that of St. Theodore is just finished. In both cases, the method, one invented by Signor Vendrasco, was the same. After the statues and the capitals had been carefully removed the columns were entirely encased in planks of wood, which were tightly bound to them by ropes. Then, by an ingenious arrangement of girdles of rope and wooden wedges, the columns were held in suspension while the bases were removed. The ground beneath was prepared and the bases replaced at a proper level, and then slowly and gently allowed to settle down into position — that of St. Mark to its own flat bottom, that of St. Theodore into a socket — and now they stand once more firm and erect.

The bringing down of the statues from the tops of the capitals, where they could not be minutely examined, to the workshops of the Ducal Palace for restoration brought out some interesting facts. The great lion which Ruskin judged to be "a splendid piece of eleventh or twelfth century bronze" is found to be "splendid bronze" certainly, but of very far greater age than he guessed, for

the head and body are those of an exceedingly fine Assyrian lion; and the statue of St. Theodore, instead of being "wholly without merit"—again to quote Ruskin's words—is discovered to be made up of rubbishy limbs and adjuncts and a finely-carved head and bust, the details of which seem to point to its being those of a Roman emperor. And yet Ruskin was not wrong, for the bulk of the materials that form the statues are carved and arranged without taste and in defiance of the rules of art. A search made through the documents in the archives explains how this came about. When, in 1329, it was decided to crown the columns, which had stood bare for one hundred and fifty years, with representations of the two patron saints of Venice, the Assyrian lion and the Roman emperor were brought out of the stores of old trophies and cobbled up into a shape suitable for their new position. The lion, crouching to spring on its prey, had its front paws placed on a large Bible so as to raise it up, and thus was made sufficiently like the emblem of St. Mark to pass muster, while the bust, provided with thirteenth-century arms and legs, sword, shield and spear, and placed on the back of a sea-monster, became St. Theodore on his crocodile—the early protector of Venice.

But if the early-time architects were clever and the present-day ones resemble them, one can hardly say the same of those of the sixteenth century, if one is to judge by their use—or, rather, misuse—of metal, for while the rivets that joined the original parts of Constantine's figure were of metal coated with Athenian bronze (Athens being the only place where, in those early days, such work was done), all the later cracks and breakages in statues and capitals were clamped together with iron bolts or tied up with iron bands, and molten lead was run into all the fissures, all of which, corroding with the weather, contracting with the cold and expanding with the heat, only increased the damage. Signor Vendrasco states that he removed from among the marble of the statue and the capital and the abacus of St. Theodore over a ton of lead, two hundredweight of iron and 130 pounds' weight of copper. It was no wonder the column had become top-heavy. I saw these heaps of metal, and at the same time I had the opportunity of examining the bust of St. Theodore. All the details go to confirm Vendrasco's opinion that it is Constantine. The face, beardless and refined, the curly hair, the well-cut, aquiline nose, all answer to his description, while the armor is ornamented round its edge with lions and eagles. On the breastplate, in high relief, is a Latin cross, over which two angels, as supporters, drape the labarum of Constantine. The foot of the cross stands in a tuft of leaves and flowers, as if to say that faith must be a living thing to be of value.

St. Theodore will now return to his lofty perch in the Piazetta a better and a lighter man. His limbs are united to his body by a network of slender copper muscles, and he has been coated over with some kind of silicate, which will enable him to resist the destructive action of the salt in the atmosphere. Thus we may now expect that the watchful lion of St. Mark and the well-armed warrior, St. Theodore, on their twin columns, may continue for another five hundred years to guard the interests of Venice.

The Venice correspondent of the *Scotsman* also writes that, in 1127, three giant monoliths, each about fifty feet in height, were brought to Venice from the East. They were bought and paid for, and not stolen, as everybody says. One lies buried in the lagoon in front of the Doge's Palace, and the other two were set up in 1173, and these are they that now so majestically grace the entrance to the city from the Piazetta of San Marco. In or about 1200 the two patron saints of Venice were set upon their summits, St. Theodore standing on a crocodile on the one, and St. Mark, under the symbol of a noble lion, on the other.

For nearly seven centuries they have stood on their noble pedestals keeping watch and ward over the Queen of the Adriatic at their feet. But in these recent days both saints and pedestals showed signs of decay, and it was feared, if nothing were done, Venice might wake up one day to find that her long-neglected saints had become her destroyers. Accordingly, the great lion of St. Mark and its pedestal were first examined and repaired. Then St. Theodore and his crocodile and his pedestal were subjected to the same scrutiny and kind treatment, and I propose telling in few words the story of that, with the strange discoveries it has led to. First, St. Theodore and his crocodile were brought down to the ground. He was found to stand ten feet in height, and his animal measured fourteen feet in length. Both were made of Greek marble, bound together with iron coated with bronze. As only in Athens iron was so coated, a Greek origin was suggested. On closer examination, it was found that half the marble was good and half was bad. Then it was discovered that half the workmanship was good and half bad. The head and upper part were of good material and well carved; the lower half of the body, like that of Nebuchadnezzar's image, is base in material, and, besides, it is base in execution. Then it was discovered that it was not St. Theodore at all, nor one homogeneous person even. The figure has the head and bust of a Roman emperor, with the lower part of the body and limbs of some inferior person. But the legs of the figure and the part of the body of the crocodile on which it stands are one piece of marble, and a closer examination of the animal showed that its form was as much that of a dragon as a crocodile.

A good deal of discussion has been carried on concerning these matters. The opinion that is gaining ground is that of Signor Vendrasco, who is the clever engineer in charge of these monuments, that the upper part of the figure is that of the Emperor Constantine, with his crown of laurel and breastplate with the Christian cross on it, and decorated with eagles and lions, and that the lower part is that of an inferior Greek statue. A curious fact is that the shield is on the right arm, whilst the left hand holds the spear. The spear is wood coated with bronze. What is certain is that it was set up to represent St. Theodore and his crocodile, which is the main thing. Now for what has been done. The statue was originally in seven parts; it was broken into one hundred. The abacus of the column was shattered. The capital was not a solid block of marble, but a hollow cylinder filled with bricks and rubbish, and the rain entering and the frost affecting it, it was split vertically and horizontally. The huge monolith, weighing, with capital, base and statue, over one hundred tons, leaned, like Pisa's Tower, a long way off the perpendicular. Signor Vendrasco has straightened the column, which, unlike its sister companion, goes into a socket a foot in depth. He has bound up with copper girders the capital, repaired and relaid the abacus, and he has made a new man of St. Theodore and set him up once more on his crocodile's back on his lofty pedestal. He has made a lighter man of him, for he has taken out of him over 2,000 pounds of lead and 300 of iron and 150 of copper. The work was only completed the other day, but it is hoped no time will be lost in removing the unsightly scaffolding, so that Venetians may once more be able to see their saints, and visitors, who are now pouring into Venice, may be able to see in all their symmetry and beauty these ancient historic monuments. As in the case of the great lion here, casts of St. Theodore and his crocodile have been taken, which will be sent to Rome, Paris and New York in all probability.

SOCIETIES

CIRCULAR OF INFORMATION NO. 1.—ANNUAL CONVENTION OF THE AMERICAN INSTITUTE OF ARCHITECTS, AND INTERNATIONAL CONGRESS OF ARCHITECTS.

THE date fixed upon for the annual meeting of the American Institute of Architects is the week beginning July 31, 1893, in conjunction with the International Congress of Architects, which is to be held in the World's Congress Art Palace, situated on the shore of Lake Michigan, in the heart of the City of Chicago.

This International Congress of Architects is one of a series of International Congresses to be held by invitation of the World's Congress Auxiliary, an organization authorized by the Directory of the World's Columbian Exposition and recognized by the Government of the United States as the appropriate agency for the conduct of the several congresses, and they have designated as their committee Daniel H. Burnham, Chairman; William Le Baron Jenney, Vice-Chairman; and Solon S. Beman. This committee have elected Robert C. McLean as their Secretary.

We are informed that the following list of subjects have been recommended for consideration:

Workingmen's houses; modern apartment-houses; ancient apartment-houses; laundries in houses, health effect; kitchens in houses, health effect; modern stables, large and small; responsibility of architects in constructional matters; responsibility of architects as to plans; responsibility of architects in decorative matters; sculpture and architecture; painting and architecture; the client's right to service, as to drawings, ownership of same, specifications and details, as to supervision, etc.; mechanical engineering in architecture, and the architect's responsibility therefor; modern steel construction; fireproofing of buildings to date, etc., and that persons specially fitted to treat upon them are to be invited to prepare papers to be read at the Congress.

It is also proposed by the American Institute of Architects to have a series of papers read by the master-artists who have been engaged upon the work at Jackson Park, and at this time we are promised papers by Daniel H. Burnham, Chief of Construction; Frederick Law Olmsted, Landscape Architect; E. C. Shankland, Chief of Constructing Engineers, and W. H. Holcomb, General Manager, and expect favorable replies from several others.

A full attendance of the members of the Institute, as well as of the architects throughout the country, is expected, and this notice is issued at this time to enable all intending to attend the Congress and the Convention to arrange their plans with reference thereto.

ALFRED STONE, *Secretary A. I. A.*

THE ILLUSTRATIONS

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

THE JUDSON MEMORIAL CHURCH, WASHINGTON SQUARE, NEW YORK, N. Y. MESSRS. MCKIM, MEAD & WHITE, ARCHITECTS, NEW YORK, N. Y.

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

PARLOR AND LIBRARY IN THE HOUSE OF FRANCIS WILSON, ESQ., NEW ROCHELLE, N. Y. MR. G. K. THOMPSON, ARCHITECT, NEW YORK, N. Y.

THIS house in the southerly section of Residence Park, near Pelham road, some 2,000 feet from the Sound, is a three-story and basement structure of stone and frame. It is 65′ x 50′ in size, with piazza twelve feet wide extending across the front and one side. It will be perfect in appointment throughout, finished in hard woods, heated by hot water and lighted both by electricity and gas. The billiard-room in basement is finished in ash, one of its attractive features being a log-burning fireplace. The halls throughout are of antique oak with exposed timber ceilings. The first floor has the library, drawing, music and dining rooms, the kitchen, butler's pantry, etc. Of these the music-room is finished in white and gold, while the drawing-room, which opens from it, has been done in natural cherry. The dining-room in oak with wainscoting has a ceiling in plaster-relief decorated in water-color tints, these being used in all decorations throughout the house. The second story is arranged to meet the comfort and requirements of the family exclusively, and also contains the private library, which has been so placed that it will undoubtedly afford the rest and recreation which comes from well-hedged seclusion. The third story has been arranged in part for a theatre, perfectly appointed with a stage, 25′ x 12′, and with a seating capacity for 100. This little theatre — large for such a house — is finished in ash with rococo ceiling and side-walls, and as all seats will be movable, it may be easily used, as shown in our issue for October 29, 1892, for dancing-parties, banquets and like entertainments. Besides this model provision for the entertainment of guests and the better development of such new work as shall tickle the public later, this story of the house is provided with five guest-chambers and bath-room.

DÉTAILS ON THE COURT-YARD OF THE STROZZI PALACE.

SEE article on "Architectural Shades and Shadows" elsewhere in this issue. This plate is copied from *Le Moniteur des Architectes.*

ENTRANCE TO THE CHÂTEAU D'ANET NOW IN THE COURT-YARD OF THE ECOLE DES BEAUX-ARTS, PARIS, FRANCE.

SEE article on "Architectural Shades and Shadows" elsewhere in this issue. This plate is copied from Pfnor's "*Monographie du Château d'Anet.*"

A HOUSE AT GERMANTOWN, PA. MR. GEORGE T. PEARSON, ARCHITECT, PHILADELPHIA, PA.

SKETCH FOR A SUBURBAN HOUSE. MESSRS. BARNETT & HAYNES, ARCHITECTS, ST. LOUIS, MO.

DESIGNS FOR THE WASHINGTON *Post* BUILDING, WASHINGTON, D. C. MR. O. VON NERTA, ARCHITECT, WASHINGTON, D. C.

[Additional Illustrations in the International Edition.]

A HOUSE AT COLOGNE, GERMANY.

[Gelatine Print.]

THE HÔTEL BOURGTHEROULDE, ROUEN, FRANCE.

[Copper-plate Etching.]

THIS building, one of the Historical Monuments of France, situated on the Place de la Pucelle was built toward the end of the fifteenth century by Guillaume la Roux, lord of Bourgtheroulde. The bas-reliefs on the low building at the left unmistakably represent scenes from the Field of the Cloth of Gold which the seigneur may himself have attended, while those which in much mutilated shape still adorn the panels of the tower are understood to exhibit scriptural scenes.

HEWELL GRANGE, BROMSGROVE, ENG.: THE GREAT HALL. MESSRS. BODLEY & GARNER, ARCHITECTS.

THE ENTRANCE FRONT, BATSFORD PARK, MORETON-IN-THE-MARSH, ENG. MESSRS. ERNEST GEORGE & PETO, ARCHITECTS.

AT RATISBONNE, AFTER A DRAWING BY SAMUEL PROUT.

NOTES AND CLIPPINGS

LUMBERMEN AS AFRICAN MISSIONARIES. — Finally it is my dispassionate opinion that a mission of lumbermen, professing no philanthropy, but, instigated by the necessary interests of commercial enterprise, with its direct benefits, and the sequences, would do more to civilize and open up to the whole world the so-called Dark Continent, than any other mission ever exploited in Africa. — *M. French-Sheldon, F. R. G. S., in the Northwestern Lumberman.*

OLD TIN-CANS IN INDIA. — A curious industry is said to have lately arisen in the Punjab, India. Large quantities of kerosene are imported from Russia and America, and the tin cases containing the oil are sold cheaply when empty, and eagerly purchased by the whitesmith, who manufactures from them a number of articles, both fancy and useful, including lanterns and lamps, dispatch-boxes, bird-cages, watering-cans, kettles, and last, but not least, jewel-boxes for native ladies. Packing cases, which frequently arrive from Europe with tin linings, are also utilized in the same way. — *The Metal Worker.*

MODEL OF A MODEL DWELLING-HOUSE. — An exhibit at the World's Fair that will be of special interest to that growing class of people who are learning how to do without the landlord is a Philadelphia model dwelling-house for wage-earners. It is building on the Midway Plaisance in Jackson Park, and covers a lot 16 by 43 feet. It is two stories in height, with a front of red compressed brick and Bedford rock. A flight of four steps leads to the double front doors. The hallway is 5 feet in width, and the staircase is at the farther end. The parlor, on the left side, is 18 feet 7 inches by 9 feet 1 inch, and has a handsome walnut cabinet let into the wall. There is one broad window looking out on the street. The dining-room, 10 feet 1 inch by 12 feet 2 inches, is entered through folding-doors from the parlor. In the rear is the kitchen, 9 feet 6 inches by 7 feet 4 inches, equipped with a brick range, a boiler for hot water, and a coal-bin. A veranda 6 feet wide completes the plan of the first floor. On the second there are three bedrooms. The front one is 14 feet 3 inches by 11 feet 10 inches, decorated with a walnut mantelpiece and corniced ceiling. Connected with it is a room 11 feet 1 inch by 9 feet 1 inch, and behind this is the bath-room, which is about 6 feet square. A room of about the same size as the front chamber and having a bay-window looks out on the rear. Both floors are well lighted throughout. The house has a basement running its entire length. The cost of the dwelling is $2,500. The plan of setting this object-lesson before the workingmen of the country was the idea of the Philadelphia County Ladies' Auxiliary to the World's Fair managers. — *New York Evening Post.*

TRADE SURVEYS

Two matters give business men much consideration just now: first, the probable duration and severity of the present financial scare — depression, weakness or whatever it is — and, second, the probable result of it on general business. The commonly accepted notion is that the depression will soon disappear, and that the outcome will be beneficial. The reason held is that prices and values in some directions have of late gone too high, through successful stock-manipulation and other than strictly legitimate devices. Eleven industrial securities in three weeks fell to the extent of seventy million dollars in value. If this levelling-down process were to continue all through the stocks listed, which, in value, are thirty times those mentioned, it would be a serious thing. The probability is that the storm will not subside until whatever inflated value has been given to most of the other stocks has been punctured. This self-castigation is not comfortable, but it is healthful. Legitimate enterprises are only indirectly affected, to the extent that it is not so easy to borrow money to push them. Even this is not an unmixed evil. There is an abundance of everything the world needs. The visible supply of wheat is forty per cent greater than a year ago. Cotton consumption appears to be 1,950,857 bales less this season than last in Northern and foreign markets. Low-priced textile goods have just been reported in abundant supply in the West, where travelling agents have succeeded in inducing retailers to stock-up heavily. Hosiery and knit-goods have suddenly become dull. Print-cloths are falling in price. Wool-buyers in foreign markets are not doing anything. English exports of cotton, yarn and cloth have fallen off one-fourth for March as against March last year. April clearing-house returns show a decline of three per cent as against April, 1892. Railroad traffic is also unfavorable in its aggregate, in comparison to last year, according to this week's showings. These are a few of the hastily-picked-up evidences in the commercial world of unsatisfactory conditions. But, after all, they mean very little. People are at times seized with the fever of economy and retrenchment, and this fever seems to be expending itself in European countries, where imports have largely fallen off. Business men are experiencing much inconvenience in not obtaining prompt discounting of commercial paper, but this, too, is a temporary evil only. The New York bank-surplus is about thirteen million dollars, against fourteen million dollars a year ago. As regards the second source of anxiety, the outcome of existing inharmonious conditions, an answer is necessarily guesswork, but the underlying influences can be plainly seen. It takes no great study to observe what marked advantages the money-lender has over the money-borrower, the banker over the producer. The banker turns his key, and the world of industry trembles. The gold standard is to be maintained without the gold to do it. Production is to be regulated, not by the legitimate demand for products, but by the ability of traders to exchange values as measured by gold. The yard-stick is to be worshipped at the expense of the thing it measures. The industrial masses are getting this problem into their heads slowly. The markets of the country are abundantly supplied with staple products. Production is under control. Prices have settled down to firmness. Building operations are assuming great magnitude, and builders' material from lumber, stone and brick down to inside finishings of all kinds are now in great demand. The record of projects to furnish electric roads for urban and suburban requirements is surprising. Builders say no such incentive has been given for years, and the projects heard of during the past year certainly lend strong probability to their statements that we are on the eve of greater building activity than ever known. Architects and builders, and others in a position to know, express the opinion that, with the progress of electric-road building, a marked dispersion of population will occur, especially among persons of moderate means who have heretofore lived in congested districts. This belief may be realized, but it is certain that a cause has been set to work which will in time take away in large part the necessity for close crowding in cities. The question of adding early and late workers'-trains has been considered in not a few railroad boards with reference to large cities. Architects have been consulted by moneyed men with the view of formulating some practical system of cheap house-building in suburban localities. As an indication of this, three large industrial communities are soon to be established near Chicago. The Reading Company, at Philadelphia, has the same matter of quick and cheap transit under consideration. The point aimed at is to place within the reach of the wage-working class, the shopworkers, the same chance of living out of town and working in town that has been enjoyed by the more prosperous classes. This matter has been helped along by the great fall in the price of iron and steel and in the perfecting of machinery for use of steam and electricity. Besides, moneyed men see in this field a very inviting one for some of their surplus dollars.

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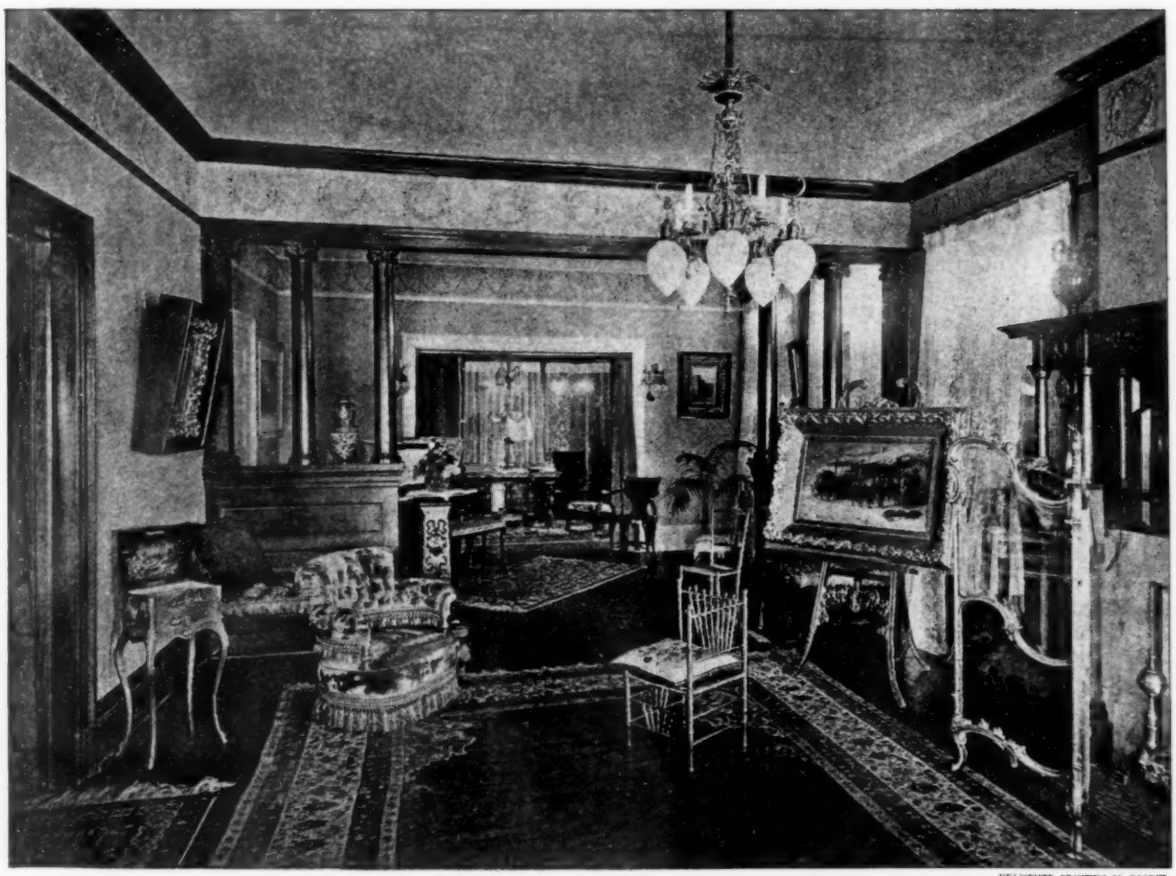

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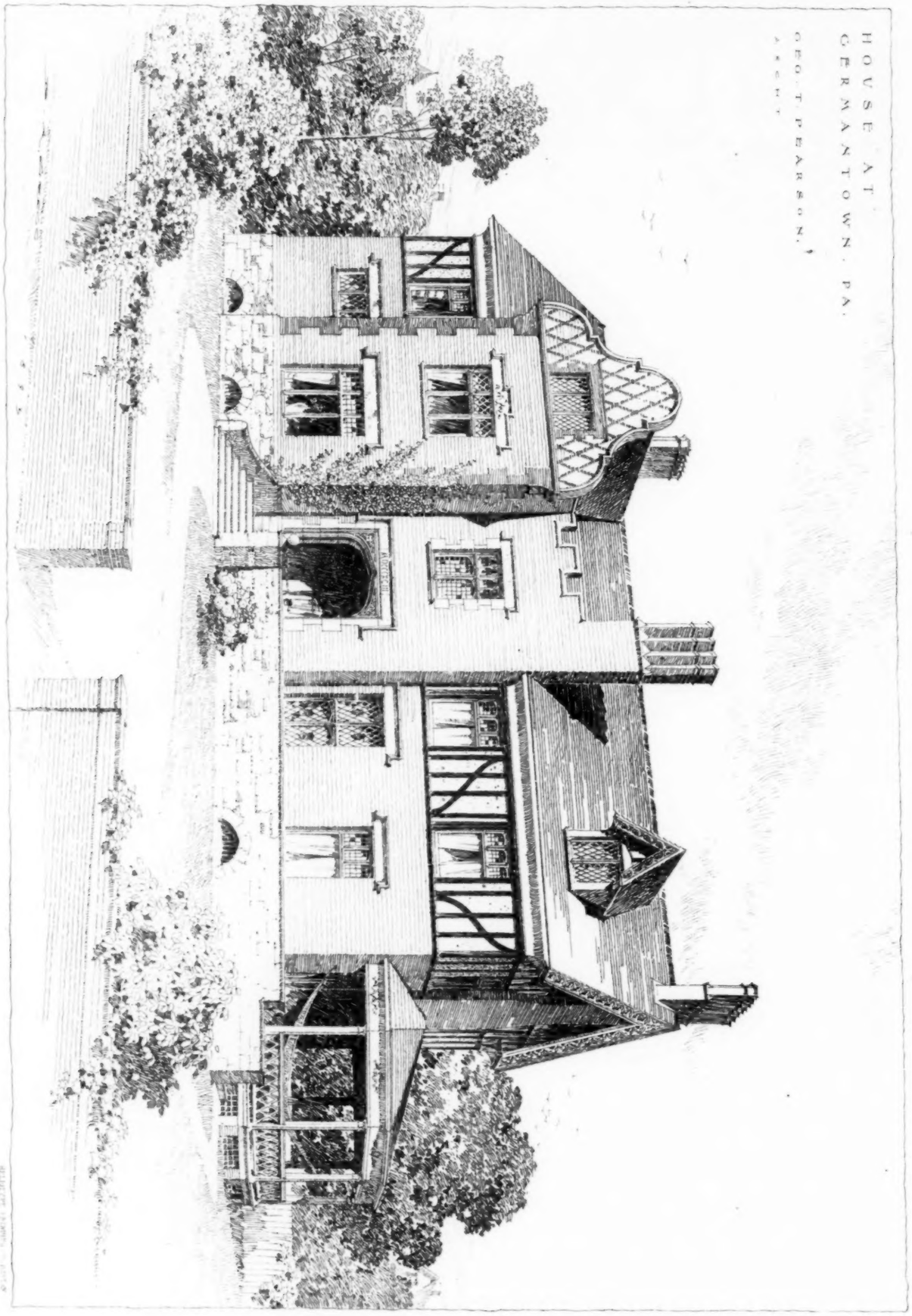
Parlor and Library in House of Francis Wilson.
New Rochelle, N. Y. G. Kramer Thompson, Arch't.

DESIGN FOR THE POST BUILDING WASHINGTON D.C. D. VON NORTA, ARCH'T.

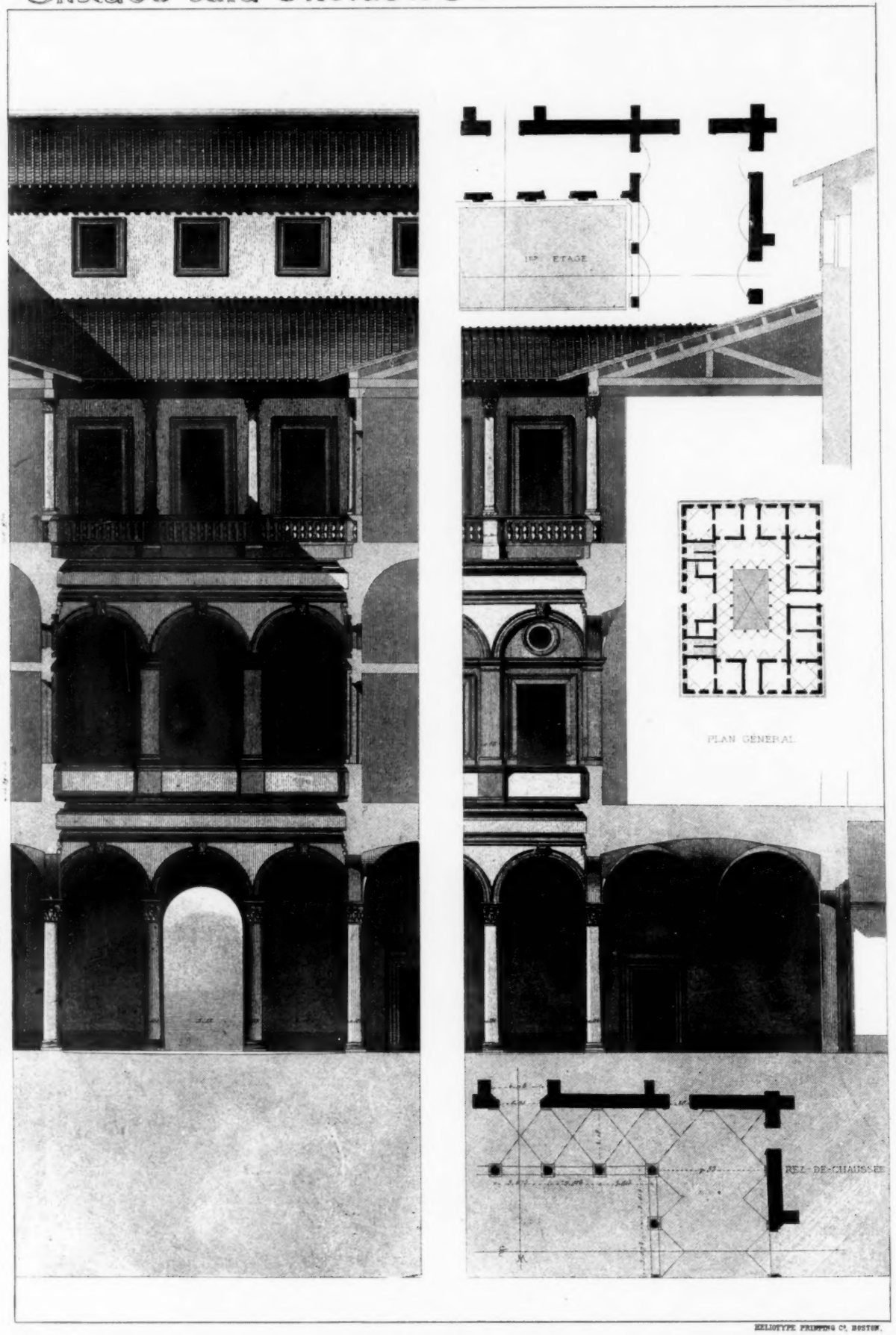


HOUSE AT GERMANTOWN, PA.

GEO. T. PEARSON, ARCH'T.

SKETCH.
A SUBURBAN RESIDENCE.
BARNETT & HAYNES, ARCHITECTS.

Shades and Shadows. Plate II.



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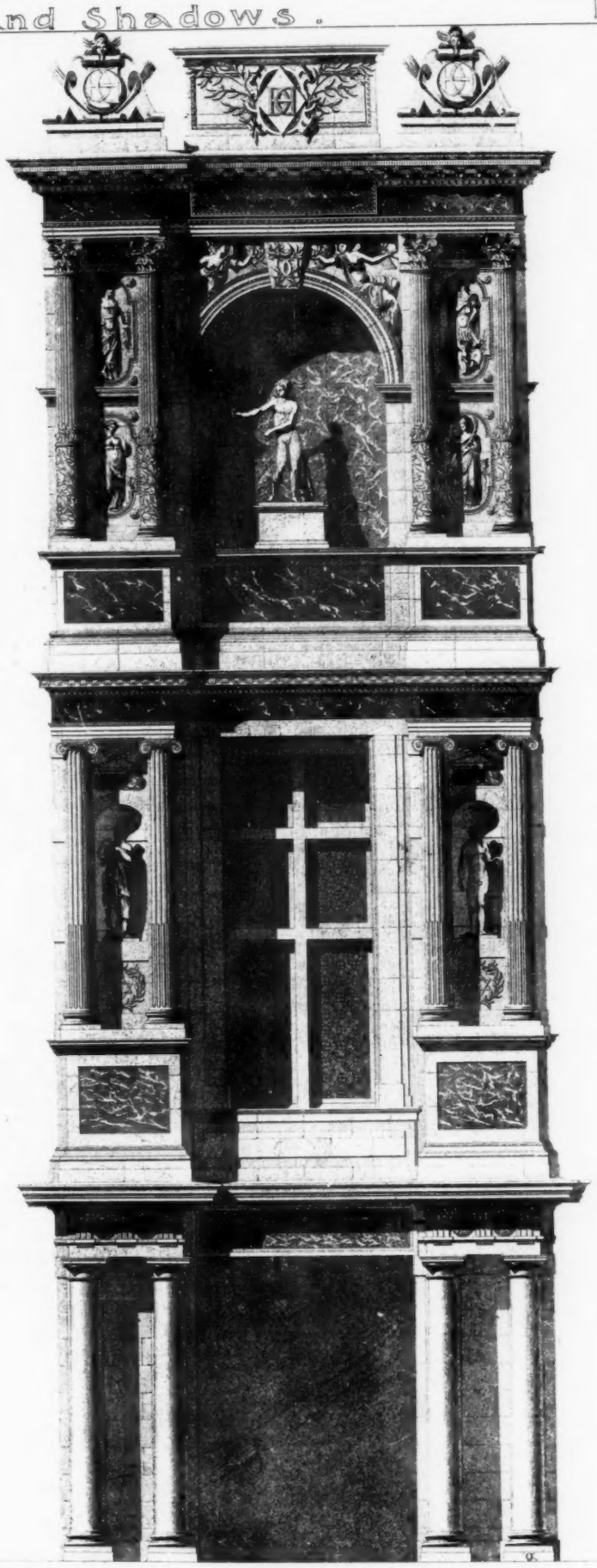
Court of the Strozzi Palace, Florence.

Shades and Shadows. Plate 10.



Entrance of the Chateau d'Anet.