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CONSTRUCTION

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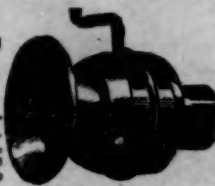
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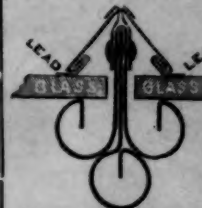
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AUGUST 3, 1895.



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THE profession of architecture, not only in this country, but throughout the world, has suffered a great loss in the death of Mr. Richard Morris Hunt, which occurred at his country house at Newport on Wednesday. Mr. Hunt was born in Brattleboro, Vermont, October 31, 1828, of a distinguished family. The sons of this generation seem to have been endowed with artistic talent in a remarkable degree, for a brother, the late William M. Hunt, became one of the most noted painters that this country has ever produced. Richard, while yet a very young man, was sent to Europe to complete his education, and, while there, was taken with a fancy for architecture. With characteristic energy, he prepared himself for entrance into the School of Fine Arts in Paris, remaining there for about seven years, under the great Lefuel. On leaving the School, he travelled extensively, and, returning to Paris, was invited by Lefuel, who was then engaged in building the wings connecting the Tuileries and the Louvre, for the Emperor Napoleon III, to become his assistant. He accepted the invitation, and is reputed, according to the tradition among New York architects, to have designed many of the details of the building, including the entrance archway from the Rue de Rivoli to the court-yard. At this time, Hunt was much more a Frenchman than an American. At the time that he entered the School of Fine Arts, he was, we think, the only American in the School, or, at least, in the Department of Architecture, and he was identified with French architectural design, and French architectural practice, until his work on the Louvre was finished. Returning then to America, he was employed for a time by Dr. Walter on the extension of the Capitol at Washington, and then entered into practice on his own account in New York. Although comparatively rich, both by inheritance and by marriage, he worked assiduously and ardently in his profession, and designed and carried out an immense number of fine buildings. In New York, those which occur to us at the moment are the Lenox Library, on Fifth Avenue, the Tribune Building, on Printing-house Square, the W. K. Vanderbilt house, on Fifth Avenue, the Osborne house, on Park Avenue, a hospital near Third Avenue, the Marquand house, and many other dwelling-houses, besides several mercantile buildings on Broadway and elsewhere; and the pedestal to Bartholdi's Statue of Liberty; besides the Vanderbilt Mausoleum, on Staten Island, and a large number of monuments. In Newport, he built many splendid country houses, including the so-called Marble Palace, belonging to Mrs. W. K. Vanderbilt, and the magnificent Goelet house, reputed to have cost a million dollars. In Boston, his work is represented by the two Brimmer houses on Beacon Street. At Asheville, North

Carolina, he was engaged, at the time of his death, in the completion of an immense house for another of the Vanderbilt family. In the assignment of the work for the Chicago Exposition, he was given the principal place, by being asked to design the Administration Building, and all the world knows how he succeeded. Before that time, however, his great talents had long been recognized in the profession. He had been repeatedly elected President of the American Institute of Architects, to whose interests he devoted the most earnest and wise attention, both in office and out of it; and was decorated many years ago with the cross of the French Legion of Honor. Later, the French, who seem to have followed his career with an affectionate interest, which was fully returned on his part, raised him to the highest honor that could be bestowed on a foreign architect, by making him Corresponding Member of the Institute of France, in the Section of Fine Arts; and similar honor was recently done him on the other side of the Channel, by the Royal Institute of British Architects, in the award of the Royal Gold Medal.

THE hearts of those who desire to have the Massachusetts State-house replaced by their own or another's work have been warmed this week by the appearance on the east wall of a crack of some magnitude, which has obviously been caused by the dilatory manner in which the underpinning of the north wall of that wing has been carried out. That the crack has appeared can hardly be held a good advertisement for those who have brought it into existence. The architects of Boston are used to looking out for the pecuniary interests of their clients and it is not supposable that any one of them feels that any contractor who is desirous of securing contracts in their offices hereafter would be wise in announcing his inability to underpin such a wall as the north one of the State-house. It was Wm. M. Tweed and Peter B. Sweeney, we believe, who once delivered themselves of the two now notorious expressions: "What are you going to do about it?" and "The Public be damned." To judge by the frequency with which those interested in the building express themselves in the daily papers, there would seem to be a belief prevalent that every one who is connected with the State-house alterations is asking the same question from the same standpoint. It is a shame and a disgrace that any such public feeling should be allowed to exist, when it is so easy to dispel it, and it is really time for those in charge of the work to state categorically and over their own names, that the fears that the public certainly do entertain are not based on tenable premises. The men on whom it is most incumbent to do this are the three public servants, the Commissioners, who cannot be suspected of having any pecuniary interest at stake. The facts are obscured by a great amount of useless newspaper discussion and the air ought to be cleared by a plain official assurance, that the perfectly possible work they have been empowered to do shall be carried out without injury to the old building, which they are not authorized to injure or undermine.

IT is proposed in New York to limit by statute the height of all buildings, including office-buildings, so as to bring them within reach of the streams from fire-engines. In their present condition, the upper stories of some of the high office-buildings could never be reached by a stream of water from the outside. So long as they are used simply for offices, the accumulation of combustible material in them is not likely to be great enough to cause the destruction of structures built, as these are of incombustible materials, combined so as to protect each other, and planned in such a way as to subdivide the space contained in them, by fireproof partitions, into very small portions; but there can be no question that, sooner or later, many of the buildings now used for offices will have to be let for storage, or for some kind of mercantile business requiring the piling-up in the rooms of large quantities of goods; and from that moment they will be exposed to serious danger from fire. It is evident that, supposing only a single story in such a structure to be filled with inflammable goods, a fire among them, serious enough to cause the perforation of a few of the floor-arches, or to allow the flames to reach the elevator-well, or staircase, would convert the whole structure into a furnace, perhaps three hundred feet high, supplied with air at the bottom, and enclosed above. Such a furnace, on a small scale,

would be powerful enough to reduce iron from its ores, or calcine limestone; and it is hardly to be expected that any combination of building materials could be made to resist it. No doubt, a destructive fire in a structure of that sort would discourage the practice of building them; but it is not always desirable to wait for such arguments,

EVERYTHING points to a great increase in building operations in the near future, all over the country. In New York, which, as the centre of business, feels very promptly improved general conditions, the amount of building is already enormous. The number of permits for the erection of new buildings during the past six months is almost exactly twice as great as the number issued during the corresponding part of 1894, and the proportion between the intended cost of the buildings for the two periods follows nearly the same ratio. Meanwhile, the number of permits for alterations has not very much increased; showing that the hesitating season of alterations, which usually precedes a time of confident and extensive building, is nearly over, and that New York, at least, is entering on a new era of development. How soon its example will be followed by other cities remains to be seen; but nothing is more certain than that the prosperity of one part of the country means the prosperity of all; and local conditions can only in a slight degree delay or modify the change which building interests have for the last few years looked and hoped for.

ONE of the correspondents of *La Construction Moderne* has been staying in Geneva, and makes some interesting observations about that famous town. Considering that Geneva had, at the beginning of this century, only twenty-five thousand inhabitants, and that it has now less than eighty thousand, it must be acknowledged that it has earned an exceptional reputation for science and learning of all sorts. Not to mention Rousseau, Calvin, the Prisoner of Chillon, the heroes of the *Nouvelles Gênévoises*, and the other miscellaneous lights of ancient Genevese history, the present century has drawn from Geneva an extraordinary number of men who have won fame in science, art and literature, not only at home, but abroad. The French are not very much disposed to bestow their highest honors on strangers, yet few artists have won greater distinction in France than the sculptors, Pradier and Chaponnière, or the painters, Galland and Giron, all of whom came from Geneva; while the celebrated Prime-minister of the Republic, Tirard, is also a native of the sober little Swiss town. In endeavoring to account for the conspicuous position of Geneva in the intellectual world, our author observes that its inhabitants seem to be possessed with a passion for instruction, such as hardly exists anywhere else in Europe. Small as it is, Geneva boasts a University, with eight hundred students; a College, corresponding exactly to the French *lycées*, and now four hundred years old; a female college of the same rank, where girls are fitted to pursue, by the side of their brothers, the courses of the University; a School of Fine Arts, whose graduates take a high rank in the artistic world of Paris; a Conservatory of Music, with nearly a thousand pupils; an Academy of Music, for instruction in the higher arts of composition; and a large number of special technical schools, such as the Industrial School, the School of Drawing, the School of Watch-making, the School of Commerce, the School of Applied Arts, and so on. Besides these, the place swarms with learned societies. Beginning with the National Institute, which is planned on the model of the Institute of France, but with the difference that the number of members is unlimited, the list includes historical, geographical, archaeological, artistic and other societies, almost without number.

THIS would seem to be a tolerable equipment for a town of eighty thousand inhabitants, but the half has not yet been told. During the winter, free lectures are given every evening in the great hall of the University, by some of the most distinguished men in Europe, on a variety of subjects of interest to the learned. In this hall Raoul Pictet showed his fellow-townsmen the experiment, never performed before except in his own laboratory, of the solidification of hydrogen gas into a metal; here Taine first delivered his lectures on the *ancien régime*; and here François Coppée read several of his unpublished works; and the lectures given in it are listened to by an audience which often waits in the street an hour for the doors to be opened. At the same time, lectures are frequently given in other halls, under the auspices of some of the

learned societies, which attract equal crowds. The Hall of the Reformation is devoted to the higher philosophy, and audiences of more than two thousand people often assemble there to hear discourses on the Origin of Evil, and similar topics. Even this does not exhaust the capacity of the Genevese for instruction, and there are sometimes five evening lectures, on subjects of equal interest, going on at the same moment in different parts of the town.

OUR author, while recognizing the exceptional position of Geneva, as the intellectual centre of Switzerland, and a point where people of many nations meet, nevertheless believes that, artistically, at least, its example might furnish an example to the French provincial towns. Ethnologically, there is no more difference between the Genevese and the French than there is between the Bretons and the Provençals, the Picards and the Gascons, or the Normans and Burgundians, and there is no reason, except in the habit of centralization, why Rouen, Dijon, Lyons, Amiens and Marseilles should not each become a centre of architectural development, if not of other sorts of cultivation. For this they would have an advantage which Geneva does not possess, in the existence of splendid local types of architecture, infinitely nobler and more interesting than the diluted Parisianism which now reigns in all French provincial towns. With such a foundation to build upon, and the instruction that a well-equipped architectural school could give, the inborn capacity which was able, seven hundred years ago, to produce the glories of Norman, Picard and Burgundian architecture, and the Romanesque of Central and Southern France, or which, later, showed itself in the Renaissance of Touraine, ought to win for the great provinces which compose the Republic a renewed artistic fame, as brilliant as that which rendered illustrious the emulation of the Free Cities of the Middle Ages. We need not say that, in our opinion, the future of art in general, and especially of architecture, in this country, depends in a great degree on the development of local schools, much like those which our author wishes to see revived in France, and on the emulation and differentiation which would come from the establishment of such schools. We should not wish to see, as our author suggests, public building in our towns restricted to local architects, but we are convinced that good architectural and artistic schools in all our large cities, devoting themselves, perhaps, with a certain care to the artistic use of local materials, and the treatment of local conditions, with suitable provision for comparing results with each other, are the foundation on which our artistic greatness must rest. It is true that we already have many of the schools, and we have now a certain provision for emulation between them; but the importance of differentiating the schools is hardly yet thought of. Among the architects themselves, something of the sort has been done, perhaps by instinct, as in the case of the Spanish fashion of building which we have learned to associate with California, and the rich Renaissance which is becoming characteristic of New York, but this process of differentiation by natural selection should be recognized in the schools, and intelligently guided by them, before it can produce the best results, and in this, as in many other matters relating to architectural education, the profession might interest itself to great advantage.

IT is interesting to learn that the Mohammedan population of Paris has increased so much of late that a committee has been appointed to consider the subject of building a mosque for their benefit. This committee includes Benjamin Constant, the painter, and two architects, MM. Ambroise Baudry and Saladin. Whether the last is related to the great champion of the Prophet, we cannot say, but why Benjamin Constant, or M. Baudry, should concern themselves with the affairs of Mohammedan worship we will not attempt to explain, nor is it, apparently quite certain that the Turks and Arabs of the city are desirous of having their affairs interfered with by these gentlemen. There is a certain class of people in Paris, to which, it is to be understood, we do not say that MM. Constant and Baudry belong, who patronize, so to speak, all sorts of outlandish sentiments and superstitions, in order to show that they are themselves free from any prejudices of that sort; but between having no religion, and professing the religion of the Prophet, there is a very long step, and the committee might find an interview, in their mosque, with a crowd of fanatic dervishes, on the subject of the furnishing of the sanctuary, an awkward affair.

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Fig. 56. Or

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ELECTRICAL SCIENCE FOR ARCHITECTS.¹—XIII.

THE NATIONAL CODE OF RULES FOR ELECTRIC WIRING.—VI.

22. INTERIOR CONDUITS²:—

[The American Circular Loom Co. Tube, the brass-sheathed and the iron-armored tubes made by the Interior Conduit and Insulation Company, and the Vulcan Tube are approved for the class of work called for in this rule.]

NOTE.—The use of two Standard wires (see Rule 10 a), either separate or twin conductor, in a straight conduit installation is approved in the iron-armored conduit of the Interior Conduit and Insulation Company, but not in any of the other approved conduits. (See Rule 22 c.)]

a. Must be continuous from one junction-box to another, or to fixtures, and must be of material that will resist the fusion of the wire or wires they contain without igniting the conduit.

b. Must not be of such material or construction that the insulation of the conductor will ultimately be injured or destroyed by the elements of the composition.

c. Must be first installed as a complete conduit system, without conductors, strings or anything for the purpose of drawing in the conductors, and the conductors then to be pushed or fished in. The conductors must not be placed in position until all mechanical work on the building has been, as far as possible, completed.

d. Must not be so placed as to be subject to mechanical injury by saws, chisels or nails.

e. Must not be supplied with a twin conductor, or two separate conductors, in a single tube. [See Rule 22.]

f. Must have all ends closed with good adhesive material, either at junction-boxes or elsewhere, whether such ends are concealed or exposed. Joints must be made airtight and moisture-proof.

g. Conduits must extend at least one inch beyond the finished surface of walls or ceilings until the mortar or other similar material be entirely dry, when the projection may be reduced to half an inch.

A junction-box (Fig. 56) is a box made of material similar to that composing the conduit with which it is used and it is placed where connections are to be made, as, for instance, where a tap wire joins a branch wire or where a branch wire joins a main wire. In these

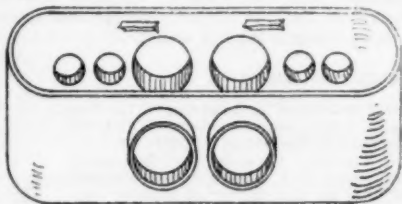


Fig. 56. One form of Junction-box: shown without cover.

boxes the tubes making up the conduit system end, and from these points all wires are inserted or withdrawn. The use of the junction-box makes easy the connection of the wires, it brings these connections to an accessible place and it provides a place for the fuse-blocks. The boxes also make it unnecessary to have concealed joints in the wires and make it possible always to remove lengths of wire that may become defective or that will be too small for an increased number of lights.

Since conduit is allowed in all sorts of places, it of course should not be of such material that it would burn upon the fusing of the wire. If the wire be properly protected by fuses, it can never overheat sufficiently to fuse, but the safety of the construction obviously should not depend upon the carefulness of the men who place the fuses.

As the conduit is not depended upon for insulation it is doubly important that there be nothing in its composition that will injure the insulation on the wire.

The virtues of the conduit consists in its being a complete protection to the insulation on the wires entirely enclosing it at all points, and affording a smooth and ample raceway for the insertion and extraction of the wires. If conduits were allowed to be installed with the wires inside, there would not be the same necessity to the workman of joining the tubes accurately that there is when the wires must be afterward inserted, and many installations would through carelessness be little better than plain installations of fished wire, with lengths of tube strung along the wire as suited the convenience of the workman. Even if it were allowable to lay strings in the tubes at the time they were placed, so that the wires might be pulled in by means of the strings afterward, there would be danger of abrading the insulation on the wire, because it would then be possible on account of the force that could be applied, to pull wires through tubes that were too small, or in which there were obstructions that would tear the insulation. There would be lost too, all advantage that comes from being able to remove and replace wires with facility. By requiring the conduit to be first installed as a complete system and the wire to be then pushed in, there is assurance that the joints in the tube are well made—or otherwise the wire would catch—and

that there are no nails driven through the tube anywhere or obstructions in it, for in that case the wire could not be forced through.

If conduits be inserted before the mechanical work on the building is completed, any damage to the installation through crushing, cuts, or punctures not only injures the tubing as a mechanical protection, but it is apt to injure the insulation on the wire at the same place. If the wire be inserted after the work on the building is completed, these damages are likely to be discovered when an attempt is made to insert the wire, and even though the wire slip through easily and the defect in the tubing be not discovered, there is at least the surety that the electrical insulation on the wire is intact.

If a tube containing a twin wire (Fig. 55) or two separate wires were pierced by a nail and a short-circuit thus caused, or if from any other reason an arc were to form in the conduit, there would be danger of the conduit igniting before the protecting fuse could melt. With the iron-armored conduit there is very little liability of such short-circuits forming because the iron armor is a thick iron pipe like a gas-pipe, which is an effectual protection against nails. Even though an arc form within the conduit, harm could hardly be done, since the fuse protecting the circuit would melt before the iron would burn through.

Rule 22 (f) is made because it is wished to have the conduit as free from moisture as possible, and by having the ends closed and the joints airtight there is less liability of the gathering of condensed moisture.

23. DOUBLE-POLE SAFETY CUT-OUTS:—

a. Must be in plain sight or enclosed in an approved box, readily accessible.

[Section a. To be approved, boxes must be constructed, and cut-outs arranged, whether in a box or not, so as to obviate any danger of the melted fuse metal coming in contact with any substance which might be ignited thereby.]

b. Must be 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).

c. Must be supported on bases of non-combustible, insulating, moisture-proof material.

d. Must be supplied with a plug (or other device for enclosing the fusible strip or wire) made of non-combustible and moisture-proof material, and so constructed that an arc cannot be maintained across its terminals by the fusing of the metal.

e. Must be so placed that on any combination fixture no group of lamps requiring a current of six amperes or more shall be ultimately dependent upon one cut-out. Special permission may be given in writing by the Inspector for departure from this rule in case of large chandeliers.

f. All cut-out blocks must be stamped with their maximum safe-carrying capacity in amperes.

It is required that cut-outs or fuse-blocks be in plain sight, because when the fuse melts there is an arc for at least a short time and it is obviously dangerous to have this take place in a concealed place where there possibly may be inflammable material. Where there are several cut-outs grouped, it is more convenient to have them enclosed in a box built flush with the wall. The best boxes are made

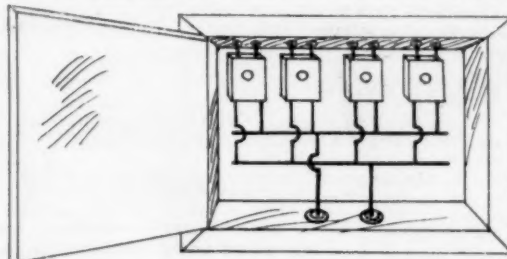


Fig. 57. Fuse Closet.

entirely of non-combustible material, but they are usually made of wood, lined throughout with asbestos board (Fig. 57).

Where branches lead off from main wires care must be taken that fuses be provided to protect them. Thus, in Figure 58, suppose a branch to be taken off at A. On the wires BB is a motor and on the wires AA are 5 lamps. Suppose the motor to require 25 amperes. Then the fuses at C must have a carrying-capacity of at least 25 amperes or they will melt when the motor operates. But suppose the wires AA to be No. 14 B. & S. gauge, which is large enough to carry the current required for the 5 lamps which it supplies, but which would overheat, in case there were a short-circuit, before the fuses at C could melt. It is consequently necessary to have smaller fuses at A where the size of wire changes, so that the carrying-capacity of these No. 14 wires will not be exceeded. If there were no motor or lamps on the wires BB then there would be no need of fuses at the point A, because a small fuse that would protect the wires AA could be put in the cut-out at C.

The bases of cut-outs must be non-combustible, because otherwise they are liable to ignite from the heat of the arc that forms when a

¹Continued from No. 1020, page 15.

²The object of a tube or conduit is to facilitate the insertion or extraction of the conductors to protect them from mechanical injury, and, so far as possible, from moisture. Tubes or conduits are to be considered merely as raceways, and are not to be relied on for insulation between wire and wire, or between the wire and the ground.

fuse melts; they must be of insulating material, because otherwise there would be constant leakage; they must be water-proof for dampness will cause leakage.

When fuses melt the arc sometimes melts off particles of the copper or brass to which the fuse is attached, and if this molten metal flies

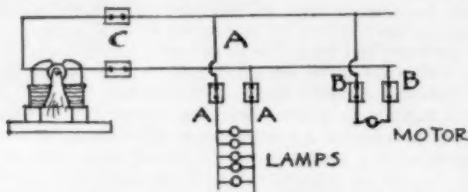


Fig. 58. Illustrating Use of Branch Fuse.

into inflammable material that may be ignited. For this reason it is required that the fusible metal be entirely enclosed by non-combustible material, as it would be, for instance, in a cut-out like that shown in Figure 22 where there is a porcelain cover. Figures 59 and 60 give two views of a "plug." The fusible metal is soldered to brass terminals set in glass, and a brass cap screws over the top, while the whole plug screws into the cut-out base.

If a fuse be too short, the arc formed by the melting of the fuse will continue between the terminals to which the fuse is attached, and will give out intense heat just as an arc-lamp does. It is consequently of great importance that the length of fuse be enough to insure an arc of short duration. The electrical pressure and the current at the time the fuse melts, both determine the distance the arc can hold over, but as there is always a liability and even a probability that the fuse will melt because of a short-circuit, and consequently from a very heavy current, the correct length of fuse must not be judged by the smallest current that will fuse it. The length of fuse metal for 50 volts should not be less than $\frac{3}{4}$ inch, the length for 110 volts not less than 1 inch, for 220 volts not less than $1\frac{1}{2}$ inches and for 500 volts not less than $4\frac{1}{2}$ inches.

A combination fixture is one that is arranged so that either gas or electrical lights may be used. If a large number of lamps were dependent upon one fuse, or rather, if one lamp were dependent



Fig. 59.



Fig. 60.

upon a fuse large enough to carry the current for many lamps, then a short-circuit in one of the lamps or in its receptacle might cause a vicious arc that would burn through the gas-pipe and do considerable damage before the fuse could melt. Even though there be no wire in circuit small enough to require a five-ampère fuse, lamps on combination fixtures should nevertheless be arranged so that no lamp will be dependent upon a fuse larger than this.

Cut-outs should be stamped with their maximum-carrying capacity so there will be no excuse for overloading them.

24. SAFETY FUSES:—

- Must all be stamped or otherwise marked with the number of amperes they will carry indefinitely without melting.
- Must have fusible wires or strips (where the plug or equivalent device is not used), with contact surfaces or tips of harder metal, soldered or otherwise, having perfect electrical connection with the fusible part of the strip.
- Must all 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.

The largest number of amperes that a fuse will carry for an indefinite time without melting is its carrying-capacity. It is better to mark the fuse with its carrying-capacity than with its fusing-point, because the amount of current that the conductors are to carry is determined by their size and it is only necessary to choose a fuse with the same carrying-capacity, while if the fuse were marked with its fusing-point a careless or ignorant person might allow altogether too much margin in choosing the size of fuse for a given case. It is important that the fuse itself be marked, not only so that one will know definitely what is used, but



Fig. 61. Fuse with Tips of hard-metal Fuse-link or Safety-catch.

because when the fuse melts it is then known what size is required to replace it.

Figure 61 shows a fuse having tips of copper soldered to the fuse wire. These are also called "fuse links" or "safety catches." Fuse metal being soft and inelastic cannot be properly fastened under

the head of the binding screws in the cut-out. It is apt gradually to work loose, thus making a poor contact that is a frequent cause of overheating in the cut-out. The copper tips furnish a true, hard and elastic terminal that can be securely clamped. Moreover these fuse links with tips of harder metal are more accurate as regards their fusing-point than fuse wire alone. A fuse wire of a given diameter will have different fusing-points for different lengths of fuse; for when the fuse is very short the metal to which it is attached conducts the heat away from the fuse so fast that it takes a large current to generate heat fast enough to melt it. When the fuse is long, the heat is not taken away from the fuse metal so fast and a smaller current will melt it. With fuse links, however, the length of fuse metal is fixed because it is soldered to the copper terminals, and the manufacturer is careful to choose a size that will have the proper fusing-point. Figure 62 illustrates this change in fusing-point with the change in length of fuse. With the size fuse wire for which this curve is true, it will be noticed that when the fuse is five inches or longer, the fusing-point is very close to 24 amperes, while when the fuse is 1 inch long, for instance, the fusing-point is 45 amperes.

If the fuse is to protect the wire, it is obvious that it must melt before the carrying-capacity of the wire is exceeded. It is, of course, not possible for the fuse to heat to the melting-point instantly when

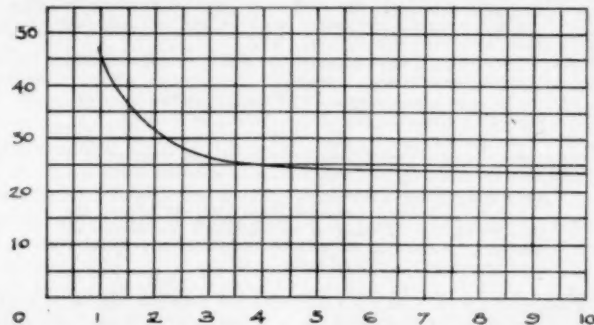


Fig. 62. Showing different Fusing Points for different Lengths of the same Wire.

an excessive current flows, but as the wire cannot instantly heat to a dangerous temperature either, the fuse properly proportioned is a good protection against this particular kind of danger.

25. TABLE OF CAPACITY OF WIRES:—

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 Brown & Sharpe gauge, which must be followed in the placing of interior conductors:—

TABLE A. Concealed Work.		TABLE B. Open Work.	
B. & S. G.	Amperes.		Amperes.
0000	218		312
000	181		262
00	150		220
0	125		185
1	105		156
2	84		131
3	75		110
4	63		92
5	53		77
6	45		65
8	33		46
10	25		32
12	17		23
14	12		16
16	6		8
18	3		5

NOTE.—By "open work" is meant construction which admits of all parts of the surface of the insulating covering of the wire being surrounded by free air. The carrying-capacity of 16 and 18 wire is given, but no wire smaller than 14 is to be used except as allowed under Rules 18 (a) and 27 (d).

The size of wire is determined by the amount of current it has to carry and the fuse is determined by the size of wire. If the fuse be always chosen with regard to the size of wire only, the wire cannot be dangerously small and still be used, because when a current above its carrying-capacity is sent through it, the fuse will melt.

26. SWITCHES:—

- Must be mounted on moisture-proof and non-combustible bases, such as slate or porcelain.
- Must be double-pole when the circuits which they control supply more than six 16 candle-power lamps, or their equivalent.
- Must have a firm and secure contact; must make and break readily, and not stop when motion has once been imparted by the handle.
- Must have carrying-capacity sufficient to prevent heating.

e. Must be placed in dry, accessible places, and be grouped as far as possible, being mounted—when practicable—upon slate or equally non-combustible back boards. Jack-knife switches, whether provided with friction or spring stops, must be so placed that gravity will tend to open rather than close the switch.

If switches are not mounted on water-proof and non-combustible bases, arcing, and heating arising from leakage will be apt to set the base on fire.

A single-pole switch draws a longer arc than a double-pole switch, because the single-pole switch breaks the circuit in only half as many places, and moreover, since it is on only one side of the circuit, it does not break all connection with the wire beyond the switch. For these reasons the single-pole switch is thought suitable only for small tap circuits and its use is limited to branches having on them not more than six 16 candle-power lamps. The making of a connection that completes a circuit and the breaking of a connection that interrupts a circuit are spoken of as the "make and break."

Rule 26 (c) is made to provide against the arcing in the switch that would be caused by poor construction.

If the parts of a switch that conduct the current are too small or the surfaces that come together do not make sufficient connection, the switch will heat just as a wire that is too small will heat. Resistance is introduced and wherever current is forced through resistance there is heat.

The jack-knife switch is shown in Figure 63. It will be seen that if the switch be mounted so that it is closed by moving the handle down, anything accidentally falling on it, or possibly a jarring of the supports will close it and perhaps in doing so cause a short-circuit somewhere, as at a motor, for instance. Stops of some kind, either springs or friction arrangements, are usually provided, but they are not always trustworthy and it is just as easy and as convenient to mount the switch so that it tends to fall open rather than shut.

RUSSELL ROBB.

[To be continued.]

BERLIN TENEMENT-HOUSES.

THE act of the New York Legislature appointing a committee to examine into the tenement-house question in the City of New York, and "to report thereupon to the next Legislature," became a law on May 4, 1894. Under this law, the following were named as the Tenement-house Committee by the governor of the State: Cyrus Edson, Roger Foster, Richard Watson Gilder, Solomon Moses, George B. Post, John P. Schuchman and W. D'H. Washington.

At the request of this committee, the Department of the State sent the following instructions to its consular representatives in Berlin, Brussels, Glasgow, Liverpool, London and Paris:

- (1) What laws or municipal ordinances regulating the construction and use of tenement-houses, dwellings for artisans, houses in which three or more families reside, are in force in the city where your office is situated?
- (2) What has been the practical effect as regards morals, crimes, health, and otherwise, of the operation of such laws?
- (3) In this connection, please state whether there has been any change in the death rate, number of illegitimate children, and of crimes committed in the district?
- (4) Have any tenement-houses, artisans' dwellings, or dwellings containing three or more families been constructed in your city, or in its vicinity, by the national or city government, or by any philanthropic societies or individuals?
- (5) If so, please describe them and state what has been the practical effect as regards morals, crimes, health and otherwise, of this construction and use—as recited in question 3.
- (6) Has any investigation into the condition of the dwellings of the poor been recently made in that locality? If so, please send a copy or abstract from the report containing a full copy of any recommendations therein made.

As the reports, in answer to the foregoing interrogatories, were received at the Department, they were immediately mailed to the New York committee, in order to avoid the delay of copying them, the law being mandatory in regard to the time at which the report of the committee should be submitted to the Legislature. A printed copy of the committee's report shows that it was submitted on January 17, 1895.

The following are the reports as received from the consular officers. A number of plans, illustrations, books, etc., accompanying them were not deemed necessary to publish, and have been filed in the Department for reference.

BERLIN.

On my arrival at this post, I found that a request for information had been transmitted by the Department of State some month ago, at the request of a Legislative committee of the State of New York concerning the conditions of tenement-houses in Berlin. The unsettled condition of affairs of this consulate-general prevented an earlier reply.

The six interrogatories submitted in the circular from the Department are not as susceptible of clear, well-authenticated answers as one could wish; in part, because no statistics of very recent date can be reached, and, in part, because of the difficulty of obtaining data from those who might be supposed to know.

On the authority of Herr Oberbürgermeister Zelle I answer the series of questions as follows:

- (1) No laws or municipal regulations exist regulating the construction and use of tenement-houses in Berlin.
- (2) The practical effect of such laws is nil.
- (3) Changes in death rate, illegitimate children born, and crimes committed can not be given because there is no separation of statistics in regard to tenement-houses.
- (4) Neither national nor city government has constructed tenement-houses, artisans' dwellings, or dwellings for three or more families. Individuals and societies have.
- (5) No statistics are to be had as to such new buildings. Morality and mortality figures are not separated for such structures, nor are there any distinctive "tenement-house districts" in Berlin.
- (6) The Oberbürgermeister knows of no investigation into the condition of the poor having been recently made in Berlin.

Berlin has done much to improve the condition of the laboring classes as regards their housing; but rents have risen and wages have fallen; capital has embarked on the building of fine new quarters of the city and neglected the tenements, thus failing to provide small buildings, apartments and small suites and, in many cases, driving the poor still closer together into such buildings as existed before.

The moving of factories that employ many hands toward suburbs which are not inhabited by the rich, and the rise of rents in the city proper, have forced the poorer classes toward the outskirts. Efforts have been made to provide laborers with small separate houses still farther out, but this is not practicable on any large scale for the really poor. They must live near their work, near the city centres where wives and children find customers, patrons, etc., and thus help; near the swarms of homeless men and women who hire sleeping spots by the night or week; near, in fine, the conveniences of a big town, heating, water, gas, etc. Hence it is recognized by the best authorities that the "rent barracks" or *Mietkasernen*, are necessary evils. Laborers, at present, must live close together in order to live on their present wages.

During the years 1886-1890, the number of lodgings attainable by the working class and small official class showed a steady decrease.

Rentals.	Decrease.	
	From—	To—
1 mark to 50 marks (23.8 cents to \$11.90).....	773	532
51 to 100 marks (\$12.14 to \$23.80).....	12,379	7,511
101 to 150 marks (\$24.04 to \$35.70).....	31,804	23,016
151 to 200 marks (\$35.94 to \$47.60).....	52,320	45,520

But the average rental for all lodgings in Berlin rose during this period from 609 marks to 666 marks (\$144.94 to \$158.51). This came from the rise in the higher-priced flats and lodgings, namely, those for which more than 200 marks (\$47.60) were paid. While wages and salaries fell, these rentals rose in number from 322,175 to 402,610.

In 1890, the population of Berlin was estimated at 1,436,233, of whom 265,101 paid no taxes. The taxes paid by the remainder were proportioned as follows: Persons paying income tax, 120,412; class tax, by families, under 900 marks (\$214.20) limit, 622,550; class tax, by families, over 900 marks limit, 428,170. Reduced to heads of families, 318,755 persons paid taxes under the 900 mark limit and 162,540 persons over the 900-mark limit.

The large proportion of families for whom cheap lodgings are absolutely necessary may be seen from the number of families taxed under the 900 mark limit.

But prices of the simplest lodgings bear no relation to average wages and salaries. An average laborer or small official, with wife and child, should have from 1,575 to 1,750 marks (\$376.85 to \$416.50) annual income to occupy the smallest quarters, reckoning his rent at one-fifth his income.

The average daily wage of an adult man is only 2.40 marks (57 cents), which at three hundred working days—a very favorable conjunction—gives but 720 marks (\$171.36) annually.

Now, the rent of one room and kitchen in the back part of the house, where air is poor and often foul, is reckoned at an average of from 230 to 270 marks (\$54.74 to \$64.26); rent of a room with two windows or one-windowed room and kitchen, 315 to 350 marks (\$74.97 to \$83.30); rent of an apartment with a two-windowed front room, one-windowed back room, corridor and kitchen, averages 450 marks (\$107.10). A workman, with wife and child, must, therefore, spend about 315 to 350 marks (\$74.97 to \$83.80)

annually on his rent alone, or nearly one-half what he makes as an average wage-earner. Hence, it is necessary that wife and children must work to help pay the family's way, and any small floor, bed, or sofa space that can be squeezed out is let to more or less permanent tenants for the night. These sub-lodgers are called *Schlafburschen*—sleep-boys or sleep-lodgers. They are of both sexes and all ages; they comprise the hard-working, sober young laborers, steady girls, widows and widowers, as well as the floating population which deals in and distributes vice, infectious diseases and punishable crimes.

Efforts have been made to stop this subletting, and the Berlin police, which does not make its hand light, adds much to the misery of the laboring classes by its endeavors to interfere with and regulate such abuses. Sleeping out and strolling in streets and parks are offences against the civic rules; "sleeping in" can not be so well attacked for obvious reasons. "Sleep-lodgers" harm the family union by introducing jealousies between the married people, spoil family privacy, and often corrupt the young. Illegitimate children born to very young girls are the natural result of promiscuous herding together of the sexes.

The tenement-house in Berlin is not so easily recognized as in some other cities, owing to the admirable cleansing and police systems; also to the fronts on the street, often imposing, which cover much misery. A common thing is a broad, high, massive front broken by an arched passage, which leads to one, two, or three courts. The back courts are often ill-kept, narrow and foul, violating the rules which prescribe so many cubic feet of air to the human being. They are often old buildings, by no means calculated for the human strain to which they are now subjected, and lack conveniences, especially closets. In these houses the worst mortality occurs in garrets; then come the cellars. Garrets are more fatal, perhaps, because of the greater cold or the strain on the old and sickly from having to ascend and descend stairs, or it may be that garrets are slightly cheaper than cellars, which latter are largely rented by dealers in old rags and iron, etc., so that the poorest of the poor people, already weakened by disease and hunger, take to the garrets and are predisposed to greater mortality. Cellars are also occupied by men and women who take charge of the cleaning of the houses. Even in the best houses, the gate-keepers or *portiers* live in very badly lighted, badly warmed, and ill-ventilated rooms considerably below the level of the street. In the back parts of tenement-houses, these evils are much worse. In 1880, as many as 100,000 people lived in cellars. In that year attention was drawn to the excessive crowding of the floating population in large single rooms, locally called *Pennen*, which offered places for the beginning of epidemics. The worst of these were done away with then, but there is a constant tendency to their revival in defiance of the police.

Cellar-dwellers suffer from eye diseases and rheumatism, owing to the lack of light and the dampness of the walls. As lately as 1893, the number of cellar-dwellers was reckoned at 100,000, which is a diminution, in view of the general increase of population, but shows badly still. There is no reason to estimate them at a smaller figure now. They exist in the suburbs, where rents are relatively cheaper, as well as in older quarters. Big houses in the suburbs often have horse and cow stables in the back; the effluvia and drainage from these stables affect the cellars especially.

Under such conditions, the misery of renters of cheap lodgings is enhanced by the fear of landlords that the rents will not be paid. The German laws as to detaining furniture for rent are still unfavorable to the poor, and the latter, therefore, hesitate to buy decent furniture. On the other hand, the landlord is slow to repair tenements, knowing that his rooms will get hard usage and that he can not expect long tenures, while the pressure of demand for any sort of rooms is so great that he need not fear they will be long vacant. Rents are still taxed in Berlin.

Fine apartments in Berlin are a drug on the market, owing to the boom in such property since 1880. Much capital has been lost in that way. The financial and commercial stringency of 1893 and 1894 has done much harm; but the accommodations for the poor have not improved, nor has there been any fall in rents for high-priced apartments (flats) in good neighborhoods.

Property-owners in Berlin are heavily taxed, and are much worried by police regulations. They find it safer to take the chances of renting to the well-to-do for long periods than to enter the laborious career of tenement owning. Hence, while Berlin is overbuilt for rich people and those with moderate fixed incomes, it is underbuilt for the laboring classes.

The rise in rents in general may be seen from an estimate made this month in the *Vossische Zeitung*, which is based on figures for 1893: From 1869 to 1893, 63.6 per cent was raised somewhat, and 30.2 per cent was raised to double or triple; From 1851 to 1893 7.9 per cent was raised somewhat, 32.3 per cent raised to double or triple and 57.4 per cent raised to triple or quadruple. The average of all rents rose from 295 marks (\$70.21) in 1851, to 391 marks (\$91.57) in 1861, and from 407 marks (\$96.87) in 1864, to 671 marks (\$159.70) in 1893. As to empty dwellings (houses, flats and lodgings), there were 9,925 unoccupied in 1884, and 6,904 in 1887; but since 1887, they have increased annually at about 5,000, so that, in 1893, there were 26,262 unoccupied, representing the value of 11,000,000 marks (\$2,618,000).

In 1893, fully 6 per cent of Berlin dwellings stood empty, and this year the number must be greater. During 1861-1885, while the size of building lots grew gradually smaller, the proportion of people

to the lot grew larger in the following ratio: In 1861, 48.3 per cent; 1864, 49.7 per cent; 1867, 51.4 per cent; 1871, 57 per cent; 1875, 58 per cent; 1880, 60.7 per cent; 1885, 66 per cent.

The "sleep-lodgers," or floating population of Berlin, increased through factory demands and the depressed condition of many agricultural lines, which forced laborers to the capital, while a growing dislike to the monotony of country life has steadily augmented their numbers during the last decade. In some parts of the city they doubled between 1880 and 1890, during which period they rose from 5.42 per cent of the population to 6.21 per cent. In the northern quarter, called Moabit, at the section called "Wedding," they rose from 2,157 to 5,817. In the Upper Friedrichstadt of the Schöneberg quarter, the rise was from 1,923 to 4,238, and in the Lower Friedrichstadt, from 3,687 to 8,437. In 1880, the "floaters" were 92,189; in 1885, 124,626; and in 1890, 133,359. Only two districts showed a decrease.

I will add a translation from the work by Liszt and Lilienthal on the criminal world of Berlin, dated 1885, which Dr. Heinrich Albrecht characterized in 1891 as still true in many parts of the city.

When you enter such a building you are at once met by a pestilential smell of moist rotteness. Filth rules everywhere, and half-naked children pummel each other on the stairs. Discord and war reign between the neighbors on the same floor. On the slightest pretext, wordy battles occur on the stairs and floors, accompanied by the most filthy expressions and bloody scimmages. Sticks, broomsticks and knives play a large part. The women scatter loathsome liquids and filth on each other, men throw each other down stairs, and, in between, children of every age whine and cry. On every occasion of the kind two parties form themselves in the house, and these make war on each other. They only unite when it occurs to the owner or his representative to be so foolish as to attempt to interfere in order to obtain peace. Then they fall in one band upon him and beat the common hated enemy black and blue.

Just the same thick, foul-smelling air, the same filth as are found in the entry and on the stairs occur inside the apartments. Everything lies about "higgledy-piggledy." What few beds and furniture exist are old and rickety. If the apartment consists of several rooms and a kitchen, the rooms are generally rented out to young people, some of whom work, others not, or to prostitutes, often women of the most dangerous variety; the family arranges itself in the kitchen. But if the apartment consists of only one room, which, of course, must serve at one and the same time as sitting-room, sleeping-room and kitchen, then everybody is crowded together in one spot. In the single bed, which has generally been made up only once for all, lie husband, wife and children, just as they happen to get a place; often there are children on the floor in the straw, and among them the "sleep-lodger."

Under these conditions, it is not surprising that the men and boys in families of small officials, burghers, shopmen and laborers desert their homes for the beer-shop or restaurant, which are the clubs of Berlin, while the young women take to dance-halls, with the usual results of danger to morals.

CHARLES DE KAY, Consul-General.

BERLIN, November 12, 1894.

A SYLLABUS OF EARLY CHRISTIAN, ROMANESQUE AND GOTHIC ARCHITECTURE. — I.

INTRODUCTORY.

EARLY Christian architecture is of special importance as the beginning and nucleus of a new style.

The chief building of the early Christian time, the *basilica*, the building of worship for the new faith, becomes the model upon which later ages enlarge.

Methods of vaulting practised by the Romans develop under the influence of the Christian spirit into new and interesting forms in the Byzantine style.

The combination of vaulting with the plan of the *basilica* produces *Romanesque*, and in due time *Gothic* style.

SOME GENERAL POINTS.

The classification of historical buildings into groups is based upon their general characteristics.

For the recognition of these a study of the building in reality, or in geometrical outline on paper is necessary. The latter is, for convenience, drawn in two forms: first the *ground-plan* and second the *elevation*.

The former shows the foundation, and thereby the main outline as regards the extension and general disposition of the building. The latter conveys the impression of the structure as a whole, exterior and interior, the arrangement of the lower parts as well as the upper ones, and is usually divided into sections.

The ground-plan thus gives the fundamental thought as to the disposition of the space, while the elevation shows the plan carried out.

Architecture consists further of two parts: one mechanical, named *construction*, essential to the erection of the building; and another of *aesthetical* character, essential to its pleasing qualities as regards decoration and artistic effect.

In architecture, æsthetical pleasure is closely connected with constructive excellence, and our enjoyment, strictly speaking, depends as much upon one as upon the other.

In the study of construction, then, the ground-plan as the abstract idea is the point from which we start, but in course of study we advance to the elevation, which allows a consideration of the structure as well in detail as a whole.

For an æsthetic valuing of the edifice, ground-plan and elevation are alike important. The latter, however, as a means of recognizing the artistic perfection of the building, appeals more fully to the understanding.

HISTORICAL POINTS.

The vast extension of the Roman sway.

The Roman soldier was a promoter of civilization as well.

The centralization of this sway was in the omnipotent person of the emperor and his residence, the city of Rome. Whatever changes affected these were experienced throughout the State.

The decaying Paganism. The Christians tolerated as a Jewish sect. Their disobedience to Roman laws causes hostility on the part of the government. Ten persecutions. The martyrs.

The Christian religion recognized by the State on the accession of Constantine, 323 A. D.

Early Christian architecture includes three kinds of structures:

- A. The catacombs — peculiar excavations in the earth, but of no influence upon succeeding architecture.
- B. Concentric buildings, which continue a form much appreciated in pagan art.
- C. The basilicas, destined to become the Christian churches proper, especially in the Occident.

THE CATACOMBS. — ORIGIN OF THE CATACOMBS.

The Roman mode of burial by preservation of the ashes of the deceased.

The Christians decline to burn their dead.

The construction of the catacombs. Crypts for memorial services. Place of refuge in time of persecution. The sanitary conditions, however, prevented the gathering of any large congregation in these subterranean chapels.

The catacombs forgotten and lost track of. Recent discoveries. The great historical interest of the inscriptions and paintings found there.

According to the system of basing the classification of historical monuments chiefly upon their ground-plan, early Christian buildings are divided into:

A. Buildings with concentric ground-plan.

B. Basilicas (rectangular ground-plan).

This mode of division also marks the main distribution of monuments thus:

a. Concentric buildings in the Orient.

b. Basilicas in the Occident.

Exceptions are chiefly:

1. Rome and Ravenna in the Occident, containing concentric edifices.
2. Syria in the Orient possessing a number of remarkable basilicas.

A. CIRCULAR AND POLYGONAL STRUCTURES. — INTRODUCTORY.

Christianity is not inventive. It distinguishes itself mainly by the adoption of forms already existing.

The Romans renowned masters in vaulting. Their unsurpassed talent for management of space as regards its constructive and decorative character so as to create an harmonious impression. This interest for a vast and well-defined space intimately connected with the erection of the cupola. Examples:

Pantheon, Temple of Minerva Medica.

Christianity enters into the inheritance, but disfigures the circular or polygonal building, for the sake of the cult, by the addition of a separate apse.

The difference between Occident and Orient during this period consists mainly in the devotion of the Orient to the concentric structure.

In these buildings the construction and the æsthetic ideas are one.

HISTORICAL POINTS.

The origin of the concentric building may be ascribed to the pagan custom of erecting tombs in the shape of a tower:

Mausoleum of Cæcilia Metella in Rome.

The circular, or polygonal shape is furthermore used in some cases for temples:

Temple of Vesta, Pantheon, Temple of Jupiter at Spalato.

And finally, as large additional hall in the imperial palaces or thermæ (*frigidarium*).

The Christian idea, likewise, of the concentric structure, as a tomb, is perhaps the reason for the circular shape of most baptisteries (the "grave of the former existence"), the baptismal tank or piscina forming the architectural centre.

Further, many sepulchral and memorial churches are of a concentric character, the tomb of the saint or memorable dead being placed in the middle of the edifice.

In Byzantine style the concentric form is adopted also for parochial churches.

MAIN CHARACTERISTIC OF CONCENTRIC PLAN.

Material employed in the construction is mostly brick.

The concentric building has a pronounced direction of growth in height and in circumference.

All these structures, whether circular or polygonal, have a common centre around which the parts group themselves enrythmically. Hence, generally styled concentric. The absolute symmetrical character of all parts is ideal.

The chief feature of the building, namely, the cupola, enforces this impression of concentricity by its dominating elevation.

The ground-plan varies according to the form adopted, whether circular, polygonal, Greek cross or square, the radiation of subordinate parts being always from the centre. The building generally consists of an inner rotunda or polygon with surrounding aisle.

Elevation. — The use of vaulting, or of the cupola or dome as roof of the inner rotunda or polygon may be considered a general characteristic. Different kinds of vaults are: tunnel-vault, groin-vault (intersecting tunnel-vaults), cupola or dome being circular or polygonal, niche.

Concentric buildings without cupola are:

S. Stefano, Lateran Baptistery at Rome.

The inner, or main structure usually rises two stories or more. Frequent use of niches or colonnades in the interior, which serve as supports as well as divisions between inner and outer aisle.

As immediate supports of the cupola, besides the drum proper, are used piers (in the corners of the polygonal sub-structure that also form outside buttresses) and pendentives.

The predominance of the cupola is distinctly perceptible within, also, where it increases the loftiness and dignity of the room.

The distribution of light is of great importance, windows being either in the walls of the drum or piercing the lower edge of the cupola:

Sta. Sophia, in Constantinople.

The surrounding aisle is of great internal effect as contrast to the lofty central space. The irregularity and disfiguration of the plan is sometimes hidden by an enclosure (square or rectangular) which is not an advantage as regards appearance (Byzantine churches).

A portico is sometimes added as a pendant to the apse:

S. Vitale, in Ravenna.

MONUMENTS.

The simple rotunda or polygon uninteresting.

1. The rotunda or polygon elaborated by niches.

a. The niches remaining in the thickness of the wall:

S. Giovanni in Fonte at Ravenna, 430 A. D.

Tomb of Theodoric, sixth century.

S. Georg at Salonichi, sixth century.

b. The niches an extension of the plan and opening into the surrounding aisle or outside room:

S. Vitale at Ravenna, 326-547.

Church of Sergius and Bacchus at Constantinople, 527.

2. Combination of polygon (or rotunda) with interior colonnade (or piers):

Church of Holy Sepulchre at Jerusalem, 326.

Sta. Constanza in Rome, fourth century.

Lateran Baptistery, 432-440.

S. Stefano, fifth century.

Dome at Brescia, seventh century.

3. The Greek Cross:

Sao Lorenzo at Milan, fourth century (?)

Dome at Trier, 370 A. D.

S. Nazaro e Celso at Ravenna, fifth century.

4. Structures of peculiar type:

Sta. Sophia at Constantinople, 538-563.

Ch. of Sta. Irene at Constantinople, eighth century.

Ch. of S. Nicolaus at Myra (Asia Minor), tenth century.

B. THE BASILICAS. — INTRODUCTORY.

The origin of the basilica is a still-disputed point. The meaning of the term is probably "hall" in its widest sense.

The name for the Christian basilica is probably adopted from the Roman *basilica forensis* as a place where people congregated. Perhaps also the ancient custom of planning the common court-hall may have been of influence upon the method of dividing the Christian basilica into a middle room of great width, with aisles on either side supported by colonnades.

The immediate model, however, of the Early Christian church is most likely the *private house* which, of course, is the same, whether it be inhabited by pagans or Christians.

In the atrium of the Roman house with its adjoining *vestibulum*, *alæ* and *tablinum*, we have the ground-plan of the Christian basilica indicated.

The further development of this simple scheme is brought about by the purchase of the house as common property

enlarged and improved upon by suitable changes: *e. g.* adoption of the plan of the *basilica forensis*.

The large dimensions, the galleries above the aisles, the semicircular form of the apse are either imitations or natural transformation of the original scheme.

MAIN CHARACTERISTIC OF THE BASILICAL PLAN.

The basilica may generally be described as a structure of rectangular shape and elongated proportions. The length of the building by far exceeds the height and width, and the horizontal lines are the predominant ones.

Of the whole structure, the place for the altar, the apse, is naturally the chief place of interest towards which all things tend and where the highest architectural and æsthetic achievement is to be sought. It is preceded by a vast amount of space that serves only as a preparation and introduction to the holy of holies. Inasmuch, however, as the apse forms only a small part of the entire complex, situated as it is at the farthest end of the building at considerable distance from the entrance, with a long and lofty main house or a spacious transept in front of it, the point of architectural gravity must be said to be thrown entirely upon one side of the edifice and the Christian basilica thus deemed eminently unsymmetrical in its disposition of space.

Material. — Brick substructure with wooden ceiling, either panelled or with visible trusses.

The ground-plan is generally characterized by an uneven number of parallel aisles separated by colonnades. The middle aisle exceeds the others in width and is clearly to be considered of chief importance. It terminates in a semicircular apse which is sometimes, especially in larger structures, preceded by a transept. This transept is without aisles.

The arms of the transept usually project beyond the line of the main body of the church thus forming the beginning of the cross, the so-called *Signum Tau*.

The basilica is in older structures preceded by a square front-yard or atrium, in later by a *pronaos* or vestibule.

Elevation. — The predominance of the middle nave creates in the interior an open and lofty room with light from the windows in the upper part of the walls, while from outside it is the main indication of the body of the church. Compared with the nave, the aisles appear low and very subordinate. The transept is of equal height with the nave. The latter has a gable front.

The apse is a semicircular niche and the only vaulted part of the structure.

The need of an open space between the aisles causes the walls of the nave to be supported by columns connected either by arches or an architrave, while the transept has only walls. The lack of suitable material sometimes suggests the use of piers instead of columns.

In the Orient the aisles have two stories, the gallery being reserved for women.

DESCRIPTIVE NOTES.

In accordance with ecclesiastical usage, the atrium serves as a place of waiting for pilgrims, catechumens, excommunicates, and others. In the middle of the atrium is a well, *cantharus*.

In the basilica proper the main house (the *navis*) is for the congregation; the aisles forming side ways, so as to leave the central nave open for the perspective view and free from the multitude on procession days.

The transept helps in very large churches to distribute the crowd and gives space besides for the ministering clergy. The wings are often reserved for people of high social standing.

The apse contains the altar and in episcopal churches the bishop's chair and seats for the higher clergy.

In basilicas built for commemorative purposes the tomb of the martyr is often contained in a cave beneath the altar, a *crypt*, called *confessio*.

ITALIAN MONUMENTS. — ROME.

Basilica of S. Peter, fourth century, destroyed during sixteenth century.

Basilica of S. Paul fuori le mura, fourth century.

Sta. Maria Maggiore, fourth century.

S. Clemente (restored 1099-1118.)

Sta. Maria in Cosmedin.

Sta. Linforosa, fourth century, and others.

RAVENNA.

S. Apollinare nuovo, sixth century.

S. Apollinare in Classe, sixth century.

PARENZO.

Cathedral, seventh century.

FRANCE.

St. Martin at Tours, St. Denis at Paris, and others.

In Spain, Germany or England, Early Christian basilicas existing only in parts.

IN THE ORIENT.

Church of S. Demetrius at Salonichi.

Ch. of Holy Mary at Bethlehem, fourth and sixth centuries. The Syrian basilicas.

ÆSTHETIC ASPECT OF EARLY CHRISTIAN ARCHITECTURE.

In concentric buildings the form is in itself decorative. Harmonious proportions are of much consequence.

The poor material needs to be coated in order not to appear too mean for its purpose.

All emphasis is thrown upon the attractive appearance of the interior. Difference in this respect from the pagan temple.

Form is subordinated to color in the decoration of Early Christian churches, especially the Byzantine. Precious material; painting upon stucco; gilding; mosaic.

The columns are the chief architectural feature; of precious material; mostly robbed from pagan edifices. The imitation of pagan work devoid of artistic perfection. The corrupt Corinthian capital. Crude blocks of trapezoidal shape introduced. Arches.

The decoration of the exterior is very meagre. The rough masonry undisguised. Blind arcades with pilaster-strips. Frieze under the edge of the roof. Small windows with closures of peculiar design.

M. WERGELAND.

(To be continued.)

NIGHT REFUGE FOR WORKINGMEN AT TURIN.

FOR the purpose of giving shelter over night to poor, destitute and honest artisans out of work, whose spirit forbids them to beg or accept the degrading hospitality of a police-station, a few prominent, liberal-minded and public-spirited gentlemen of this city came together in 1887 to organize the *Società per gli asili notturni in Torino*, that is, a society to offer night refuge to homeless workingmen.

A solid stone edifice of massive structure, built for and used during the exhibition of 1884, was leased and changed for the purpose. The opening of the refuge took place in January, 1888.

The "tramp," in the American sense, is altogether unknown on the Continent of Europe. When men leave their country, they generally do so to find work elsewhere: as a rule, they are equipped, if not with a certificate as craftsman or apprentice, at least with strong arms, a keen desire to work, and such papers are as requisite and necessary to give documentary evidence of having been born of Christian parents, christened, vaccinated, confirmed, and having the permission from their home authorities to travel for a given term. A wanderer not possessing such papers is not kindly treated by private persons, while local officials will try hard to rid themselves of such an unwelcome visitor by expediting him with despatch to the next provincial district, and so on, until the unfortunate reaches his home again. Occasionally, a truly philanthropic society will assist him with funds enough to go to the United States.

The refuge is beautifully located on the corner of Via Burdin and the Corso Massimo d'Azeglio opposite the Valentino Park. It is a high one-story building. To the right of the large entrance-hall are the office and the disinfecting and wash rooms; the reading-room, dormitory, and two smaller rooms for families are on the left of the entrance.

The building is heated by steam, lighted by gas, has running water and ample water-closets of the latest improved method — accommodations which even in good Italian hotels are often sadly missed.

The receiving hour is at 6 P. M., or later, according to the season. The newcomer's name, nationality, his age, religion and trade are registered — all nationalities, ages, and religions are treated equally. After an obligatory shower-bath, clean clothing is given him, while his own, in the meantime, is disinfected and cleaned, by chemical process, if necessary. Then he has leisure to go into the reading-room or can smoke in the adjoining garden and under the portico. A physician is at hand to attend to little ailments or wants, the medications for which are taken from a house chest standing in the office. At 9 P. M. a large bowl of meat soup, with plenty of vegetables, is served to the hungry, and at 10 o'clock the doors are closed and the inmate can take to his bed, thirty of which are in the large dormitory. The beds are such as are used in the new barrack hospitals in Germany; they are of iron, have a mattress, two pillows, linen sheets and covers, blankets and a comforter, all scrupulously neat and clean. The dormitory is well ventilated above and has tiled flooring. For the whole house, the proverbial phrase "clean enough to eat off the floor" holds good.

Should a father or mother with children apply for admittance, two separate rooms are set aside for such purposes, containing each three beds. Single women are never admitted.

At 7 o'clock A. M. in summer, and at 8 in winter, the inmate is obliged to leave the refuge, the place receiving a thorough cleaning and overhauling every day.

No police or other surveillance is kept; two attendants look after all that is necessary. The refuge, however, is in telephonic connection with the *Questura* (police headquarters) and the principal hospitals, in case of emergency. So far, these places have never been appealed to.

The applicant is permitted to use the refuge four consecutive nights, but this can be extended to seven nights. He is permitted to return to the refuge after a lapse of two months.

That these temporary inmates are grateful is evident; that they are often very talented, also, is equally apparent, for the portico and reading-room contain many fine sketches in water-color and crayon made by poor artists, who found here a night's rest and a plain meal on their way across the Alps to or from the Eternal City and elsewhere.

The Institute is purely a private enterprise, supported by contributions of annual, honorary, and perpetual members, who pay \$30 and

\$100 respectively. The institution once received a subsidy from the Government of \$200, and from the municipality of \$300. It receives gratuities, also, from the foreign consulates represented in Turin, with the exception of the commercial agent of the United States, who has no funds at his disposal for such purpose, notwithstanding the fact that twelve "stranded" Americans received the hospitality of the refuge in 1893.

During the last fiscal year, 8,500 lire (\$1,640) has been the total income from which 13,877 people were given shelter, representing 30,827 nights.

Next to the Italians, the largest contingent applying for admission are French (1,222), Swiss (490); Germans and Austrians follow, and even Egyptians and Moors are received in the institution.

The management of the refuge is non-sectarian. Catholics, Protestants, and Jews work together, solely for one object — the good of their fellowmen.

It is simply astonishing what private charity has done and still does to lessen the misery in his city. In regard to distributing charity systematically and practically, the benevolent Turinese is far ahead of this kind in all cities I know of — in Europe as well as in the United States.

The Asilo Notturmo Umberto Primo is a model institution in its way, equal, if not superior, to those I had the honor to describe in my report of May 1, 1894,¹ and worthy to be known and imitated in so benevolent a nation as the United States.

W. E. MANTIUS, U. S. Commercial Agent.

TURIN, September 29, 1894.

COLUMBUS, THE CAPITAL OF OHIO.

It was on that memorable morning in 1812, when for the second time Americans took up arms against Great Britain, that Columbus became a village instead of a dense, unbroken forest, inhabited only by many wild animals and a few Indians. Just across the sluggish Scioto River, which bisects the City of Columbus as the Cuyahoga River divides Cleveland into the East Side and West Side, was situated the little village of Franklinton, which has long been merged into the City of Columbus. It is, indeed, strange that Ohio, with all her generous acres must have crowded close together, with only a stream to separate, two villages of seemingly no importance.

But there was a purpose in founding the village of Columbus. The site was not particularly advantageous for commercial purposes; there was no better land on the east side of the river than on the west side of Franklinton, the county seat in Franklin County, which was organized in 1803, and which had been frequently mentioned as the future capital of Ohio. The only reason for the founding of Columbus was that men who owned the land on which it now stands had been given assurance that under certain conditions the capital of Ohio would be located there. Ohio wanted a capital at the centre of the State. Chillicothe was the original seat of Government, but it had never been made the permanent one, and the Government soon after became migratory. In 1810 the Legislature met in Chillicothe. In 1811 it met in Zanesville, and the following year it returned to Chillicothe.

For a year or two prior to 1810 the Legislature realized the importance of having a permanent meeting place, and in 1809 Matthias Corwin, of Warren County, introduced a resolution to appoint a committee of five to select a site. In the following year the Speaker of the House appointed James Findlay, W. Silliman, Joseph Darlington, Reisin Beal and William McFarland as the members of the committee, and the first meeting was held at Franklinton, the prospective capital, on the 1st of September, 1810. The committee entered into its work zealously, for the State owned no public buildings, and its valuable documents and records remained from year to year in rented buildings, at great hazard. The committee examined Franklinton and several other sites offered. Moses Byxbee and Henry Baldwin made a proposal for Delaware. James Kilbourne offered Worthington, now a suburb of Columbus. John and Peter Sells laid out inducements for the location of the capital at Dublin. In the report to the Legislature the Commissioners recommended a site twelve miles above Franklinton, on the west bank of the Scioto River, where the town of Dublin is now.

Nothing was done in the matter by that Legislature, but at the beginning of the next session a Company having for its members Lyne Starling, John Kerr, Alexander McLaughlin and James Johnson made the proposition that if the seat of Government were established on the high bank east of the Scioto River, opposite Franklinton, in Township 5, Range 22, of the refugee lands, and would begin to hold its sessions in a town to be laid out thereon by the Company before December, 1817, the Company would:

First. — Lay out a town on the lands on or before July 1, 1812, agreeably to a plan presented to the Legislature.

Second. — Convey to the State by general warranty deed, in fee simple, such square in the town, containing about ten acres, for public buildings, and such lot of ten acres for the penitentiary and dependencies as a director, or such persons as the Legislature should appoint, might select.

Third. — Erect and complete a State-house, offices and penitentiary, and such other buildings as should be directed by the Legislature, to be built of stone and brick, or of either, the work to be done

in a workmanlike manner, and of such size and dimensions as the Legislature should require; the penitentiary and dependencies to be completed on or before January, 1815, and the State-house and offices on or before the first Monday of December, 1817.

At the completion of the buildings, the Legislature and the Company were to appoint workmen to examine and value the whole building, which valuation should be binding; if it should not amount to \$50,000, the Company would build such other buildings as the Legislature might direct to the maximum value, but if the valuation was in excess of \$50,000 the Legislature was to indemnify the Company.

Thus it was that the four men, confident of the future greatness of Ohio, made a proffer to the State amazingly generous for those times. Even with a war of indefinite duration impending, they were willing to link their fortunes with the fortunes of Ohio and carve from unbroken forest lands a town which they believed was destined to greatness. How well they reckoned, the substantial city of to-day is witness. It has grown from nothing in 1812 to the third largest city in Ohio, and that without having the natural resources with which its two superiors — Cleveland and Cincinnati — and its inferior — Toledo — were endowed.

The first sale of lots was made June 18, 1812. The village developed rapidly. Shops and houses sprang up, and Columbus was a thriving village when the new buildings were finished. The village in its early days had scant mail facilities. Traffic passed to the south, passing through Zanesville, Chillicothe and Lancaster. Mails came in periodically on horseback until 1816, when Philip Zinn contracted to carry mail weekly between Columbus and Chillicothe.

The founders of Columbus set energetically to work on the State buildings. On the southwest corner of the beautiful park which now contains the State Capitol the first State building was erected, in 1813. It was of brick, made from clay taken from an Indian mound near Capitol Square. The building was a very plain structure, 75 feet by 50 feet, and two stories high. A second building, 150 feet by 50 feet, was erected two years later for State offices. The timber was cleared from the entire tract in 1816, and the square was inclosed by a fence, which was soon destroyed, and the square became a common, continuing as such for about ten years. The third building, which served in part as a house of justice, was built in 1825, when the court was removed from Chillicothe. The buildings were completed nearly two years before the contracted time, and the Legislature, in 1816, passed a law establishing the capital at Columbus, beginning the second Tuesday of October in that year. The State offices were removed from Chillicothe, and the first session of the General Assembly in the new building was held on the first Monday in December.

The first penitentiary building was erected in 1813. It was of brick, three stories high, 60 feet by 30 feet. The prison yard was 100 feet square. A large prison was constructed five years later.

Surmounting the main door of the State-house was a stone slab, artistically engraved with the following inscription:

"General good the object of legislation perfected by a knowledge of man's wants and nature's abounding means applied by establishing principles opposed to monopoly. — *Lullou.*"

The State-house was burned February 1, 1852. This slab, the only remaining relic of the building, was saved intact, and now occupies a prominent place in the rotunda of the present Capitol.

The old buildings having become inadequate to the needs of the State, a large building was planned, and in 1842 work was begun on the building which now contains the executive record offices of the State. Fifteen years were required for its building, and its cost was \$1,359,121. It is of limestone, and was built by convict labor. At the time of its opening, in January, 1857, five years after the destruction of the old buildings, it was the finest and largest Capitol in the United States. It stands in the centre of the same plot originally deeded to the State. It covers two acres of land, and is surrounded by beautiful lawns. Its style of architecture is not beautiful, but its solidity, ruggedness of character and homely grandeur are still impressive. — *Cleveland (Ohio) Leader.*

BOOKS PAPERS

It is seldom that a translation of a technical work is, on the whole, as satisfactory as the book recently published under the title of "*Rational Building*." The writer has produced more than a mere transcription of Viollet-le-Duc's well-known treatise. The idea and the methods of thought as well have been translated, so that, notwithstanding the presence of a few of the hall-marks which show that the subject matter was originally conceived in a foreign tongue and under foreign associations, the work as a whole is now essentially an American book. Such a translation forms a valuable addition to the library of every one who wishes to appreciate the vital principles of mediæval French architecture, though for that matter the principles which Viollet-le-Duc deduces from the French churches and cathedrals are quite as applicable to the spirit of the

¹ "*Rational Building*": Being a translation of the article "Construction" in "*Dictionnaire Raisonné de l'Architecture Française*," of Eugene-Emmanuel Viollet-le-Duc: By George Marin Huss, Architect, Member of the Architectural League of New York. New York: Macmillan & Co., and London, 1895.

Renaissance or Classic architecture as to mediæval art. There is hardly a work in existence to-day which treats of construction in so broad and rational a method, which considers the true genius of the skeleton of a building in its relation to the finally completed structure and which elucidates so understandingly the fundamental theorem which is the basis of all true design, that good architecture always implies good construction.

It is hardly necessary to cite from a work which is so well known in its original, in order to demonstrate its value. It is an essential part of every architect's education to master this article on "Construction," even if nothing more of the great dictionary is studied. It seems strange now to read Viollet-le-Duc's frantic defence of mediæval architecture, which crops out at places all through the volume. A single quotation chosen at hazard will show his independent spirit, and will also make manifest in a degree the reason for the little success he met with in the estimate of his own countrymen. Analyzing the principles of the flying-buttress, which was perhaps the most marked constructive feature of the Gothic work, he says—"Formulas are good to exhibit the knowledge of him who gives them, but they are almost always useless to the practical worker; the latter allows himself to be directed by his instinct, his experience, his observations, and that feeling, innate in every builder, which shows him what he ought to do in each particular case. We do not hope to make builders out of those to whom nature has refused that quality, but to develop the instincts of those who possess it. One cannot teach good sense or reason, but one can learn to make use of the one, and to listen to the other."

And again, after a very sarcastic comparison of modern domestic architecture with what was attempted in the twelfth and thirteenth centuries, he makes the epigrammatic statement, that "centuries are like individuals, they wish always to be considered gifted with the qualities which are wanting in them and care very little for those they do possess." In fact, the whole treatise abounds with what might be called side-lights of mediæval architecture which are apt to stick in the memory and lend a piquancy to the treatment of so dry a subject as Construction, which would have been impossible to perhaps anybody but a Frenchman, and a Frenchman such as Viollet-le-Duc. But after all, the value of the work is inductive rather than direct. We are not trying to reproduce cathedral architecture now, fortunately. We think we are on a much better line and that the work of to-day, drawn as it is so largely from the Renaissance, while retrospective in its character, has quite as much vitality and a great deal more freedom than was ever possible with the Gothic style.

Viollet-le-Duc was a strange production in many ways. He was essentially a man with a self-conceived mission who felt himself called upon to take up the defence of what was considered barbarous and unworthy in past architecture, and who in the compass of his short life was enabled to see a whole nation aroused in spite of itself, to a respect for and a proper preservation of, the historical monuments which the genius of mediæval art had scattered so freely throughout France. But his best title to our honor is not his mission so much as his methods. He is honored to-day probably a great deal more in England and the United States than he ever was or ever could be in France. Hardly a man in modern times has toiled more conscientiously and systematically than he did. He fairly worked himself to death, and yet, although all his life was given to the study and development of the principles of architecture, he hardly left a mark on the creative art of his country. There is no doubt that France has been influenced by him, but his greatest ability was as an antiquarian, a writer and a story-teller. We may add, also, as a draughtsman, for it is rarely given to one to develop so distinct a style in architectural drawing as was produced by Viollet-le-Duc. Whoever has had the good fortune to go through the extensive collection of his works which was exhibited at the Palace of the Trocadéro some years since, can form an idea of the versatility of his genius in the graphic arts; he could draw anything in any way and with almost any medium. Some of the studies he made during the last months of his life at Lausanne, of the adjoining Alps and the glacier formations, were marvels of careful, comprehensive and appreciative drawing, while the style which he particularly developed for illustrating his works almost revolutionized architectural draughtsmanship. And yet, as an architect, he was a complete failure. It is doubtful if he could have earned a decent living at his profession, and consequently in him is presented the strange anomaly of a man who was absolutely past-master of everything relating to Gothic architecture, who was thoroughly conversant with everything that had been done, and apparently all that had been thought about churches and cathedrals of mediæval times, who appreciated most keenly to all appearances the spirit which gave rise to all of the Gothic glories, and yet who, when he was given a distinct opportunity, seemed incapable of rising above the dead level of mediocrity. Witness the Parish Church of St. Denis, or the screen in St. Germain l'Auxerrois, or even the much-talked-about decorations of the apsidal chapels in Notre Dame. Viollet-le-Duc affords a most striking illustration of the fact that architecture is more than book learning, is more than the ability to draw, that there is something beyond it all which constitutes the art and which a person may appreciate fully, may be able to describe absolutely, may analyze and classify in all its functions, and yet be absolutely incapable of applying it independently. Probably if he had been more of an artist, if his creative powers had been more nearly equal to his intellectual and

investing ability, the world would never have seen his wonderful "Dictionary of Architecture." Had he been a creator as well as an analyzer, had he been able to apply all of his exhaustive knowledge to actual problems, undoubtedly there would have been a revival of Gothic architecture in France which might have been very far-reaching in its effects. As it was, he simply was able to show to the world that the accepted standards of the Renaissance were not unique, and that in one sense art is independent of age, association, or antecedent for its fundamental principles.

It seems strange that more of his dictionary should not have been translated before this into English. As far as we know, this is the only English translation of the article on "Construction," and though most of our architects understand French sufficiently to get a very large degree of help from reading Viollet-le-Duc's writings in the original, it is to be doubted whether many of them would thoroughly understand and appreciate the little niceties so well in the original as they would in the translation. It is to be hoped that the success of this translation will lead to others from the same work, notably the articles on "Decoration" and on "Glass Work," both of which are only less valuable than the article on "Construction."

ILLUSTRATIONS

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

THE DINING-ROOM: HOUSE OF GEORGE A. DRAPER, ESQ., HOPE-DALE, MASS. MR. JOHN PICKERING PUTNAM, ARCHITECT, BOSTON, MASS.

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

HOUSE OF GEORGE A. DRAPER, ESQ., HOPEDALE, MASS. MR. JOHN PICKERING PUTNAM, ARCHITECT, BOSTON, MASS.

ENTRANCE-HALL OF THE SAME.

DESIGN FOR TOWN-HALL, CLAREMONT, N. H. MR. H. LANGFORD WARREN, ARCHITECT, BOSTON, MASS.

IMPERIAL APARTMENT-HOUSE, ST. LOUIS, MO. MR. WM. ALBERT SWASEY, ARCHITECT, ST. LOUIS, MO.

[Additional Illustrations in the International Edition.]

THE ENTRANCE-HALL: HOUSE OF GEORGE A. DRAPER, ESQ., HOPEDALE, MASS. MR. JOHN PICKERING PUTNAM, ARCHITECT, BOSTON, MASS.

[Gelatin Print.]

PARLOR FIREPLACE OF SAME HOUSE.

[Gelatin Print.]

ENTRANCE-HALL OF THE JUNIOR CONSTITUTIONAL CLUB, PICCADILLY, LONDON, ENG. MR. R. W. EDIS, ARCHITECT.

FRIENDS' COLLEGE, SAFFRON WALDEN, ENG. MR. EDWARD BURGESS, ARCHITECT.

DESIGN FOR A ROMAN CATHOLIC CATHEDRAL. MR. F. SANG, ARCHITECT.

THE ground-plan of this church is based on the form of a Latin cross, like most of the cathedrals and many abbeys and other churches of the West. In the East the Greek cross, more approaching a square, is adopted, such as we see in Santa Sophia at Constantinople, St. Mark's at Venice, and many others. In the present plan the oblong, with its cross branches, forming the transepts in the shape of the Latin cross, has been adopted. The arrangement of piers, carrying the vaulted roof of the nave and its surrounding ambulatory, remind us in their solid treatment of the best specimens of Roman and Romanesque ecclesiastical buildings up to the twelfth century in Europe, and give the beholder a sense of strength combined with beauty, which some may prefer to the clustered pillars of the later Gothic period. The guiding principle of the earlier masters was simplicity and dignity. Their golden age began in Europe in the time of Charles the Great and succeeding emperors and kings of the Holy Roman Empire. Some of the works they ordered are lasting monuments of beauty and strength, and combine Christian cheerfulness and deeply devotional feelings. Some of the Italian masters, though influenced by Northern Gothic, did not entirely abandon the hints given to them by the old masters of

Romanesque architecture, and, though slightly adopting in their works some Gothic features, successfully united the gracefulness of the South, such as can be seen now in Italy.

The dimensions of the interior of the building, shown on the plate, are: Length of the interior of the cathedral, 465 feet from inside of main entrance to back of apse; the breadth through transepts from inside of south side to north side entrances is 320 feet; the span of the dome is 116 feet; the height of dome is 168 feet; the nave is 50 feet wide and 112 feet high to crown of arch. The ambulatory on the ground-floor (for professional purposes) is 10 feet wide. A similar ambulatory or gallery surrounds the cathedral on the first floor, and also is arranged around the edifice.



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

MURAL DECORATION IN SITU.

NEW YORK, N. Y., July 23, 1895.

TO THE EDITORS OF THE AMERICAN ARCHITECT:—

Dear Sirs,—In these days when current literature is padded with so much sterile aesthetic twaddle and inflated verbiage, Mr. W. B. Richmond's paper on the "Decoration of St. Paul's," England, printed in your last issue, comes like a fresh breeze from the mountains. Such practical essays from men who have the literary, as well as the artistic, faculty are invaluable, both to the profession and the laity. The history of Mr. Richmond's undertaking from its inception, his preparatory studies, his failures, his successes, are all told with a frank precision utterly free from offensive egotism, that must prove of great utility to all who are interested in the art of mural decoration. It is to be regretted that such a model discourse should be confined to the pages of a technical journal.

While his whole paper teems with sound doctrine, there is one principle on which he particularly insists. It is that all mural work should be executed *in situ*. This is a principle that our very best men, painters and architects, are constantly ignoring; and, if conclusions may be drawn from the present trend of things, will probably continue to ignore, unless a very stout resistance be opposed to the fatal tendency. If it may be written without vanity, I have been preaching this doctrine of execution *in situ* for years, not only in your willing columns, but in others, and in conversation, too, perchance *ad nauseam*,—one always fears to injure a good cause by excess of statement. Yet the joy of meeting with corroborative testimony from good authority is so keen, that I must mount my hobby-horse once more. Hear what Mr. Richmond says: "I made up my mind, once and for all, that during winter as well as summer, we would work *in situ*, and not any more fumble away at such child's play as executing a decorative work away from its conditions of environment, a practice I believe to be quite fatal to successful decoration, and involving considerable loss of time and expenditure of energy," etc. It can safely be asserted that no mortal man, even with great experience, can invariably grasp the complexity of decorative conditions, except on the spot. Certainly within the range of my own observations, which are necessarily limited, I cannot recall but two or three—if as many—bits of monumental or important domestic painting, where really good work has not been marred by obvious decorative errors directly attributable to studio execution, and which surely would have been avoided had the work been executed in place. Naturally, I do not include those cases where a picture has been called for, independent of the architecture, though framed by architectural mouldings. Nor do I refer to qualities of design. As Mr. Richmond observes, one must wait a century for their just appreciation.

It is this *in situ* work that makes the Italian mural decorations architecturally so good. Even that of a bad epoch. It becomes *de facto* part and parcel of the building. Nevertheless, our very best architects are constantly bolstering this pernicious practice of studio-made decoration, a modern method—if occasionally the Venetians be excepted. From the financial point-of-view—a very important point to-day—it would, doubtless, be a good deal cheaper to discard all indirect methods (not forgetting the great Philistine horde of middlemen, drummers and the like) and to let our experienced artist directly superintend all mural painting, even the humbler kinds; for he would know how to eliminate all useless labor. It is to be hoped that the new Roman School, planted in the midst of the stupendous mural decorations of all ages, will open the architectural and artistic eye.

While there are always honorable exceptions, few of those who are in a position to know will gainsay the statement, that wittingly or unwittingly, our architects, contractors, the clergy, perhaps the so-called decorators themselves, by the encouragement of unsound methods, by yielding to the spirit of commercialism, by disheartening the artist and by stimulating the "lowest bidder" have pretty nearly killed stained-glass, as an art—an American industry that but

a few years ago gave such great promise. Mural painting in all its ramifications is now seriously threatened, unless those who hold its destinies in their hands come to the rescue.

FREDERIC CROWNINSHIELD.

THE MASSACHUSETTS STATE-HOUSE.

BOSTON, MASS., July 27, 1895.

TO THE EDITORS OF THE AMERICAN ARCHITECT:—

Dear Sirs,—So long as the last Legislature remained in session the determination on the part of some of our citizens to accomplish the destruction of the Bulfinch State-house was so carefully veiled that it was hoped the iconoclasts had seen the error of their ways; but soon after adjournment the old warfare on the building was renewed. The attack was not direct—it consisted mainly of clever insinuations, so vague that it was hardly possible to reply to them. Fortunately, however, there are sufficient facts in the case as well, and it is to these I desire to call attention. Practically every official statement which has appeared in print within the past month has obviously been intended either to convey the idea that at last the time has come when the Bulfinch State-house must come down, or else to discredit the report of Messrs. Cummings, Andrews and Whitcomb, the special Commission.

On June 20, the State-house Commissioners sent a "warning" to the Executive Council (which, by the way, was not signed by the practical man on the board), calling their attention to the possible danger attending the occupancy of the front portion of the State-house during the summer, saying that it was evident that the process of excavating and underpinning must be attended with more or less danger to the wall above and the safety of the building. It is interesting to know that the architect of the Annex gave the writer a rather different reason for recommending the abandonment of the front building. He apprehended no danger from the collapse of the wall, or the structure as a whole, but said that the rear windows of the old part were usually filled with lookers-on who were liable to injury from falling material, etc., and that as the elevators must necessarily stop running, and the main staircase be closed, it would be both uncomfortable and inconvenient for the occupants. Most excellent reasons for vacating, but rather different from the "warning" of the Commissioners who gave it to be inferred that the whole structure was liable to collapse. But this same letter calls attention to another interesting feature. It says the walls must be underpinned to a depth of more than thirteen feet, which naturally leads one to ask why, even if the rear wall was in such a precarious condition, it was necessary to go to such a depth? Certainly, not to reach hard-pan, as any one familiar with the site will allow, and surely a little room might be spared from a sub-cellar of the commodious annex were there a disposition on the part of those in control to help the old building in its struggle for existence. After the occupants had been safely removed the contractors started in to underpin the wall, it being understood that they had a contract to do the work. They dug down the thirteen feet or more under the west end of the wall, without placing a single shore or blocking under the building and in face of the fact that this part of the hill is filled with pockets of sand—a splendid foundation when properly confined, but which when not properly secured is liable to run out and do serious damage. After doing this ingenious piece of work, they wrote to the Commissioners and architect, saying, "Under the circumstances we feel that we cannot undertake the responsibility of underpinning the wall." It would have been a better statement to have said: "Under the method which we have adopted we cannot underpin the wall, and we advise you to employ some one who is used to such work and is willing to take the precautions and adopt the methods customary in such undertakings." But they go farther and say, "In making estimates for underpinning this wall we had assumed from the report that it was in a reasonably fair condition." Usually assumptions of this kind do not cut much of a figure when a builder has undertaken to do a job of this kind, and until they give some better explanation we will "assume" that, either they agreed to do a piece of work they were incapable of doing, or else they introduced this bluff to get out of the financial cavity in which they had found themselves deposited. There is no wall which skill and money cannot underpin.

But more than this: the contractors undertake to discredit the report of the special Commission and to use it as a shield. The specification of this special Commission distinctly states that it makes no provisions for underpinning "the rear or north wall which will be taken care of by the Commissioners having charge of the additions." This exception was made in view of the fact that the architect of the Annex said that provision had already been made for taking care of this part of the work, and it was so shown on the drawings, and furthermore the contractors are well aware that with the limited time allowed for the examination of the building it was practically impossible to examine the foundation of the wall in question, as it was buried deep under the ruins of the Bryant addition.

Now, a word as to the sham foundations which have been uncovered. Mr. Cobb, whose efforts to save the old building should be as warmly commended as his efforts to alter it should be condemned, has stated the facts clearly and accurately. This bad work was no part of the original structure: it did not seriously impair its strength, and the fact of its existence does not affect the assertion that the wall can be successfully underpinned. The statement that the

sills of the building are rotten does not call for anything but ridicule — no brick building has wooden sills — and the fact that a piece of rotten wood was found under a dwarf interior wall, which carried no superstructure and was of very recent origin, call for no comment, unless the Executive Council, to whose chamber this valuable discovery was carried, were led to believe that the stability of the gilded dome was dependent upon such material, in which case, a slight investigation will dispel any such mistaken ideas. And here it is well to say, that the weight of the dome is not carried on the rear wall, but on the cross walls, with which the builders of the Annex have no business to meddle.

After these various letters and warnings had been issued, we were told that the difficulty in underpinning the rear wall would be solved (?) by building an entirely new wall outside and independent of the wall of the old building. This is not what the Commissioners were authorized to do by the Act, (Chap. 490, Sect. 2) and it is unnecessary to call attention to the fact that in order to carry out the work as now proposed, it is practically necessary to underpin the old wall, and do the most difficult part of the work which the contractors claimed was impossible.

Whatever may be the outcome of this "attack in the rear" on the old building, and however thoroughly may be carried out the work of building a proper underpinning, which is now being built since public attention has been directed to the matter, the affair must go into the history of the fight for preservation, as an effort to discredit the report of the special Commission, and as one of the many attempts to mislead the public into thinking that it is not only impracticable, but impossible, to preserve the Bulfinch State-house.

For two successive years the Legislature has said, in no uncertain voice, "Hands off the Bulfinch Building." Let us hope the Commissioners will heed the wishes of the great majority of our citizens who wish the building preserved. They have done many things they ought not to have done, but in the future let us hope they will leave undone what they have proposed to do — and not let the vision of an expanded front and a "stilted" dome lead them to consign the hub of our universe to the untimely end which overtook its neighbor, the mansion of Governor John Hancock.

THOMAS A. FOX.



BOSTON, MASS.—*Summer Loan Exhibition: Gobelin Tapestries; Japanese Paintings; Line Engravings, Mezzotints, and Etchings by Rembrandt: at the Museum of Fine Arts.*

NEW YORK, N. Y.—*Twenty-eighth Semi-annual Exhibition: at the Metropolitan Museum of Art.*

Summer Charities Loan Exhibition: at the American Art Association Galleries.



CATHEDRAL OF SAN FRANCISCO, CHIHUAHUA, MEXICO.—The Cathedral of San Francisco, in the City of Chihuahua, Mexico, deserves to be placed on the list of the wonders of the world. Beautifully located on the principal plaza of the city, its slender, graceful towers rise high above the trees and glisten cool and white against a background of bleak mountains and bluest sky. "Graceful, massive, beautiful, magnificent," exclaims every visitor; but if the grand cathedral itself is extraordinarily attractive, its history is no less so, for it is as strange as if made during the days of the pyramids. Two hundred and nineteen years ago, in 1675, "Chihuahua, the place where things are made," was only a lively frontier Catholic mission. The cathedral was built on ideas borrowed from both the Moorish and the Gothic architecture. The rich façade, in its elegance and purity of complicated filigree, contrasts agreeably with the severer style of the rest of the grand mass. It is the work of an artist who was sentenced to death for some crime, but was promised that the sentence would not be carried out until he had completed ornamenting the front of the cathedral. For twenty-one years the artist stood upon the platforms and cut into stone his beautiful dreams; and for twenty-one years armed sentinels paced the walks down below, and conveyed him to and from his prison. At last, old, broken down and sick, he notified the authorities that his work was done and he was ready to die. Then came pardon, banquets and honor with mocking rapidity, but it was too late, and his eyes closed before he reached the ship that was to carry him to sunny France; and to-day, even his name has been erased from the manuscripts, and from the cathedral that is his monument. As the walls arose slowly, thousands of men, soldiers and slaves, brought dirt in rawhide bags on their backs and slowly and laboriously built up huge inclined planes all around the building. No scaffolds or derricks were used in the construction of the shell, but each stone was pushed and pulled up the long inclines and to the summit of each wall and tower by human hands, toiling under a tropical sun and smarting under the lash of cruel task-masters. As the towers rose to a height of over one hundred and fifty feet, the inclines from each were over half a mile long, and the dirt fell over and covered the church, and by the time the towers reached their full

height of over two hundred feet, the church had disappeared in a vast mound of earth. For seven more long years the patient workers toiled to remove the mountain they had themselves built up, sack by sack, and thus dug out the marvel they had constructed. In 1886 the roof of the church was crowded with Mexicans watching the progress of the battle between their forces and the troops of Maximilian; but they hastily climbed down when a cannon ball cracked the big bell in the northeast tower. Two years ago a mining man offered to give the church a new bell for this cracked one, which he wished to send to the Columbian Exposition; but an examination proved the interesting fact that the bells had all been cast in the towers when the church was built, and that now there was no way to get them out without tearing the towers down. — *Florida Citizen.*

GOVERNMENT CONTROL OF WATER-POWER.—An issue which has a wide and most important bearing has arisen at Appleton, Wis. The Government has ordered the local electric light and power company to entirely cease using the water of the Fox River, and the city found itself temporarily without either street-car or lighting service. The quantity of water used by the company is said to be about 6,000 cubic feet for three hours daily, which is hardly more than is now running over the Government canal and actually wasted; but the Government order is peremptory, and the only thing the company could do was to equip its station with steam as promptly as possible. Some of the large paper and other mills of the city were affected by the prohibition, and there has been a wholesale ordering of engines and boilers, as it is quite evident that such a crisis as the present must be reckoned with in the future. Many of the neighboring towns will feel the deprivation severely, as the profits of manufacture will be materially cut into by the necessity of installing steam plants, and some of the smaller manufacturers will be in a bad plight. The situation, however, is accepted philosophically, as the action of the Government was for the public good. While navigation is still possible on the lower river, the lake supply is steadily diminishing and threatens to be so depleted within a few weeks that the navigable traffic will be stopped. The incident shows that the Government has come to realize the gravity of establishing an organized control over the water-powers of the country, and the principle of this initial step will doubtless be extended to other enterprises, both contemplated and in actual operation. For instance, the proposed canal between Lake Michigan and the Mississippi River is estimated to lower the level of Lake Michigan and all the other lakes from three to nine inches, and reduce the body of water now running over Niagara Falls 5 per cent, and ultimately 10 per cent. This would shallow many harbors and make Cleveland an inland city. The carrying-capacity of the lakes is over 30,000,000 tons, representing many millions of dollars of merchandise annually, and the determination of how far this vast commerce is likely to be affected by the canal will doubtless come within the scope of the Governmental prerogative which has just been put in force at Appleton. — *N. Y. Times.*

ELECTRIC POWER ON THE PACIFIC COAST.—This week has seen the introduction of electric power to Sacramento from the Folsom Prison dam. Enormous power is furnished by the waters of the American River. This proves that the western flank of the Sierra Nevada will give power to the towns and cities lying along the central drainage of the Sacramento and San Joaquin valleys, and the innovations and changes to occur from this are far-reaching. There is a large percentage of land in both these valleys which cannot be economically irrigated, because of the unevenness of the surface. There are swells in the plains, and the best the irrigator can do is to run ditches around their bases. Cheap power will enable the owner to pump from these ditches at the base of a swell to its top and irrigate in that way, so that hereafter but few lateral ditches will be constructed. Wrought-iron pipe is so cheap as to cost little more, and somewhat less, than a lateral ditch, and the pumping power, when transmitted by water-power from the flanks of the mountains, is going to be so cheap that extensive irrigating systems, supplementing main canals with pipe, are going to be the rule. Besides this, every farmhouse will have cheap power, and the windmill will disappear. The windmill in California is an important auxiliary of a farmhouse, but heretofore it has had to be supplemented with horse-power because of the intermittent character of the wind. Both wind-power and horse-power will disappear, and the electric motor will take their places. The country is well suited, by reason of its topography, for the wholesale application of electrical power in California. From the head of the San Joaquin to the head of the Sacramento Valley is about seven hundred miles, while at short intervals there rush down the western slopes of the Sierra Nevada streams fed by snows, affording a vast water-power all the year round. The high price of coal has handicapped the California manufacturer. After her water-power is converted into electricity it will make her one of the great manufacturing States. — *N. Y. Tribune.*

A FOUNDATION SACRIFICE.—It was recently ascertained that the tower of Darrington Church, about four miles from Pontefract, had suffered some damage during the winter gales. The foundations were carefully examined, when it was found that under the west side of the tower, only about a foot deep from the surface, the body of a man had been placed in a sort of bed in a solid rock, and the west wall was actually resting upon his skull. The gentle vibration of the tower had opened the sutures in the skull and caused a crack about two and a half inches long. The grave must have been prepared and the wall placed with deliberate intention upon the head of the person buried; and this was done with such care and art that all remained as placed for at least six hundred years, till, in fact, the storm of December last found out the weak place. The place can still be seen, being protected by a framework of bricks. — *Yorkshire Herald.*

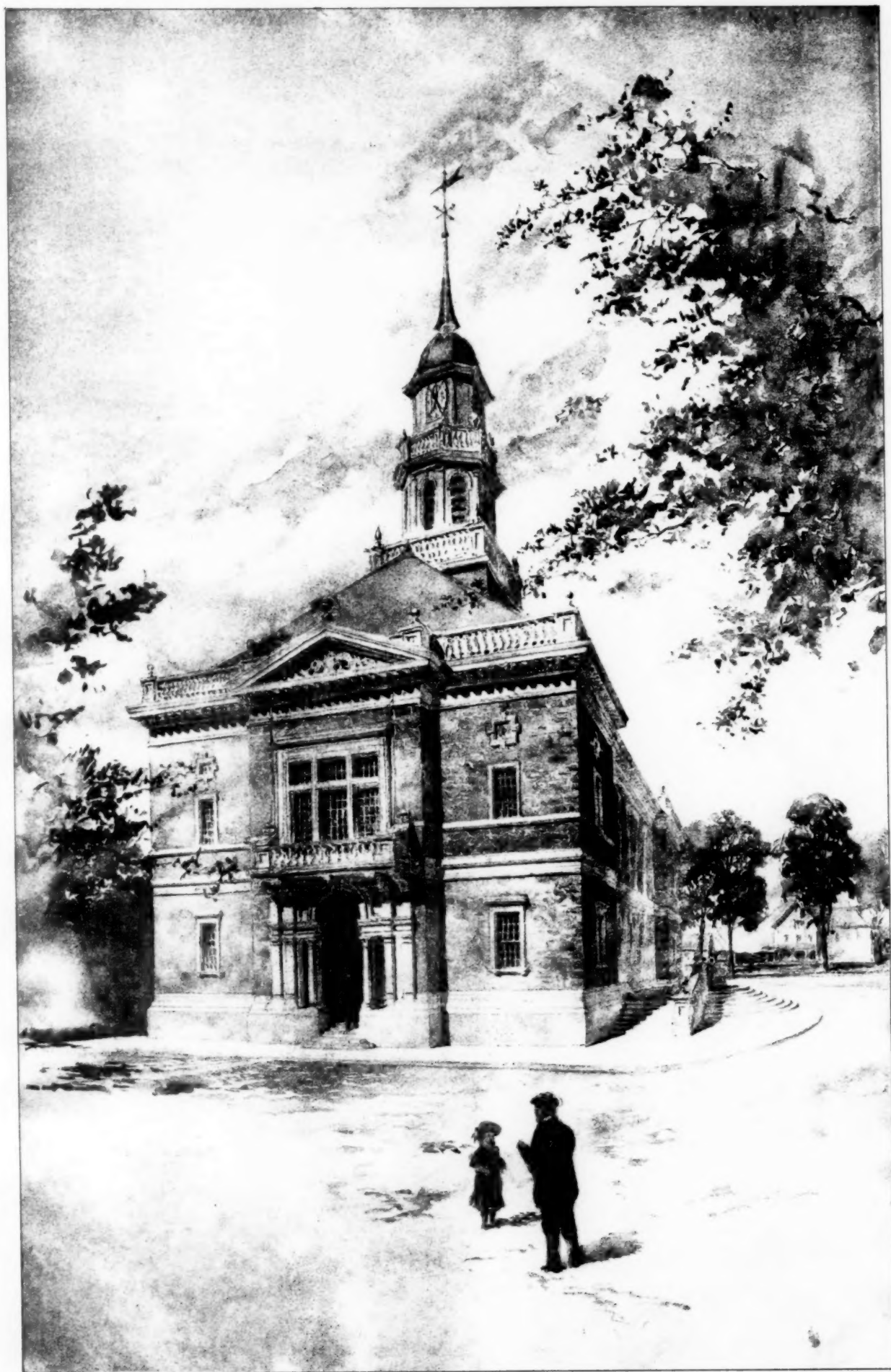
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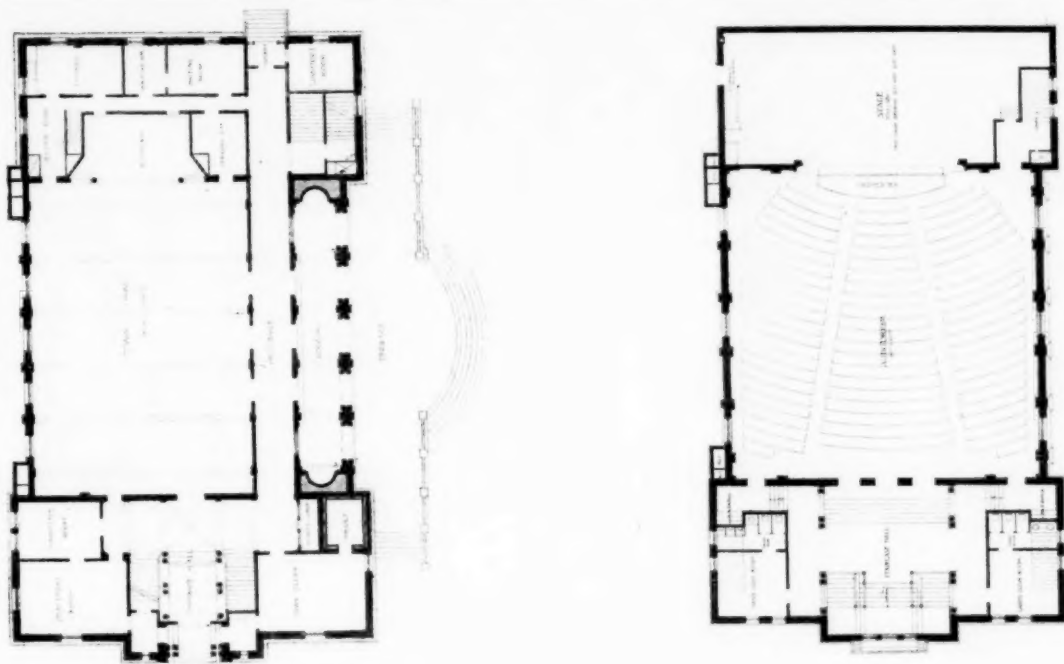
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DESIGN FOR TOWN HALL, CL.

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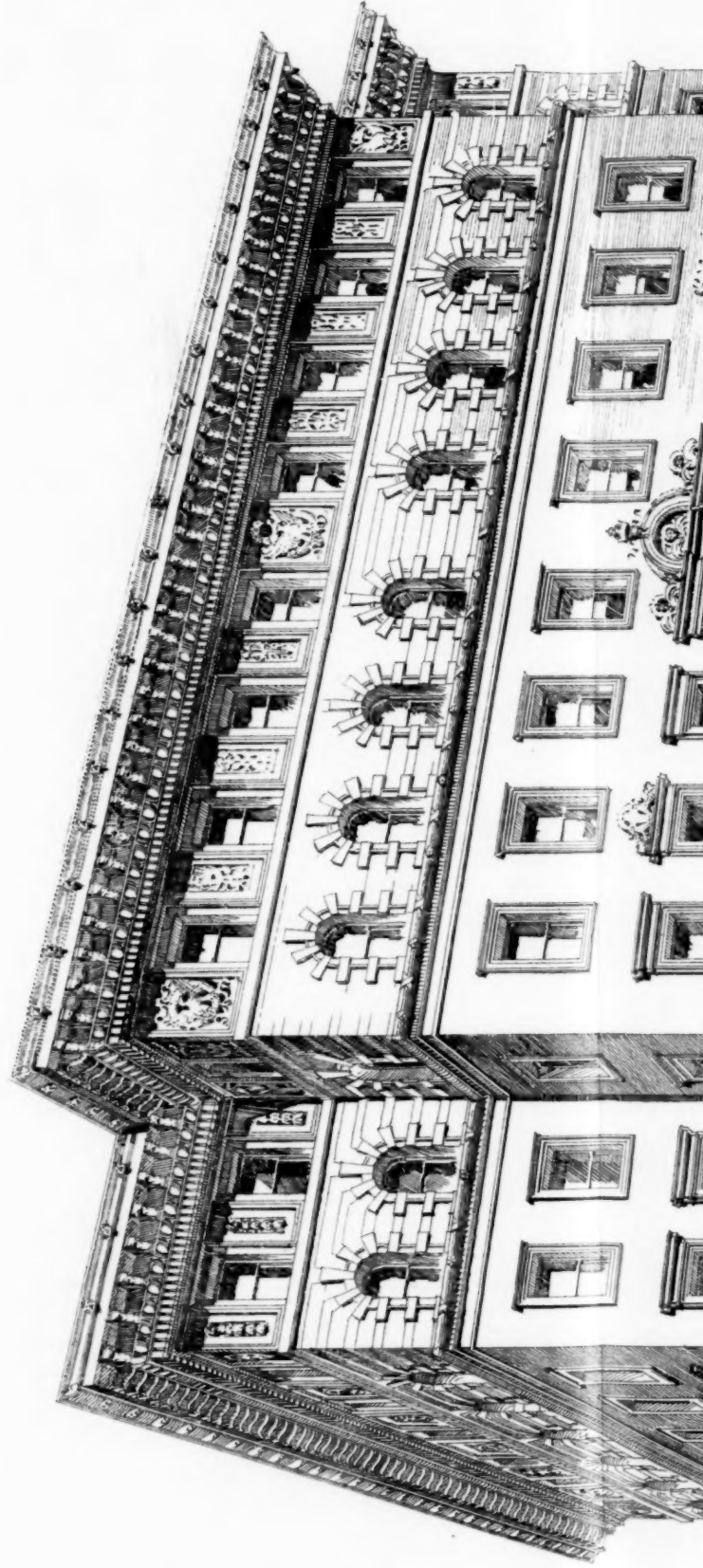
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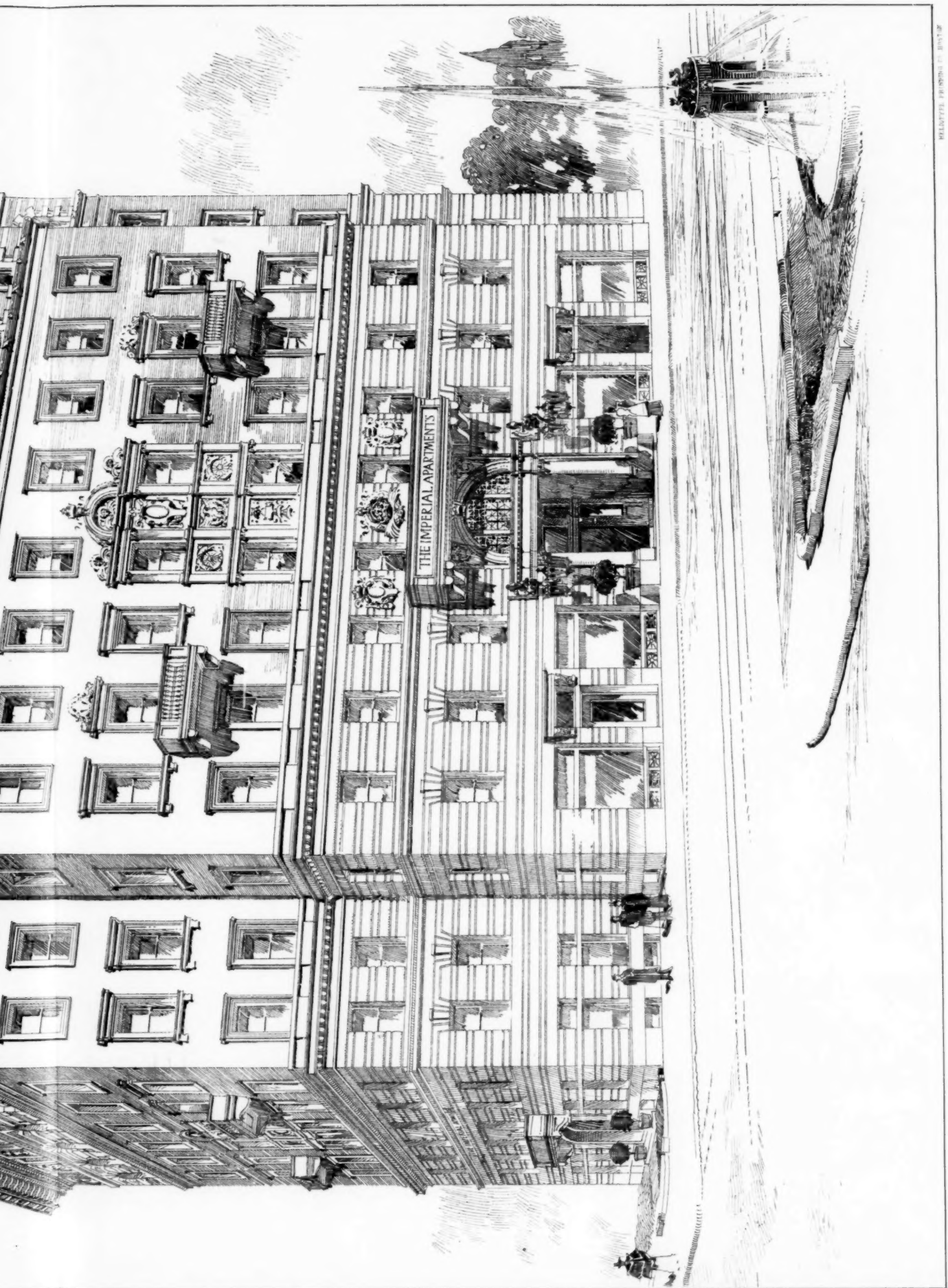
LANGFORD WARREN, Architect.

THE IMPERIAL APARTMENTS

ST LOUIS MO

W. ALBERT SWASEY ARCHT





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