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CONTENTS

THE New York Park Commissioners have done an admirable thing in appropriating Castle Garden, which has now been abandoned by the Commissioners of Emigration, as an aquarium building. The structure is very well adapted to the purpose, having outside walls of great thickness, but being clear of partition and division walls. The enclosing walls form a circle on the outside, but a polygon on the inside, and the architect to the Board, Mr. Munckwitz, proposes to repair and repoint them, close the windows, and the loop-holes, which still recall the days when the building was really a "castle," and line them with brickwork in cement. Fronts and partitions of thick plate glass will then be set at a certain distance from the walls, forming a ring of immense tanks, which will be lighted from above by skylights. This arrangement is similar to that adopted in the aquaria of the best European zoölogical gardens, but the one at Castle Garden will be on a much more extensive scale than any in Europe, except, possibly, the one at Naples. Beside the tanks on the floor, Mr. Munckwitz proposes to utilize the ring of columns which carry the middle portions of the roof for supporting a gallery, on which will be placed another tier of tanks. In all, there will be one hundred and fifty of the glass-front tanks, and, in the middle of the floor, will be formed seven open ponds, which will be devoted to whales, sharks, and other large fishes, and, we hope, in part to seals, the most intelligent and popular of all marine animals. Proper means will be provided for warming and cooling the water in the tanks to the taste of the occupants, and when the work is finished, which will probably be before next winter, the New Yorkers, particularly the children, will have an aquarium of which they may well be proud.

THE leaders of the striking granite-cutters of the New England quarries recently undertook, as is the wily custom of such persons, to bolster up their declining fortunes by attaching themselves to some outside popular movement, and, with this idea, sent a deputation to Dr. Parkhurst, of New York, to offer their aid in his "crusade" against vice in New York, on condition of receiving his assistance in their own equally important task of crushing contractors and quarry-owners. Dr. Parkhurst, however, proved quite insensible to the attractions of this offer, and, while he expressed himself as desirous of the aid of all virtuous citizens in repressing immorality, he said that his time was so much absorbed in the pursuit of one particular division of this subject that he would hardly be able to inquire into the collateral branches to which the committee invited his attention. With this wise and sensible reply, which we commend to the attention of the would-be Governors, and other ambitious persons, who fall so easily into the snares of the labor tyrants, the delegation returned to their constituents, and neither the quarrymen nor the contractors are likely to be any the worse off for the appeal to an earnest and courageous man. It is safe to say that the answer was not at all according to the taste of the delegates, who would have preferred some rant about "oppression," "the dignity of labor," and so on, and that Dr. Parkhurst will not be called upon again to help along such undertakings, but it would be a good thing if he, and a few others like him, would occasionally volunteer their comments on a system under which, in this free country, a few men are able to say that no mechanic who does not pay them tribute shall be able to earn an honest living in the States of New York, New Jersey, or Massachusetts, and who do not hesitate to plunge half a million people into misery at a word, for the mere object of showing their power, and inspiring fear in the few persons who have independence enough to resist their dictates.

A GREAT fire took place in Hamburg not long ago, which shows how difficult it is to prevent or check conflagrations in storehouses filled with combustible goods. Hamburg has the reputation of being better protected against fire than almost any other city in Europe. Not only is the ordinary construction very solid, and under rigid police supervision, but the city possesses a splendid fire-service, enormous hydrants are liberally scattered through the business section, and, as an extra precaution, the locomotives of the harbor-freight railway, twenty or thirty in number, which circulate at intervals of two or three minutes through the business section, are fitted so that they can be utilized at a moment's notice as steam fire-engines. Nevertheless, although the nearest fire-brigade station is only two minutes away, one of the largest storehouses in the city, having five acres of floor-space, and built almost entirely of brick and iron, was completely burned out in three hours from the time the fire was first discovered. A year and a half ago, a similar storehouse, containing five hundred thousand dollars' worth of coffee, was burned in the same way; and the fire-engineers attribute the destruction of both buildings to the same cause — the dissemination of the flames through them by elevators and ventilating-shafts. In the last case, there were four elevators. The fire broke out in the upper story, and attacked the wooden roof-boards, with which the iron rafters were, by a singular piece of economy, covered. With the help of these, a great body of flame was generated, which penetrated downward through the ventilating-shafts and elevators, and soon set the whole building in a blaze. One would naturally suppose that the elevators, if covered with skylights, after the American manner, would have drawn the fire up, instead of giving it a pathway downward, but the ventilators, although they at least must have opened freely into the air at the top, seem to have helped to carry the flame down, and it is probable that the expansion of gases due to the heat was too great to find vent in one direction only, and that the fire was scattered, by a sort of explosion, through every possible outlet.

IT is often said, with truth, that the student of architecture finds it of great advantage, in studying the work of particular countries and periods, to know as much as possible of the character and history of the people by whom the buildings in which he is interested were produced. To the experienced scholar, familiar with books and libraries, it is natural and easy to supplement the investigation of the proportions of the Greek orders by a course of ancient mythology, and at least the history of the Persian War, or to sharpen his sympathy with mediæval sincerity and fervor by reading the story of the early Benedictine missions, and the deliverance of Europe from slavery through the heroism of the free cities; but for younger students this is not so easy. Many of the most promising graduates of our architectural schools, men of great capacity and artistic feeling, know nothing of the mediæval or antique architects except through their works, and thus miss much of the help which they would derive from being able to throw themselves into fuller sympathy with them. We do not ourselves pretend to anything like an extensive acquaintance with historical literature, and are, moreover, quite conscious of the fact that it would be useless to recommend to a busy draughtsman the perusal, for example, of Guicciardini's "*History of*

Italy" as an assistance to his comprehension of Milan Cathedral and Santa Maria del Fiore, but there are less pretentious works, often in the form of historical novels, which are extremely interesting reading, and leave a vivid, and tolerably correct, impression on the mind.

THE best of these in English is, perhaps, Charles Reade's "*Cloister and Hearth,*" a story which, besides being very interesting, not to say exciting, gives an immense amount of information in regard to mediæval life. Reade spent years, during his residence as a Fellow at Oxford, in collecting material for this book, which he considered the greatest of all his works, and, picturesque and dramatic as it is, there is no doubt of its historical accuracy. Next to this, the Waverley novels are perhaps the best English books of the kind, which treat of the mediæval and transition period, but even better than these, for the student of architecture as a profession, are Viollet-le-Duc's slight, but learned novelettes, such as the "*Story of a Fortress,*" the "*Habitation of Man in all Ages,*" and some others. Most of these are accessible in the English translation, but students who hope, as all architectural students do, to spend a part of their life abroad, could not prepare themselves better than by reading them in the original, following them, when Viollet-le-Duc's very technical, but clear and elegant French has become somewhat easy to read, by a prolonged course of his noble "*Dictionnaire Raisonné,*" a work the text of which is as brilliant and interesting as the illustrations, which are the only portion that most American architects are familiar with. Those who can read German will find many interesting and accurate historical novels relating to the period between the fall of the Western Empire and the Renaissance. Of these the best are probably those of Professor Felix Dahn, and, although they concern themselves only with the earlier portion of the Middle Ages, and have little to say about architecture, they give a very accurate and vivid picture of the times of Justinian and Charlemagne. The best of them, and the only one, so far as we know, which has been translated into English, is the "*Kampf um Rom,*" or the "*Struggle for Rome,*" as it is called in the translation; but everything that Professor Dahn, who is one of the most brilliant novelists and dramatists in Europe, as well as one of the most learned historians in Germany, has written to illustrate his favorite period—that which corresponds in architecture to early Romanesque—is charming and instructive reading.

OF books to illustrate the Classic period, the best are, perhaps, Becker's well-known "*Charicles,*" for Greek life, and "*Gallus*" for that of Rome. Both of these are rather text-books of information about classical antiquities, strung on a thread of story, than novels, but the work is done with great skill, and no one can fail to find them interesting. Bulwer's "*Last Days of Pompeii*" is worth reading, although Bulwer does not shine as an archæologist, and there is an excellent little story named "*Quintus Claudius,*" by a German author whose name we forget, which has been translated into English. However, we must confess that our novel-reading days were over a good while ago, and the recollection of the stories of the kind which amused and instructed our youth comes back to us with considerable difficulty; so that we hope that some of our readers, fresher from their days of comparative leisure, may be disposed to add from their greater knowledge to a list which will, we think, be of value to many a hardworked draughtsman, who likes to keep in the vein of his beloved profession, but has not energy enough left, after a long day over the drawing-board, to undertake Lübke or Penrose.

IT is worth while occasionally to repeat the directions for blue-printing and other office processes, with suggestions for improvement or simplification in their use. At present, the recognized formula for preparing blue-process paper appears to be to make two separate solutions, one of four ounces of citrate of ammonium and iron, or ammonio-citrate of iron, as it is often called, in a pint of water, or, more accurately, sixteen ounces; and the other of four ounces of red prussiate of potash, otherwise known as ferrocyanide of potassium, in a pint and a half, or twenty-four ounces of water. The two solutions may be made and kept separately in daylight, but, when mixed, are very sensitive to light, and the mixture should be made and used only in a dark room, or at night, by artificial light. To prepare the paper, the two solutions are mixed thoroughly, and applied with a large, soft brush. The paper must be dried and kept in a dark place. Two pints and a half of the liquid is sufficient for forty sheets of paper of double-elephant size—twenty-six by forty inches. The process of printing is too well known to require description, but it is not always very skilfully practised in offices. The copy should be printed darker than is usually thought necessary by amateurs, and should then not merely be washed on the upper surface, but thoroughly washed on both surfaces, and then, if possible, soaked for fifteen minutes in clean water, and finally rinsed again in fresh water. When dried, after this treatment, the lines will appear in brilliant white on a dark blue ground, and there will be none of the subsequent discoloration of the whites which so commonly affects the clearness of blue-process prints. The quality of the paper is of importance. To obtain the best prints, the paper should be smooth and well sized, to keep the sensitive solution on the surface, but not too thick. Very good prints from tracings can, however, be made on common brown Manilla paper, such as is used for detail drawings, prepared in this way; and, with care, tracing-cloth can be prepared with the solution, and prints made which are far superior, for use by workmen, to the paper prints. All the chemicals required can be obtained at the photographic-goods stores, and, in an office where there is any leisure time, prepared paper can be made, of a quality quite good enough for ordinary use, at a fraction of the price charged for the commercial paper.

NOT long ago, an "international competition" was announced for plans for draining the city of Sofia, the capital of Bulgaria. There was a jury, composed of Bulgarian officials and scientific men, with two engineers, one a German and the other an Austrian. Twenty-five plans were received, of which seventeen were at once excluded, leaving eight, of which four received premiums, while the other four were recommended by the jury for purchase by the Government. The plans were sent in under motto, but the motto, in such cases, conceals nothing, and it was soon ascertained that one of the jury, who had attended the meetings, and expatiated on the merits of the designs, was himself the author of the one placed first. The German and Austrian members of the jury, when this fact became known, protested against the decision, and demanded the exclusion, either of the enterprising Bulgarian, M. Momtchiloff, from the jury, or of his design from the competition, but their protest was quite unheeded, and they were obliged to content themselves with refusing to sign the awards. It will be observed that this incident affords an unusually good illustration of the distinction between what we may call the commercial and the sentimental view of competitions. Among the degraded subjects of the effete despotisms of Europe, there is an idea that an architectural competition is a fair contest between men of learning and skill, in which, after an impartial award by an expert jury, the work is given to the author of the best design. According to the commercial view, which prevails among the keen and enterprising inhabitants of certain States and Territories which we will not name, and, as it appears, also among the hardy mountaineers of Bulgaria, a competition is a device for extracting from unwary outsiders of eminence ideas and suggestions which can be utilized by the inside person, whether a member of the jury, or a friend of the managers, or a benefactor of the janitor, who has already been promised the work. In most cases, this individual, who is likely to have devoted so much of his mental energy to the arts of wire-pulling and mean trickery as to have had little to spare for the study of his profession, feels himself rather at a loss when the time comes for executing his task, and, as those to whose favor he owes his employment like to have a specious blind for exhibition to the public, the resource which best suits both parties is to announce a "competition," the fruits of which are divided between them.

A NEW wood-concrete, according to the *Bautechnische Zeitschrift*, has been invented in Germany. Shavings and planing-mill chips, either of common or fancy woods, which may be stained before use if desired, are mixed with cheese, or rather, casein, calcined magnesian limestone, glycerine, silicate of soda and a little linseed oil, and this queer mess is forced by hydraulic pressure into moulds, where it is allowed to harden. When dry, the composition is strong and solid, and can be sawed, planed, polished and varnished. It is expected that it will be found useful as an "ornament," in the shape of panels, or as a covering for entire wall-surfaces.

ROOFING.[1] — I.

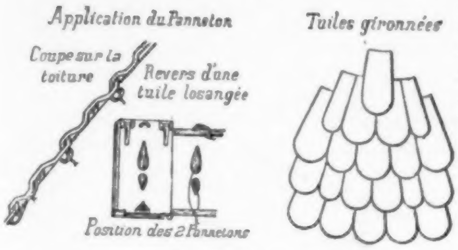


Fig. 1 et 2.

SINCE the roof of a building is designed as a protection against all kinds of inclement weather, and especially against dampness, its chief requisite is absolute imperviousness, that is, it must be so constructed that it cannot be penetrated by water; this gives rise to a great variety in the slant. The character of the materials employed and the ease with which they can be obtained sometimes determine the kind of roofing. In addition to these there are many other considerations that must enter into a decision as to the roof to be adopted for any structure. Sometimes, in fact, the slope has to be slight to insure against the slipping of the material, while at the same time an easy flow must be maintained for water; sometimes, on the other hand, a steep pitch is required in order that the water may flow off. It sometimes happens that the material can be adjusted to a gentle incline, but owing to a curious phenomenon of capillary attraction, there is danger that the dampness will gather gradually between the surfaces in contact, and so reach the interior; in this particular case, therefore, the roof must be steep. In the same way, to secure suitable resistance in localities exposed to high winds, it is prudent not to slant it too little.

There is such a diversity in roofing materials that we make the following classification for the purpose of facilitating our study. (1) clay materials; tiling; (2) stone materials; slate, cut stone, lava; (3) metallic materials; sheet-iron, plain or corrugated, cast-iron, tin, lead, copper; (4) wood materials, as thatching, boards or shingles, cloth, paper and tarred-pasteboard, either bituminated or not. We shall not devote equal space to these different divisions, as we desire especially to give technical details concerning the materials in most common use at the present day.

Before entering upon this dry subject, let us digress a little and take a retrospective glance at the last Paris Exposition which is already nothing more than a brilliant dream. Along the Seine several structures were erected embodying the history of human habitations in which the different methods of roofing were exhibited from earliest times down to the present. The series began with the wretched dwelling of our troglodyte ancestors, and even with the cleft in the rock which served as their shelter; then came the first rudimentary attempts at roofing in a sort of tent formed of branches stripped, fastened together at the top, and covered with the skins of animals, similar to those still seen among the savages of Terra del Fuego; thatched roofs next appeared, indicating a certain

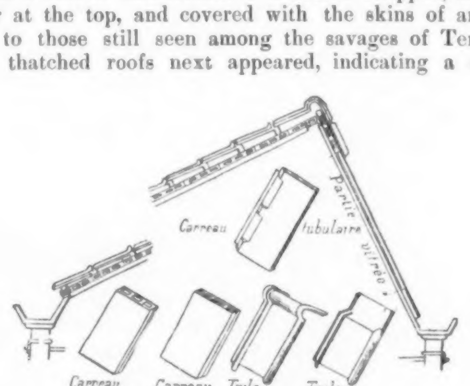


Fig. 3.

degree of reasoning on the part of their constructors and a certain amount of work; lastly, stone and wooden roofs were seen, which brought us to modern times.

But to return to our subject. Of the manufacture of materials for roofing purposes, that of tiling has been extended in a remarkable fashion of late; especially is this true of ornamental tiling; artists are to-day adopting this sort of decoration for their works. Tiles are made of argillaceous earth reduced to a fine and smooth paste and freed from all calcareous substances; sometimes a little very fine river sand is added. Pottery clay is nothing else than the silicate of alumina (silica 57, 42, alumina 42, 52) mixed with magnesia and certain oxides. It is soft to the touch, and soapy in texture; it absorbs water very readily and forms a sticky paste, which is ductile and has the property of hardening with heat. When the clay is of good quality the products are but very slightly porous and can stand sufficient baking to enable them to resist successfully all atmospheric action.


Fig. 4.

The manufacture of tiling as well as of brick, is still carried on just as it was before the development of machinery. The most essential condition of success is that the original material be selected with extreme care; everything, in fact, depends upon that. The choice once made, the next thing is to ascertain whether the clay tempers easily or not. If it does — which is generally the case in the south of France — the work is much more quickly done; if not it must first be cut up with a machine, which always causes a loss of time. When reduced to a paste, it is worked to make it more ductile, and is then run into moulds. This operation over, the drying process begins. When ready for burning, the tiles are put into continuous kilns, which are very generally employed now on account of the excellent results obtained. In some tileries also the Haussmann kiln is used, the results from which are also good, though not as good as from the first. There are still


Fig. 5.

Fig. 6.

other kinds of kilns but they are so far inferior to those already mentioned that we pass them by.

The simple flat tile was long ago almost universally superseded by lapping tiles and interlocking tiles; roofs are now much lighter than they were formerly and consequently greater economy is possible in the timber work. In countries where heavy winds prevail, as lightness is incompatible with stability, the tiles are not simply laid on scantling but are firmly secured to the lathing by means of a galvanized-iron wire passed through holes in the tiling made for the purpose. This system of fastening, the Montchanin (Fig. 1) is often indispensable for the first few courses projecting beyond the walls, in constructions where these jutting portions cannot be completely battened.

On circular constructions, as rotundas, flat tiles are frequently used; the ease with which they can be produced makes it possible to shape them so that the two long sides converge toward the centre (tiles for the edge of a roof, Fig. 2). They are laid thus like ordinary tiles, and do away with the special eaves and hip tiles necessitated by the use of rectangular tiles.

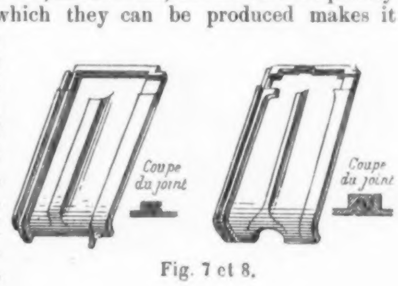


Fig. 7 et 8.

If the roofing is adjusted to open lathwork, the attic is exposed in some regions to intolerable heat; the idea was therefore suggested of utilizing the air, which is a poor conductor, as an intermediary cushion, and as hollow tiles were already manufactured nothing remained but to apply them at once for roofing purposes. We give as an example (Fig. 3) the tubular

[1] From the French of A. Rospide, in Planat's *Encyclopédie de l'Architecture et de la Construction.*

tiles adopted by the Maison Royaux for covering manufacturing establishments. It will be remarked that the ridge-tile represented in this figure does not merely cover the upper ridge, but the portion turning down at an angle is the continuation of an ordinary tile; this makes it heavier and much better fitted to withstand high winds.

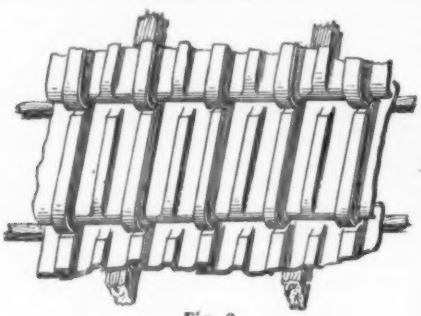


Fig. 9.

For the purpose also of admitting air, skylights are introduced into roofs. In tile roofs the joints are made with mortar or zinc, and are, as every one knows, either very frail or very difficult to execute well. With the ordinary flat tiles it cannot be otherwise; but with interlocking tiles a metal sash may be made of the same form and dimensions as a number of these united, and then inserted in the roofing as easily as the tiles themselves, since the joints are made in the same manner.

Figure 4 represents a Montchanin skylight, placed at some distance above the floor, and manipulated by means of a cord and pulley, as readily as though it were within reach of the hand. Through these windows light and air can be obtained at will, but they always increase the expense somewhat. In country buildings where economy is a desideratum, it may not always be necessary to have as much light as is admitted through the window. To meet the demand in such cases tiles wholly of glass have been for some time manufactured at Saint-Gobain. These are introduced here and there in the roof, or what is still more economical, as the quantity of glass used is much less, a small pane may be inserted in a perforation for the purpose in a tile, the latter merely forming a frame for it (Fig. 5). As ventilation cannot be secured with these, as in the case of the skylight, cat-hole tiles (Fig. 6), either with or without gratings, are used, which give permanent ventilation, while at the same time not allowing easy access to the interior, as does a good-sized metal sash.

Fig. 10.

Let us turn now to lapping and interlocking tiles. Figure 7 represents the so-called "Emile Muller lapping tile." The section of the joint shows at once the characteristic feature of this type. Clearly, perfect tightness, if possible, must be assured, and this is accomplished by means of the projection beyond the clamping heel. Each tile weighs on the average three kilos, and nearly fourteen are required to the metre; the price is 200 francs a thousand.

Another system is that represented (Fig. 8) by the interlocking tile weighing 2.800 kilos. Here there is no projection and the clamping must be executed with the greatest care to prevent the infiltrations which are liable to occur in seasons of heavy rains and damage the interior. In both systems the tiles are adjusted in the same way. To keep them in place either wood or iron laths are used, according to the ease with which the one or the other can be obtained. Figure 9 gives a roof of lapping tiles on fir laths. These have to be adjusted with great nicety, and extreme care must be exercised by the men charged with the execution of the work, to avoid undue waste. For this purpose, before the laths are placed, the tile must be measured to ascertain in advance the number required in each course; then the lathing can be done. After that, it is necessary to verify with the greatest exactness the distance required between the laths in order that the vertical joints shall be perfectly straight and perfectly perpendicular to the eaves. All these precautions taken, the work will be done in the best possible conditions and will therefore be satisfactory. Three linear metres of lathing to every square metre of roofing will be required. The dimensions of the fir laths are: 40 to 50 millimetres in width to 25 to 27 millimetres in thickness, the distance between the rafters being 0.60 metres to 0.80 metres. When iron laths are used for this kind of roofing small angle-irons of 25 to 30 millimetres on a side, or even simple T-irons are generally employed. In the sections represented in Figure 10 we have shown the difference between the joints of two lapping tiles and two interlocking tiles. Every one can thus appreciate what has just been said on the respective value of the two joints. Lastly, it may be added that the most convenient pitch for a tile roof is 23 degrees, or 0.40 metres to the metre.

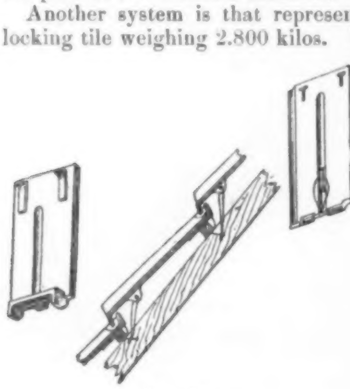


Fig. 11.

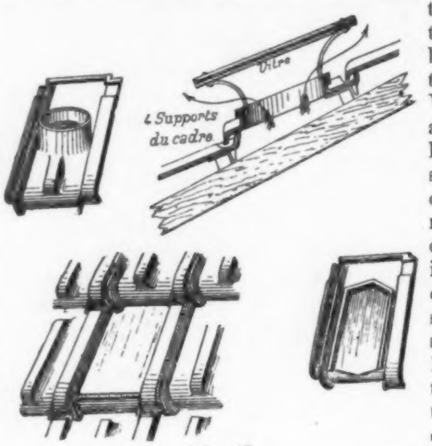


Fig. 12.

We will now discuss the method of securing the tiling on structures subjected to peculiar climatic conditions, that is, those built along the seashore, where they are exposed to tempests from the deep, or on hill-tops, for example, where they are continually beaten by the prevailing winds. The Montchanin system was spoken of above. We present here that employed by M. E. Muller. Figure 11 shows two lapping and interlocking tiles with the means of fastening them — a kind of spur or ear pierced to admit of the passage of a brass or galvanized-iron wire, which is nailed to the lath or rafter; there is only one spur to each tile. In special cases there are sometimes two attachments, which assures absolute firmness. This differs from the system adopted by the Maison Royaux simply in the fact that the spur, in the latter, is thrown back completely to the rear.

We will now glance at a few special forms, as they are usually manufactured to the architect's order, to suit the demands of his construction. For example, Figure 12 gives a tile designed for the passage of a smoke-pipe; however, as these pipes are ordinarily of the same size, tiles of the kind can be found ready made. Their weight is eight kilograms, the price one franc. Special tiles are also made for ventilating and lighting garrets. In the one represented in Figure 12 the pane has a metallic frame. The weight of the tile, without the trimmings, is about six kilos; the price is, we believe, 2.75 francs.

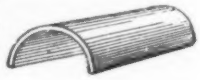


Fig. 13.

For glazed roofs glass tiles are sometimes employed (Fig. 12). They are nearly identical in form with the one already described, but they are heavier and the price is considerably higher; they are worth about three francs. Pottery tiles with panes of glass inserted are likewise in use; they are so disposed that the pane can be slipped in afterward when the rest of the system is already in place. They are perhaps more economical than the former and can be used where no particular decoration is demanded. We will say nothing of the special skylights for tile roofs, since the design already presented gives a sufficiently clear idea of their form.

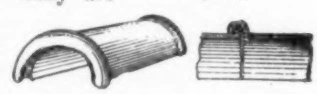


Fig. 14.

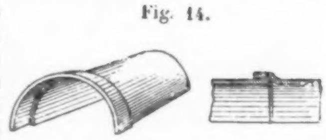


Fig. 15.

A word concerning ridge-tiles is, however, called for. We distinguish first (Fig. 13), the semi-cylindrical ridge-tile, neither lapping nor interlocking. Evidently its use must be limited to the roofing of sheds, where nothing is to be feared from dampness. The length is 0.50 metres, and the price from 0.60 francs to 0.80 francs, according to the width. Figures 14 and 15 give interlocking and lapping tiles. Lastly, special ridge-tiles are made for buildings exposed to high winds. In this case, some are nailed over the lap, others underneath.

For the covering of hips and eaves it is also necessary to have recourse to special forms. The tiling is brought down over the eaves in the ordinary way, then the special tiles are adjusted, after having had their dimensions determined upon, and having been fitted exactly to the first. It is the same for the hips.

Fig. 16.

As to decoration in the roofing, it consists chiefly in the ornamentation of the ridge, and sometimes likewise in variations of the hues of the tiles. Figure 16 gives a few specimens of decorated ridges which make further explanations unnecessary.

We close our study of roofing-tiles here; they have been shown under their different forms, and in their most varied uses. We have designedly insisted on details of application, which the builder should be reminded of from time to time. It is, in fact, not always enough, in the construction of a roof, for the architect to be an eminent artist; to this qualification must be added a thorough knowledge of the properties of the materials and the mode of employing them to the best advantage; it is equally necessary, in a word, for him to be a skilled workman.

Before leaving the subject, we desire to remind the reader of the vast strides which the tile-making industry has taken during the past few years. Great improvements have been made since the days of the rudimentary and semi-cylindrical Flemish tiles which are still encountered in some of the poorer villages of the centre and west of France. We have now multitudes of tile roofs of the most graceful appearance. Setting aside the famous domes of the Palais des Arts at the late Paris Exposition, which are masterpieces, and merely taking into account private residences, we find a foundation here — supplemented by decoration — for a new *genre* which in the hands of men of talent may create a special architecture whose brilliant tints would introduce a degree of gayety into our somewhat monotonous city streets. Some attempts in this direction have already been made, and it must be admitted that they have met with marvellous success.

[To be continued.]

CONSTRUCTION.[1] — IX.

Fig. 35.

BUT the Romans had by no means the idea of placing groined vaults over porticos formed of detached monocylindrical columns, for that could not agree with their principle of inert stability. What the Romans had not done, in that as in many other things, the builders of the Romanesque period attempted. They wished to surround the chancels of their churches with porticos or concentric aisles following the curve of the apse, and to give as much light as possible to these porticos by supporting the vaults on detached columns, which were to cover them. In the first instance, as in the churches of Auvergne and Poitou, they were satisfied with a cradle-vault on a circular plan, formed by the intersection of arches from one column to another. To buttress the thrust of these cradle-vaults on the inside, they relied at first on the weight which bore down on the columns, and then on the circular form of the apse which offered to these thrusts a great resistance. The aisles of the apses are thus vaulted in the churches of Nôtre Dame du Port, at Clermont, at Issoire, at Saint Nectaire, at Saint Savin near Poitiers, etc.

Figure 35 explains this method, without the need of further development.[2]

But when during the twelfth century, the builders had introduced the system of vaults with pointed arches, they naturally wished to apply it everywhere, and thought, with reason, that it was impossible to keep in the same edifice the system of Roman groined vaults beside the new style. Easy as it was to place upon the oblong abacus of the capitals A, the abutments B, shaped so as to receive a simple groined vault, so much more difficult did that become when the groined vault yielded to transverse and pointed arches. This difficulty was not the only one.

If we represent a section of the plan of the apse of the Church of Nôtre Dame du Port with its aisles (Fig. 36) we shall see that the intersections of the semi-cylinders A and B in the circular cradle-vault $C\,C'$ give, in horizontal section, the two lines $E\,F$ and $G\,H$ crossed. We observe that the portico being on a circular plan, the opening $H\,F$ is greater than the opening $E\,G$; that, if we should build one semicircular arch over $H\,F$ and another over $E\,G$, this latter would have its key much lower than the former; that the intersection of the semi-cylinder whose diameter is $E\,G$, with the circular cradle-vault $C'\,C''$, would be outlined in horizontal section by the line $E'\,L\,G$, and that consequently there would be no groined

[1] From the "*Dictionnaire raisonné de l'Architecture Française,*" by M. Viollet-le-Duc, Government Architect, Inspector-General of Diocesan Edifices, translated by George Martin Huss, Architect. Continued from No. 858, page 150.
[2] The aisle of the choir of Nôtre Dame du Port, at Clermont.

vault, but simply the intersection of a small cylinder with a great one. To obtain a groined vault, *E F G H*, the builders raised the semicircular arch drawn above *E G*, as the revolved section *I K M* indicates by taking a height *N M* equal to the radius *O P*.

Thus the abaci of the four engaged and free columns *R*, *S*, *V*, *T*, being on the same level, the two keys *M* and *P* were found in the

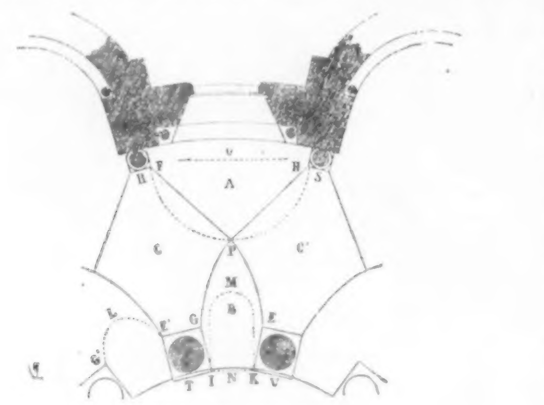


Fig. 36.

same horizontal line which governed the length of the radius of the cradle-vault *C C'*.

The idea of raising semicircles upon the isolated columns *T* and *V*, was then no caprice, or barbaric whim, still less an Oriental imitation, as men have sometimes claimed, but the result of a very simple calculation on the part of the builder.

This first step taken, let us now see how the architects of the twelfth century, inaugurating the use of the pointed-arch vault on a circular plan, tried to go farther. Let us not forget that one of the motives that had led them to adopt the pointed-arch vault, was the desire to get rid of certain troublesome necessities imposed by the antique groined vault; the need of independence felt by the builders. But independence in building, as in everything else, is acquired only after abortive attempts. The architects of the twelfth century felt sure that their principles were fertile in application, that they would lead them to surmount without effort the difficulties in the building of great edifices; yet, as it always happens, these principles at once so simple and so adaptable, embarrassed them cruelly in the immediate application; and in order to remain loyal to them they complicated their buildings, and being unable to rid themselves altogether of old traditions, but wishing to reconcile

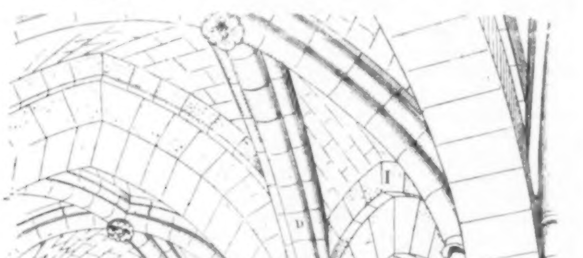


Fig. 37.

them with their new ideas, they fell into infinite difficulty. Yet far from being discouraged, they clung after each attempt to these new ideas with the zeal and persistence of a people wholly convinced. We shall see them at work in the Cathedral of Langres, one of the most instructive monuments in France, and certainly one of the best built. There, ancient traditions have considerable sway; Langres is a Roman city in a district covered but a few centuries ago with numerous Roman edifices almost intact. But let us come to the fact that concerns us particularly, to the vaults with pointed arches over the aisle of the chancel.

The monocylindrical column, which even in purely Gothic structures lasted so long, is employed in the choir of the Cathedral of Langres. These columns have the proportions of the Roman Corinthian column, and their capital is quasi-Roman; but (Fig. 37) their abacus is already arranged with a view to what it must support; two of its sides are not parallel, and they form an angle in order to avoid irregular surfaces at the intrados of the archivolts *A*, that they carry; and on the side of the aisle this abacus gives a broken line in order to offer a projecting support to the transverse arch *B*.

In *X* we give the horizontal projection of these abaci. Feeling the necessity of separating the transverse arches and of leaving a place for the pointed arches to start, and fearing the action of the thrust of the vaults upon the columns, in spite of the circular form of the apse, the architect has surmounted this abacus with a projecting corbel *C*.

As our figure shows, the pointed arches *D* find scarcely room to start, yet the instinct of the artist has led him to ornament that starting-point in order to disguise its inadequacy. There are three abutments one upon another. The first two, *E* and *F*, have their beds horizontal, while the third, *G*, has its sections normal to the curve of the arch. So these arches succeed, not without difficulty, in disengaging themselves from the square plan, and even the pointed arch must make its way between the voussoirs of the archivolts and of the transverse arches.

But now the builder wishes to double his archivolt *A* with a second arch *I* which shall intersect the pointed arch, for the wall surmounting these archivolts is thick, and carries a semidome or oven-shaped vault. It is, then, only above the pointed arch and when this leaves the abutments that one can fix the second arch *I*. This is not all, for since these vaults radiate, the architect has drawn his pointed arches in plan, as indicated in (Fig. 38); the surface *K*

Fig. 38.

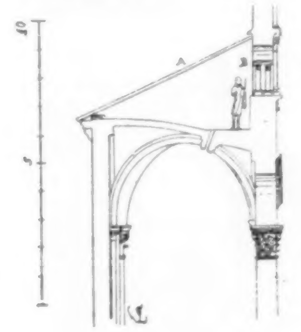


Fig. 39.

L M N being a trapezium, the builder yet supposing it impossible to draw pointed arches forming in their horizontal projection broken lines, the key *O* is nearer to the line *M N* than to the line *K L*.

The arch *K L* having its summit on a higher plane than that of the arch *M N* (for they have not dared to make that higher), the line *R S* slopes from *R* to *S*.

(Fig. 37) shows this arrangement, and the section (Fig. 39) explains it still better. Moreover a construction of this kind, whether preconceived or produced by chance, presents advantages: it allows the light entering under the wall-arches of the vaults to pass from the aisles into the midst of the chancel; it does not waste the height of the rampant arch at the roof *A*; the slope of this roof and that of the vault give room for the gallery *B*; moreover it offers a great resistance, in that it throws a large part of the weights and thrusts upon the interior semi-cylinder which, forming the vault, runs no risk of separating off in slices and leaving its centre.

At Nôtre Dame du Port the abaci of the capitals (Fig. 36) give parallelograms in their plan, so as to offer a thick enough impost for the wall of the chancel; and the result is that the arches raised over these abaci present irregular surfaces and cones rather than semi-cylinders.

At the Cathedral of Langres, the abaci of the capitals are outlined, as we have noticed, in angular form, in order to keep at the intrados of the archivolts curved surfaces which are exactly parts of a cylinder. Thus they avoided a difficulty of facing and of irregular surfaces displeasing to the eye, but the angular abaci made the capitals ungraceful. When looked at parallel to the diagonals they presented on the side of the aisle an angle of greater projection than on the side of the chancel. The architects of the Gothic school soon freed themselves from these perplexities, and learned how to avoid these difficulties.

Our readers will at once see why we have lingered over the drawing, and the mode of constructing the vaults radiating from the aisles of the apses. One word more before proceeding to the improvements introduced by the Gothic architects. These had originally adopted two methods of neutralizing the thrust of vaults: the first method was that of restraining the effects of these thrusts by a force acting in opposition; the second, which one might call the *preventive method*, consisted in destroying these effects at the outset, or, in other words, in hindering them from acting. They employed one or the other of these two methods according to the need: sometimes they profited by the effects of the thrusts, though without permitting them to destroy the general equilibrium, as we have seen in Figure 34 and sometimes they annulled them and reduced them at once to a vertical pressure.

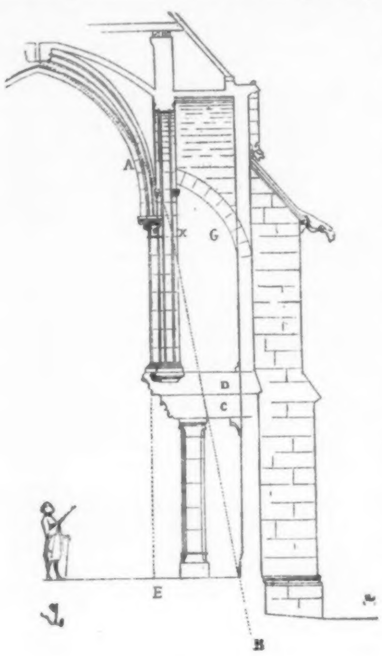


Fig. 40.

A very simple drawing will explain the application of these two methods.

Let (Fig. 40) there be a vault, the resultant of whose pressures is the line $A\ B$, we can establish a construction like that given in our drawing.

In supposing the stones C and D to be of a single piece each, having resistance, and fastened at the end under the buttress, this construction will be more solid than if we had built a pier $E\ A$ from the ground, under the skewbacks of the vault.

In this drawing we profit by the effects of the thrust $A\ B$, and we draw it off according to its direction.

The flying-buttress G and its masonry are there only to hinder the vault from spreading in a horizontal direction.

Let us notice, in passing, that the flying-buttress does not weigh upon the pier X, and that it does nothing but counteract the thrust of the vault at the point where the curve of pressures tends to come out at the extrados of the voussoirs.

This is the method which restrains the effects of the thrusts, but by using them as an element of equilibrium.

Now, let (Fig. 40*b*) there be a vault, the resultant of whose thrust is the line $A\ B$. If, in place of a flying-buttress we oppose to the thrust $A\ B$ a less powerful thrust $C\ D$, and if we place a weight E to bear upon the extremities of the two vaults, we reduce the oblique thrusts to a vertical pressure; we prevent their effects, they do not act. This is what we call the *preventive method*.

There is, then, this very subtile distinction between these constructions: First, the flying-buttress is simply an obstacle opposed, not to

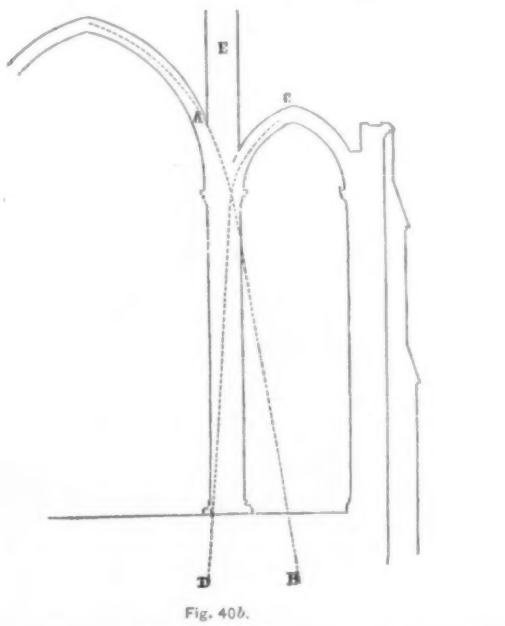


Fig. 40*b*.

the oblique pressures, but to their effects, if the equilibrium should be disturbed; Second, it permits the builder to profit by these oblique pressures in his general system, without fear of seeing the economy of this system deranged by some action beginning outside of the equilibrium.

But the entire attention of the builders, for that very reason, is brought to bear upon the perfect stability of the supports receiving the thrusts of the flying-buttresses; for the equilibrium of the forces of the different parts of an edifice depends upon the stability of the exterior abutments. Still the architects often will not or cannot give these abutments a sufficient thickness in proportion to their height; so they must make them firm by factitious means.

We have an example of the use of such means in the church of Saint Remy of Rheims, though seen still more clearly in the choir of the church of Nôtre Dame at Chalons, to which we shall return.

We first present (Fig. 41) the plan of a part of that apse, in A at the ground floor, in B at the height of the vaulted gallery, in C at the height of the triforium, and in D at the height of the springing of the vaults. We see, on the ground plan, how the architect has avoided the perplexity of building a vault with pointed arches, over a trapezium. He has placed at the entrance of the chapels the columns E, which have allowed him to draw a vault $E\ F\ G$ upon the parallelogram. Therefore the transverse arch $E\ H$ is similar in width and height to the transverse arch $F\ I$, and the line $I\ H$ through the key of the triangular fillings is not inclined, as at Langres, from the outside inward. From E to K a second transverse arch unites the column E to the pier K, and there remains a

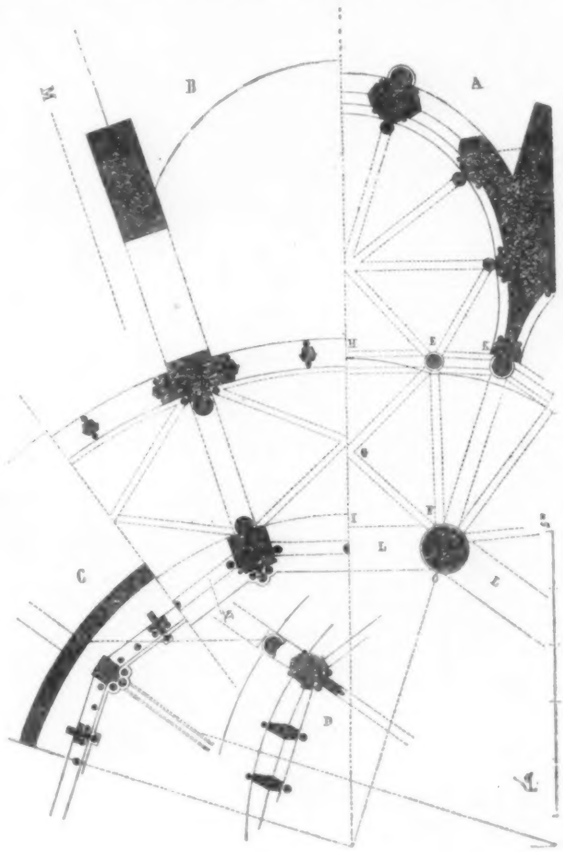


Fig. 41.

triangle $K\ E\ F$, easy to vault since it is only a portion of ordinary filling.

The method is the same at Saint Remy of Rheims, but not so well exemplified.

It will be seen that these higher plans fit exactly over the ground plan unless there is some deviation, whose necessity we shall at once recognize.

There is one important fact, in the construction of the choir of Nôtre Dame of Chalons, in that it shows the efforts of the master-builder to clear away certain difficulties which had perplexed his confrères at the end of the twelfth century.

It will be observed that the plan of the chancel gives angular faces on the interior and a semicircular curve on the exterior. In the same way the lower archivolts L connecting the great columns on the ground-floor, are ranged along the sides of a dodecagon, while the archivolts of the gallery on the first story are on a rectilinear plan over the chancel, and on a curved plan over the gallery. The outer wall of this gallery is also built on a semicircular plan, and the triforium (Plan C) is on a rectilinear plan within, and curved without. It is the same with the upper windows (Plan D).

The architect had wished to avoid the perplexity given by the construction of archivolts or of transverse arches over a semicircular plan of a rather small radius. He feared the thrusts on the vacant space, and keeping the circular form only on the outside, and changing it to a dodecagon in the inside, he united very skilfully the advantages of the two systems; in other words, great lines of walls and concentric bands, a simple arrangement without, but combining great solidity with a graceful effect in the chancel; for arches entering a circular wall of small diameter always have the effect on the eye of very disagreeable lines.

A perspective view (Fig. 42) of the aisle with the entrance to a chapel will render the arrangement of the ground-floor easy for all to understand, and will indicate its construction.

The detached columns of the chapels are monoliths, 30 centimeters in diameter at the most; the rest of the construction, except

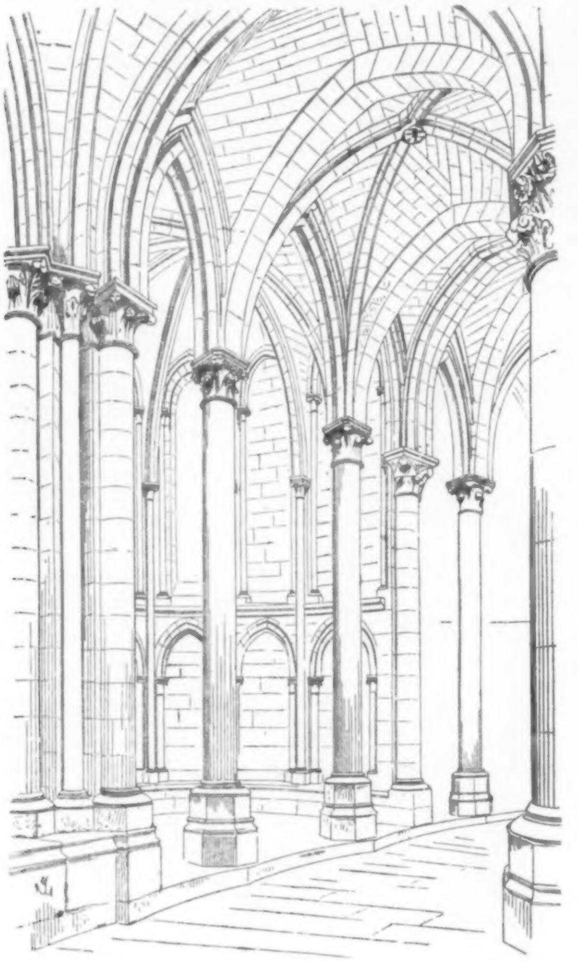


Fig 42.

the pillars at the angles of the chapels and those of the windows, are built in courses.

We now give (Fig. 43) the cross-section of this building as far as the vaults, following the line *M N* of the horizontal plan.

This section shows us at *A*, in conformity with the method then used in Ile de France and the adjacent provinces, the monocylindrical columns marked *O* upon the plan; at *B* the archivolt and the separation of the vaults of the aisle. The principal churches of that period and that province all have a vaulted gallery on the first story. (See "*Architecture Religieuse, Cathédrale, Eglise.*")

Here the vault slopes, like that of the aisle in the Cathedral of Langres, and this is not without motive (see plan B, Fig. 41).

In fact, the wall-arch *C*, being wider at the base than the archivolt *D*, has its key higher up, which allows the cutting of large windows suitable for lighting the choir.

The triforium *E*, occupying quite a large space between the key of the archivolts of the gallery on the first story and the supports of the upper windows, allows a roof *F* to be built over that gallery, with a sufficient slope in spite of the inclination of the vault *G*.

Let us examine this section with attention.

We see that the abacus of the capital of the pier *A*, receives in corbel the base of the column *H*, which supports the framework of the vault; this pillar and the two others flanking it and supporting the wall-arches do not unite with the building, but are composed of great blocks of stone set contrary to their cleavage.

It is the same with the pillars resting against the gallery and the engaged column *I*. Thus the pier at the height of the gallery is a parallelopipedon composed of courses and surrounded by columns set contrary to their cleavage like *posts* of timber in order to keep their *rigidity* under the weight and pressure from above.

It is the same with these piers at the height of the triforium *E* (see plan); the core is built of stone courses, and the pillars around it on three sides are set contrary to their cleavage.

The large pillars at the top are fastened by bands, forming rings, to the main part of the construction, by their base and the capital *K* under the skewbacks. To maintain this equilibrium it was necessary to have recourse to flying-buttresses. It will be seen in the ground-plan (Fig. 41) that the architect wishing to make his chapels as open as possible, placed behind the pier *K*, only a very light partition of stone.

He could not build upon that partition a solid abutment; moreover he had propped the vaults of the gallery on the first story by a first flying-buttress *L* (see cross-section) transferring that thrust to the more distant abutment of the gallery wall. But he lacked space on the exterior, and he did not wish the projection of the buttresses to pass beyond the circular line surrounding the chapels. This abutment was then not deep enough, and unable to resist the thrust of the large flying-buttress. So instead of starting the large buttress from the perpendicular of the facing *M*, the builder has changed the starting point to *O*.

He thus obtained from *O* to *P* a powerful abutment, and if he weighted the haunches of the lower buttress *L*, the latter gained great resistance, first, from the extraordinary size given to it, and next from *R*, the load above, which pressed on its abutments. Moreover, to avoid the effect of the thrust of the great vault between the head of the large flying-buttress *S* and the starting-point of the vaults *T*, he placed upon the outer wall of the triforium *E*, a column *V*, contrary to its cleavage, which stiffened that space perfectly, just as a strong post of timber might have done.

Also, under the impost *T* which forms a lintel in the triforium and juts out a little beyond it, the architect placed an arch *Q*, which was a powerful prop to all the upper part of the construction,[1] and offered even greater resistance to the arch *L*.

Knowing the effects of the thrusts of the gallery vaults and of the flying-buttress *L*, which was destined to annul them, and fearing

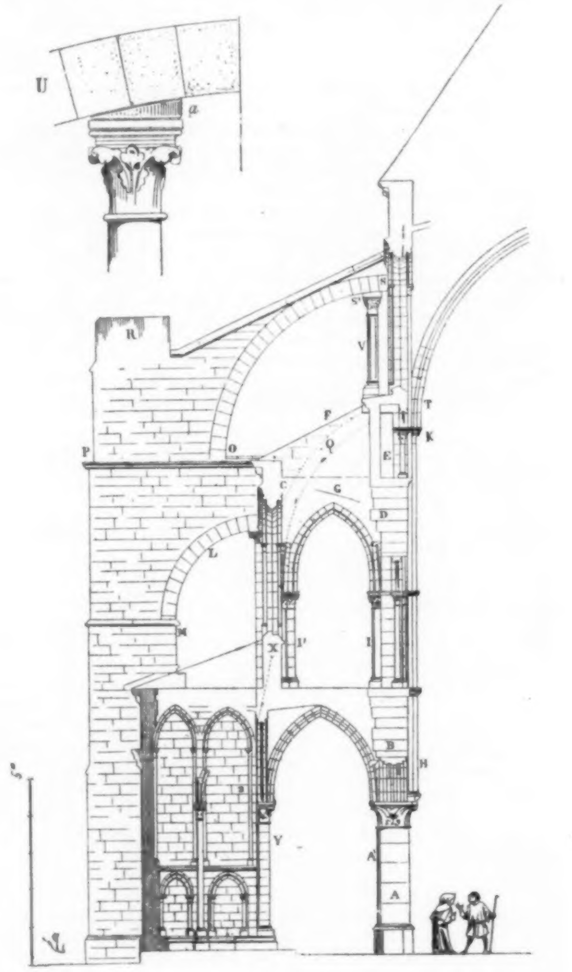


Fig. 43.

the action of the thrust caused by too broad a vault upon the interior piers at the height of the gallery on the first story, the architect moved the pier *X* out of the perpendicular line of the lower column *Y*, since he had no reason to fear a vertical pressure on this point,

[1] These arches have since been destroyed and replaced by masonry and timbers, when the roof was rebuilt in the fifteenth century. It would be timely to think about rebuilding them.

but much rather an oblique thrust from X toward Z. As to the large flying-buttress, its voussoirs pass toward the centre of the arch over the column V, as if this column did not exist; and under the upper voussoirs the abacus of the capital forms an angle with these voussoirs, as indicated in the detail U; a simple stone wedge a fills the angle between the abacus and the voussoirs.

It is here that we perceive the fineness of observation and even subtlety of these early Gothic builders.

It was possible, in all the height of the pier from A to E, that some settlement might occur, and by reason of this settlement the top S of the great flying-buttress might suffer, and exercise such a pressure on the column V, that this latter would give way, or in resisting, would cause at S' a rupture fatal to the safety of the arch.

Placing the column as outlined in U, the lowering of the summit of the flying-buttress can only make the abacus slip a little under the arch, and hence bend the column V somewhat. In this situation, resulting from a settlement of the great buttress, that column V would press upon the arch Q, and push against the pier X obliquely; which would not be dangerous since that pier X is put there to act obliquely; furthermore, the column V, would bear heavily upon the wall of the triforium, which supports it, and therefore upon the adjoining column I, an important point, for that column I, a monolith, and independent of the pier behind it, being heavily weighted, and unable to settle, transfers the principal pressure of the pier to the outer facing A' of the circumference of the lower column, or, in other words, upon the point where it is necessary to obtain a much greater rigidity, to prevent the effects of the thrusts from the vaults of the aisle.

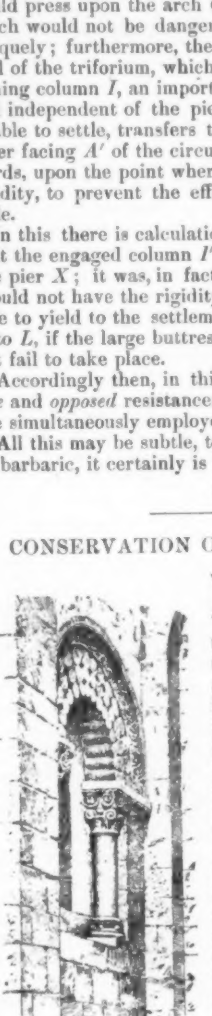
In this there is calculation and foresight; for it will be remarked that the engaged column I' facing that at I, is built in courses like the pier X; it was, in fact, important that this intermediate pier X should not have the rigidity of the inner pier, and that it should be able to yield to the settlement in order not to cause a rupture from O to L, if the large buttress should settle down, a thing which could not fail to take place.

Accordingly then, in this construction the two systems of *preventive* and *opposed* resistances, explained in our two figures (40 and 40*b*) are simultaneously employed.

All this may be subtle, too subtle, we grant; but as to being coarse or barbaric, it certainly is not.

[To be continued.]

CONSERVATION OF FILTH IN CHINESE CITIES.[1]



Window from the Church of St. Pierre, Melle, France. From *La Semaine des Constructeurs.*

LIKE all the Chinese cities I have seen, Chinkiang contains a central walled portion and a populous suburb outside the walls; the latter are three or four feet thick and from fifteen to twenty feet high, and firmly constructed of fire-bricks two inches thick and a foot square, made of a blue clay, abundant in all this region. The houses are mostly of one and two stories, built of small blue bricks, of mud and stucco, straw, or any material that can be used and gotten cheap; the roof is covered with tiles or thatched with straw. Wood of all sorts is very scarce and dear, the forests throughout this entire region having long ago been cut down. Their fuel for the most part is supplied by dry cotton stalks and a cane-like grass that grows abundantly on the islands and flats of the Yangtse to the height of fifteen or sixteen feet, and, gathered when dry in December and January, is used for cooking, thatching houses, making fences, and many other purposes. Few can afford a fire for warmth, relying solely on their work and their wadded garments, which, judging from their filth and that of the wearer, are seldom if ever changed.

The population of Chinkiang is variously estimated at from 200,000 to 300,000, but all estimates of this sort are unreliable. The authorities probably know with sufficient accuracy for all practical purposes, but they are slow and chary about communicating their knowledge. I have been told that their system consists in dividing the city into small wards, and appointing an officer over each, whose business it is to keep himself informed of the number, name and occupation or condition of every dweller in each house in his district, and to post the same conspicuously on the front of the house. The houses are mostly small, containing three or four rooms, which are seldom more than ten feet square, oftener less, with no ventilation except that afforded by the open door or window in the daytime. The latter are closed at night, and the Chinese pack themselves in these small rooms like sardines in a box, and yet it does not seem to hurt them. The thoroughfares in Chinese cities hardly merit the name of streets; the broadest are seldom more than ten feet wide, while most of them are less than six, which renders traffic with loaded wheelbarrows and donkeys a slow and difficult process. It can readily be imagined what fearful destruction fire sometimes makes in cities like this, where an active man could, and the more agile feline probably does, go from one end to the other without ever touching the ground. Their fire-engines are rude hand-pumps mounted on wheels and pulled through the streets by men.

So far as my experience goes, Chinkiang is no exception to the rule that Chinese cities are filthy beyond description. Masses of filth accumulate in the painfully small back courts, where all the slops are thrown to rot and fester, except such as find their way along the two or three shallow and generally choked gutters that pass just under the ground floor out to the deeper and larger but no less obstructed trench under the broad stone flags that pave the street loosely and give passage to all sorts of falling dirt. When the mud and filth have filled the street gutter the flags are raised, and it is taken out and removed in pails — probably to the fields, for a Chinaman wastes nothing, not even filthy mud. This nastiness is notably conspicuous for the absence of excrement of all kinds; that of animals falling in the street is carefully removed at once in small baskets and used as a fertilizer on gardens and fields, while numerous public latrines containing large earthen jars for excrement leave no excuse for the careless, lazy and depraved, who too often deposit it elsewhere. The contents of these jars are sold to the farmers, who carefully transport the matter to their fields and gardens. This makes it risky in China to eat any green vegetable without first thoroughly cleansing it with hot water, for fear of receiving the eggs of parasites or germs of dysentery, etc., into the system. It has been said that typhoid fever does not exist among the Chinese, notwithstanding their filth, and if this be true, it is a powerful argument in favor of the dry-closet system and surface drainage, for human excrement is about the only form of filth not abundantly contained in the shallow gutters and mellow porous subsoil of their cities. . . .

Much of what has been said about Chinkiang will apply to Canton, which, however, though much larger, is, I believe, a much cleaner city; the streets are also wider and better paved. The city is on the northeast border of a very rich delta seventy miles broad by one hundred long, and is built on the Pearl River, which is one of three short streams forming the delta. The soil is silt, as level as a billiard table, and only three or four feet above the surface of the river at high tide, which rises about five or six feet; but the water is fresh, except during strong easterly winds. The city lies on the north bank of the river, about ninety-five miles from Hongkong, and consists of an irregular parallelogram, three by one and one-half miles, and its population is estimated at a million and a half. The drainage is naturally bad, and what there is consists of several large canals that penetrate the city from the river, and receive the filth from smaller canals and street gutters emptying into them; but all these become greatly choked, and notwithstanding the daily rise and fall of the tide, the city everywhere reeks with odors of the vilest sort, *i. e.*, to Christian noses. The natives do not seem to notice them at all. Their water-supply is taken from the river and from wells and a few springs on the north side. The wells must be saturated with the filth that seeps into them from the adjoining soil, for they are fed from the rainfall for the most part; but it is always boiled and drunk in the form of tea or consumed in soups. The water contains little if any excrement for the reasons stated in the remarks on Chinkiang, for the latrine system of Canton is in the hands of private persons, and is more perfect than that in the former city.

From October to February or March there is comparatively little rain, the thermometer ranges from 40° to 60° F., and the climate is said to be delightful, but during the greater part of the remainder of the year there are deluges of rain, the thermometer ranging from 80° to 95° F., the atmosphere is saturated with moisture, and a condition is produced which saps vigor and energy like a pest, and the place is unfit for anything but a frog to live in. Foreigners suffer at all seasons with fevers, diarrhœa and dysentery, but these disorders are most prevalent during late summer and autumn. As the Chinese have no statistics, it is difficult to compare the health of Canton with that of Western cities of similar size and situation, but the fact is conspicuous that cholera and other epidemics visit this overcrowded, teeming mass of humanity with less virulence than in the case of the neighboring almost entirely European-built city of Hongkong. We have here on the borders of the tropics a densely populated city, with no sanitary arrangements worthy the name, a water-supply saturated with dead and living organic matter of every description, heat, moisture, foul air — in short, almost every imaginable condition ordinarily considered unwholesome, and yet typhoid fever is practically unknown and epidemics of the rarest occurrence. Dr. J. G. Kerr (to whom I am indebted for much kindness and courtesy, as well as for most of these remarks on Canton), surgeon in charge of the large native hospital near Shamien, says, in his "Report on the Sanitary Condition of Canton" (*China Medical Missionary Journal*, September, 1888), that he considers the comparative immunity of the Cantonese from disease due to the following causes, viz: Rise and fall of the tide twice a day sweeping a good deal of the filth out into the river; the heavy rainfall in the summer, filtering through the porous soil, probably purges it of much of its rottenness; most of the work can be performed in the open air, owing to the mildness of the climate, and as almost all have to work, the occupation gives exercise; the houses and shops are open all day long and are fairly well ventilated; a good supply of wholesome food,

[1] Extract from the report of Past Assistant Surgeon Ernest Norfleet, *U. S. S. Monocacy*, 1890-91.

consisting of rice, vegetables, fish and animal food, all well cooked; water used only in the form of tea, soups, etc., and never without being boiled; lastly, the closure of the street gates requires all to be indoors by 10 P. M., thus securing regular rest. But the poor physique of the population generally leads me to fancy that the nastiness they hourly breathe must in some degree lower their vitality. I had no means of knowing positively, but, judging from the few old ones I saw, I should say they are not a long-lived people. . . .

The sanitary condition of the English portion of Shanghai leaves little to be desired; that of the French town is not so good; while Hong Kew, or the American part, lags shamefully in the rear. All these are supplied with water from the waterworks just below the city, which pump the water out of the Woosung, and having filtered it through great banks of sand, pump it up into a huge tower tank in the English settlement, whence it is distributed in pipes; but it is not safe to drink until it has been thoroughly boiled, though it is almost as clear as well or spring water. Old Shanghai, the Chinese city, which touches the French portion, is fouler than any pigsty I have ever seen, and gets its water-supply from the river and from wells.

THE FIRST M. E. CHURCH AND ITS ASSOCIATED BUILDINGS, BALTIMORE, MARYLAND.

THIS edifice, technically speaking, belongs to the order of the early basilicas and churches in Ravenna, formed as it is of Romanesque masses of masonry, the entire exterior being built of granite ashlar, rock-faced. The church, seen from either side, presents the appearance of some great historic pile, with its broad, majestic colonnades, its wide, massive flights of steps, and tile roofs, above which, with impressive dignity and grandeur, rises the great campanile, to the height of one hundred and eighty-six feet.

The area of the site upon which the church stands is 184 feet by 150 feet. The tower contains 6,000 tons of cut stonework, and the walls are built of the same thickness throughout their entire height, and where offsets occur on the outside corresponding oversailing courses are found on the inside. The roof is covered with Spanish-shaped tiles of Roman red color, contrasting very pleasantly with the green grass in the quadrangle and the quiet gray tone of the walling.

The interior is the delight of all on account of its elegant proportions, the simplicity of treatment, and the many interesting and beautiful parts which form a very successful piece of architectural composition.

The entire building includes the auditorium, school, church parlors and reception-rooms. The auditorium, which presents many good features, is elliptical on plan, with a well-proportioned gallery around all sides except where the great organ occupies the space above and behind the pulpit platform. The organ is a "Roosevelt," and is a reproduction or rather a copy of that of St. Apollinaris in Ravenna. The details of the interior of the auditorium incline towards a Classic or Renaissance treatment. The coloring is rich and warm without being brilliant — Pompeiian reds, which are the base of the coloring scheme of the walls, tone off to old brass and gold in the frieze with a particularly pleasing effect. The cornice and frieze are both artistic combinations of carving, stucco and metals. The windows in the frieze, which are of costly stained glass, are reproductions of mosaics taken from the church of St. Placeta, of the fifth century, and now preserved in the Christian museum of St. John Lateran at Rome. The lighting is produced by a crown of 340 gas-jets making a circle of flame just below the frieze. By this arrangement, which is copied from the church of San. Vitale at Ravenna, it is impossible to cast a shadow in the church.

The domed ceiling forms a flattened ellipse designed after that of Sta. Sophia at Constantinople. This is treated in blue and gold, and is an exact representation of the firmament as it appeared at three o'clock A. M., on Sunday, November 6, 1887, the date of the dedication of the church. Every star that was visible to the naked eye at that hour occupies its relative position and has its relative size upon the surface of the dome. The dome being made of a flatter curve than a semicircle occasioned much difficulty in ascertaining the precise position for each star. The true points, however, have been accurately ascertained by means of a series of lines radiating from one common centre to each individual star as set out upon a diagram of the true curve, the intersections of these lines with the flatter curve when drawn in correct position marking the points or positions which were transferred to and are seen in the ceiling now completed. The white light of the "milky way" with its numerous stars is distinctly represented, and though seven hundred and nineteen planets and stars are visible, there is no appearance of being crowded, since the ceiling upon which they are painted contains over twenty-five thousand square feet of surface. The artists have been careful to preserve the shades of coloring peculiar to the different planets. Mars shining with its own peculiar red light is quickly recognized.

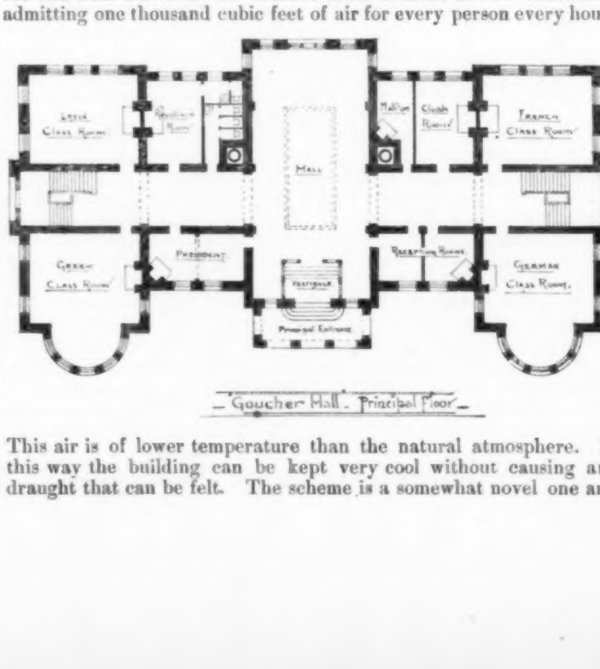
This idea of representing the firmament was originated by and the successful result is due to Dr. Goucher. The chart of the heavens was made by Mr. Prentiss of the astronomical department of the Government at Washington under the direction of Dr. Simon Newcomb, Professor of Astronomy in the Johns Hopkins University.

In the pursuance of the observations by the astronomers, a wonderful fact and suggestive coincidence was brought to light by the discovery that the heavens as they appear in the representation in the church, and therefore as they appeared on the morning of November 6, 1887, are exactly as they were at the birth of Christ. Every star that illuminated the plains of Judea, with one single exception, occupies now the same place it did upon that memorable occasion, that exception being the Star of Bethlehem.

The dome is carried forward on gilded corbels or consoles after the manner of the Cathedral of Anastasia and tongues of golden flame encircle the whole vault with magnificent effect.

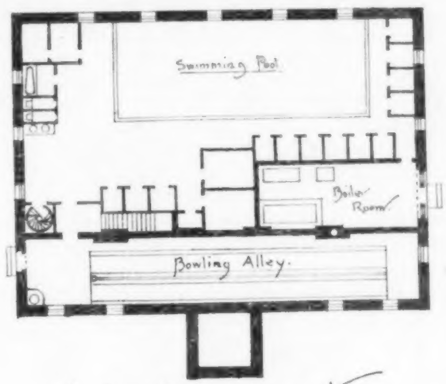
The woodwork of the interior of the church is of solid black birch richly carved with very excellent details. In place of the ordinary regulation pews, upholstered chairs are used; the upholstery is executed in Pompeiian red, imported from Belgium, and harmonizes perfectly with the carpet and walls. The carpet is unique in design and was manufactured from a special design prepared for this sanctuary. The forum and vestibules are paved with glazed cream-colored tiles which make a very bright and pleasant floor surface.

The ventilation of the church is one of its most interesting features. Beneath each chair is a small circular flue partly screened with a zinc cap or cover. These flues are so arranged that the occupant of each seat can regulate the temperature by opening or closing the flue with his foot. In summer these heaters act as ventilators admitting one thousand cubic feet of air for every person every hour.

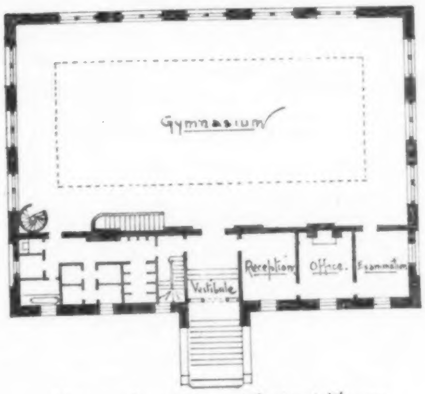


— Goucher Hall. Principal Floor —

This air is of lower temperature than the natural atmosphere. In this way the building can be kept very cool without causing any draught that can be felt. The scheme is a somewhat novel one and one which is found to work admirably and is worthy of more frequent adoption in buildings of a public character. On each side of the auditorium there are four windows erected as memorials to the ancestral line of pastors who administered to the congregation of



"Bennett Hall" Basement.



"Bennett Hall" – Principal Floor

the First Methodist Episcopal Church in the various places of worship.

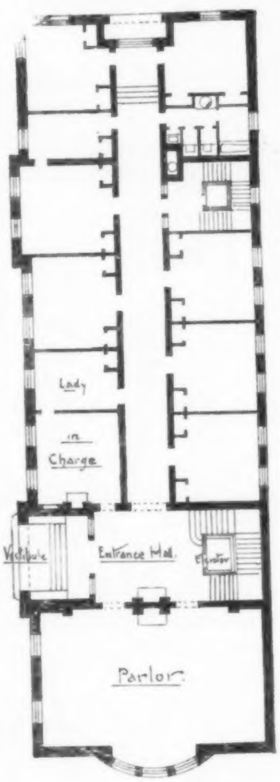
"Goucher Hall" or Women's College is a building executed in ashlar faced granite and the roofs covered with red tiles corresponding with those on the church. The style of the block is of the Etruscan order of architecture and is in strict keeping with the style of the church adjoining. It is heated by steam and lighted by electricity and by gas. This structure, which is adapted solely to purposes of administration and instruction, is a handsome building three stories in height and contains about forty rooms. It is located in close proximity to the imposing edifice of the First Methodist Episcopal Church on St. Paul Avenue, of which church the trustees have granted the college the use of their beautiful and commodious chapel for daily religious exercises; the two buildings are connected by an arcade or cloister. In the construction of this block unusual attention has been given to architectural details, and equally special care has been paid to all the requirements of sanitary science in the arrangement of systems of heating, ventilation and drainage. It affords unsurpassed facilities for class-work and all conveniences for easy and effective administration. The building was erected at the cost of $130,000. The accommodation is as under: on the ground or principal floor is a porte-cochère; a large hall 60 feet by 30 feet is placed centrally and extends from front to back of the main block and is open right up to roof, each story being reached by two stairways one at each end of the main corridor running right and left of the hall. At each floor level in the hall is a spacious gallery having a large well-hole for lighting from the roof lantern, the corridors being each provided with direct light from outside by large windows at one end and glazed doors at the other. The galleries referred to are wide enough to admit of exhibition cases being placed along the side walls to receive objects and specimens of interest collected by students or contributed to the Institute by persons who are more or less interested in its prosperity. The galleries are not only useful for the purposes of a museum in miniature but afford air-spaces and allow light to pass unobstructedly to the other floors and are also pleasing features when viewed from almost any point of sight. The remaining wall-spaces between windows and along the corridors are given to a collection of oil paintings, etchings, engravings, photographs and other objects of art which together compensate for and relieve the eye from the sparsity of decoration.

The chemical, biological, botanical and physical lecture-rooms and laboratories occupy the entire basement story. At one end, arranged so as to be convenient of access to each other, are the general chemical laboratory, instructor's private laboratory, stock-room, balance and lecture rooms. The laboratories are well fitted with all requisite apparatus and ventilated in the best manner, having a large hood for foul gases, also a hot-air chamber, and the tables furnished with reagent bottles. Each student has a separate table, for the cleanly and orderly condition of which she is individually responsible, and to this end each table is supplied with water and refuse jars.

At the opposite end is a similar suite of rooms for physics, with the addition of a large room for physical apparatus. This laboratory having south and west exposures is well adapted for experimental work. On the upper floor a room has been fitted up for work in photometry, estimating focal lengths of lenses, etc., also another large room furnished with a movable screen for projections with lantern or heliostat.

The "Bennett Hall" is the smallest of the three blocks in this group of collegiate buildings and is designed with the object of giving students a practical knowledge of the functions and relations of the different systems in, and the structure of, the human body, and of the best methods of securing and maintaining sound physical health. The course of training consists of an elementary course in human anatomy, physiology and hygiene. The students thus become familiar with the general subjects named by means of lectures, demonstrations and recitations, and systematic physical exercise in the gymnasium. The work in the gymnasium consists of class exercises, the Swedish system of educational gymnastics being used, with such exercises prescribed as may be found desirable through the physical condition of any individual student. The aim of this course of training is to secure a symmetrical development of the human body. A thorough medical examination and physical measurements of all students, prior to admission to the course, are required, and form the basis of all special exercises, which are carefully selected and adapted to the special or peculiar need of each pupil. All exercises are taken under the personal supervision of the professor of physical training or the instructor in gymnastics, and every effort is made and attention given to prevent excessive physical exertion.

The machines in use are of the "Zander" type (constructed at, and imported from Stockholm, Sweden). They are designed for special movements, are constructed on physiological and mathematical principles, and are not only wonderfully ingenious but absolutely correct; each machine is built with reference to single muscles or groups of muscles. A system of levers is so arranged that the resistance to be overcome is exactly measured and determined in proportion to the strength of the pupil or of the muscle requiring attention. The movement is perfectly even and rhythmic, the same amount of resistance being used each day until the muscles are strong enough to overcome a greater force, which is then added by adjusting the levers to the required gauge.



Ground Plan.

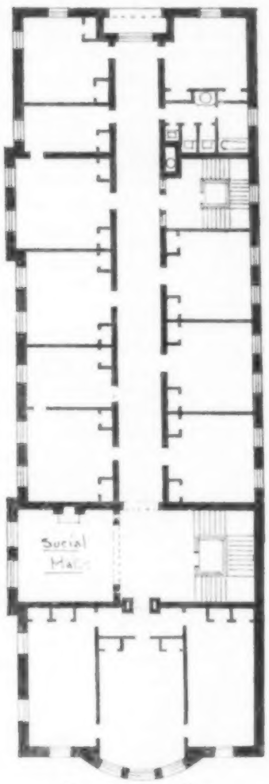
The building is executed in granite, two stories in height, with a hipped roof of Spanish tiles, and surmounted with a polygonal-shaped turret rising from the centre of the ridge, and terminated with a conical roof and weather-vane of simple but effective design. The chimney-stacks are of plain blocks of granite ashlar left quite free from mouldings and finished with a deep chamfered capping. The cornice which carries the overhanging eaves is composed of bold consoles of sectional form under a wide soffit which throws a broad shadow on the face of the wall below, with beautiful effect. Although the building is comparatively small in dimensions it is, without doubt, second to no other building of its class in the United States, and possibly to no other building in the world devoted simply to the physical culture of women.

The basement floor contains a swimming-pool about 45 feet by 20 feet, three shower-baths, needle-baths, dressing-boxes, water-closets and lavatories, and a bowling-alley 68 feet by 12 feet, the remaining space being occupied by the boiler-room. The principal or first floor provides entrance-hall, reception-room, office and medical-examination room, gymnasium 72 feet by 35 feet, and dressing-rooms with bath-rooms and water-closets adjoining. The gymnasium has a high open-timber roof, the trusses of which form support for the suspending of gymnastic apparatus. The whole front side of the block is divided into two stories, the upper one opening into a wide [illegible], which forms a running-track of twenty-three laps to the mile in [illegible]gth, padded with felt to form a good foothold. The side rooms o[illegible] track-level are appropriated to the muscle-exercising machines previously described, and the large gymnasium is fitted with the most approved modern apparatus.

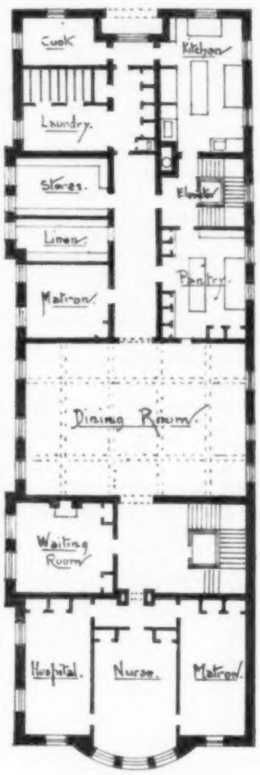
The building obtains its light from windows on all sides, which in every case are free from obstruction, and additional light from the roof turret, the ventilation being perfect.

"College Home" or the boarding hall is a fireproof stone and brick structure erected on a separate site a short distance from the college group. The plans of the hall were matured after inspection of similar halls in the best educational institutions in the States; it contains every modern feature that experience has proved to be conducive to health and comfort. It affords accommodation for about fifty students who are under the immediate supervision of an officer of the college; the daily routine of studies and other duties being subject to the regulation of the faculty. Generally the student's rooms are designed with ample space for two beds and two wardrobes, but on each flat it has been found desirable to provide some single rooms for senior students and teachers.

The whole of first and second floors are used for students' apartments and the portion directly over the entrance-hall on each flat appropriated to a social hall lighted from the front wall. On the third floor is a dining-room, the full width of the building, students entering on one side and servants on the other, by which arrangement a strict separation is maintained. The servants' street entrance is in



First and Second Floors.



Third Floor.

the basement story near a secondary stairway at the back of the building, they can ascend by the stairs or by an elevator placed in the well-hole of the staircase.

Next the dining-room is a waiting-room, and three rooms adjoining are used as hospital, nurse's and matron's rooms.

There is also a large and conveniently arranged kitchen, cook's-room, pantry, stores, laundry, linen-closets and housekeeper's-room, each compartment being furnished with all necessary appliances and utensils for domestic uses.

The college was founded to provide women with the best facilities for securing a liberal education. Its primary purpose being to meet the demands arising in the Methodist Episcopal Church and it was consequently established by action of that body.

The Institution includes collegiate and post-graduate instruction, with such provision for sub-collegiate classes as may be found necessary to meet the wants for matriculation.

The City of Baltimore possesses many advantages as the seat of an Institution of this kind which are worthy of notice. The mildness of its winters contrasts greatly with the severe climates of the north and northwest; the remarkable healthfulness of the entire State of Maryland, and the low death rate of the city indicates its sanitary condition.

It is a City of Churches, representing all the leading denominations which furnish all needful means for religious culture.

One of the great universities of the land, the Johns Hopkins, affords rare opportunities for acquiring the matured views of the most eminent specialists in every department of learning.

The excellent libraries of the Peabody Institute, the Maryland Historical Society and the Pratt Free Library together supply over 300,000 volumes and afford facilities for either general reading or special investigation. A. A. Cox.

THE INTERNAL ILLUMINATION OF BUILDINGS.[1]

Iron Gate, Vesinet, France. From *La Construction Moderne.*

THE art of internal illumination of buildings, the author considers, is just born, and will be an art in the future. Electricity is rendering theatres bearable and houses healthier, while the architect is brought face to face with a new art, in which the aid of the electrician is required to solve some of the difficulties. History is silent as to the origin of tallow, pitch, wax and oil, but gas as an illuminant came in with the present century. From the earliest days, history, whether culled from paintings or writings, teaches that lights have been dim and crude until the middle of the present century. Light, by whatever means generated, follows the same laws, and is due to the rapid rhythmic undulations of the medium, called the ether, that fills all space. Wherever there is light there is heat, and the hope of the philosopher to supply light without any heat at all is at present but a dream. Light cannot be produced without heat, and the higher the temperature the brighter the light. Color varies with the rate of vibration of the ether, while changes of color are due to the changes of wave-motion of the ether. Light may become so intense that all sense of color is lost, and very bright illumination causes all colors to appear whitish. If light emanates from a point, its intensity diminishes with the square of the distance. The candle is the British standard source of light, and the bright surface produced by it at a distance of one foot the standard illumination by which to measure the amount of light distributed by any other means. This standard Mr. Preece calls a "lux." A sixteen-candle power glow lamp is a lamp which gives a light equal to that of sixteen British standard candles concentrated on one spot, and it will at a distance of four feet give the illumination of a lux. Thus one-candle power at one foot, four candles at two feet, nine candles at three feet, sixteen candles at four feet, twenty-five candles at five feet, give exactly the same illumination, viz., one lux, on the paper on which we write or on the page from which we read. The great problem is to diffuse light throughout a room so that it be distributed uniformly over the working surfaces with an intensity of a lux. Sixteen-candle glow lamps suspended eight feet above the floor, and fixed in eight foot squares, effect this very well; and groups of four such lamps fixed sixteen feet high produce a similar result. The light a lamp gives is owing to the expenditure of energy in its carbon filament; an electric current is driven through this filament by electric pressure, its resistance is overcome, it is intensely heated by the proceeding, and the result is pure unadulterated light. The energy expended per second by an *ampère* (the standard current), driven by a *volt* (the standard pressure) is called a *watt.* A sixteen-candle glow lamp takes sixty-four watts, which, assuming the lamps to be fixed eight feet high, means that one watt per square foot of surface is required to secure ample illumination from lamps so fixed. Therefore, in designing the normal illumination of rooms, Mr. Preece takes the floor-area in square feet and divides it by sixty-four, which gives the number of sixteen-candle power lamps required, fixed eight feet high; these being increased or diminished according to the purposes of the room, its form and height, etc. The adaptability of the eye to nearly every degree of light is very great, and it is almost impossible for it to judge accurately of the amount of light present; but it is not as a mere source of light that the glow lamp is superior to the gas-burner. The former can be put anywhere and used without the adventitious aid of match or fire. It does not vitiate nor

[1] Abstract of a paper by Mr. Preece, Electrition to the General Post-Office, and read before the Royal Institute of British Architects.

unnecessarily warm the air, and it simplifies the problem of ventilation, while it lends itself above all to the æsthetic harmony of furniture and decorations. Electric light is not always absolutely safe; security is to be obtained only by good design, perfect materials, first-class workmanship and rigid inspection. Imperfect materials erected by cheap contractors lead to many disasters; on the other hand, it is stated no fire has occurred in buildings fitted up under the rules and regulations, and inspected by the officers of the insurance companies in this country. Mr. Preece advocates keeping everything as much as possible in view, and not hiding the conductors under wainscots or floors or above ceilings. The glow-lamp excited by three watts per candle is at present the most perfect source of domestic light, and when the patent expires — in a year or two — will be obtainable at one-third the present price. It is scarcely fair, Mr. Preece thinks, to say all light should come from the side of a room, as Lord Beaconsfield stated in "*Lothair*" when describing the lighting of Belmont. The House of Commons is one of the best-lighted chambers in London, and is lighted from the roof, a false glass ceiling excluding the heat and glare and admitting only the light. What is wanted is to avoid the glare of the incandescent filament in the eyes, and to prevent the lamp from being too obtrusive; it can be shaded from the eye without its effectiveness being destroyed, and without the flow of light being obstructed or its quality being deteriorated. Judging from the Crystal Palace Exhibition, at which several leading firms have not exhibited, the electric-light fitter has not seized upon the spirit of the age — which is the rule of science over mere conventional æstheticism. Two exhibits at the Crystal Palace, however, the author considers, especially deserve inspection. The one is a Tudor ribbed ceiling erected by Messrs. Allen & Mannooch, who have applied glow-lamps to the moulded intersecting pendants in such a way that the feeling of the artist is maintained by day, and is rather intensified and not marred, by the artificial illuminant at night. The other is a bold attempt of Messrs. Rashleigh, Phipps & Dawson to design in ironwork the whole of the fittings of a dining-room, so that they shall, in combination convey an idea. The artist (Mr. Reynolds) has attempted to symbolize the solar system, the centre light over the table representing the sun, and the brackets on the walls the planets. A survey of the Royal Academy pictures, the author thinks, affords instructive study. There are many interiors, but few into which artificial light has been introduced. Having described several pictures in which artificial light has been introduced with more or less successful results, Mr. Preece, in conclusion, considers that science is advancing with giant strides. Science has subdued nature so as to bring it within the compass of the human intellect, and Art must follow the knowledge thus acquired. These two being the chief instruments of modern civilization, the architect and engineer must work hand in hand.

DISCUSSION.

Mr. John Slater, B. A. Lond., Member of Council. — Mr. President and Gentlemen, with regard to what Mr. Preece has said as to the lamps in this room, he began by stating, what I think every one who has seen it will agree with, that the House of Commons is one of the best and most admirably lighted interiors, and the most comfortable form of illumination, so far as illumination goes, that is to be found; but the individual gaslights which light that chamber are all hidden behind the ground-glass screen, so that none of the glare from any lamp reaches the eye, and all the light is perfectly diffused. That seems to me, Sir, what we ought to aim at, as Mr. Preece has said, in our rooms, whether public or private, in the way of artificial illumination. But I confess that I could not quite understand Mr. Preece's argument, and I shall be very glad indeed if he will in his reply explain more fully how you can have the effectiveness of the light undiminished if you screen it. Any amount of screening must to a certain extent diminish the effectiveness of the light.[1] Mr. Preece has contrasted the different lights in this room. From where he was standing I am perfectly certain that these lights over my head are excellent, and cannot be improved. Where I am sitting three of them are as good as they can possibly be, but the fourth is shining directly into my eyes. The full force of the unprotected filament is glaring at me, and I am bound to say that I cannot look at that chandelier with any particular pleasure. I fancy, therefore, that unless we have exceedingly low-power lamps, which are not economical, we are bound in some way or another to screen off the direct glare of the filament. Take any one of the lamps with a ground-glass globe; if you look at it sideways the amount of light which comes to the eye or to the work for which you are using it is undoubtedly diminished by the very pretty ground-glass leaves which partly curl round the globe and which make it very effective to look at. You *must* in one way or another slightly diminish the natural effectiveness of the lamp before you can use it with any pleasure. These lamps undoubtedly do lose 50 or 60 per cent of their illuminating power by being enclosed in the ground-glass globes. Even with the cut-glass globes which Mr. Preece has alluded to, and the effectiveness of which none can deny, you get the light broken up so that at any individual point you do not get the full effect of the filament. Perhaps Mr. Preece will tell us, and if so we shall be very much obliged to him, how the glare can be avoided without any diminution of the effectiveness of the light. Mr. Preece has alluded to the attempt which has been made at the Crystal Palace to accentuate the architectural features of a ceiling by having incandescent lamps placed at the junctions of the mouldings, or in little hollows, or something of that sort. That, undoubtedly, is an exceedingly effective means of illumination. I may, perhaps, be pardoned for saying that ten years ago I hinted that artistic illumination might be developed in this direction by means of electricity; but it cannot be denied that such a method of illumination is to a certain extent extravagant, because you lose the reflectiveness of the ceiling, and no one who has not tested it can be aware of the immense illuminating effect which a white surface such as a ceiling gives in a room. I remember very well in one of the Paris Exhibitions that a room in the building was illuminated in a way which, to my mind, was one of the most perfect specimens of artistic illumination that I ever saw. An arc-lamp was placed on a stand in the middle of the room; it was completely screened and shaded by shrubs all around it, but it was so placed that it shed a very strong light upwards on a white screen, and the whole of the light of the room came diffused from the screen. I know that Mr. Preece was there, and he may possibly remember that. I quite admit that we cannot all have the electric-light in the middle of our rooms to throw light on screens which shall reflect it down again; but the fact remains that the more we can diffuse and distribute the light the better it will be, and the more comfortable for every one who has to use it.

Mr. E. Manville. — Sir, Mr. Preece's lucid paper, which leaves us so very little to criticise and so little to add, has, perhaps, led us up to one point of some importance. By that I mean the expression signifying the given amount of light with which a body may be illuminated. We have been used to talking of lamps of so many candle-power, which, as Mr. Preece says, means so little, because the light they give depends upon the height at which they are placed and the distance at which they happen to be from the object to be lighted. I believe that in days gone by steam-engines were rated at the power they would give with a steam-pressure of, say, twenty pounds to the square inch; but to-day, with our high steam-pressures, nominal horse-power means absolutely nothing. One engineer means about five times its nominal horse-power as the actual horse-power, and another engineer means something else. In the same way, when we talk of so many lamps of sixteen candle-power being used to light a room, it means little or nothing unless we know at what height the lamps are suspended. Perhaps one great advantage of the electric-light which ought to be taken into consideration with its undoubted extra cost is the fact that, owing to the comparative absence of heat, the non-vitiation of the atmosphere, and the fact that it is not unpleasant to have it near you, we are able to place the light much nearer to the object to be lighted, and, therefore, if we have to pay twice as much for our electric-light, we might reasonably be supposed to do with possibly half as much light. That interesting little formula which Mr. Preece gave as to the number of lamps required to light a given area, I could not quite follow. I think Mr. Preece said that the superficial area divided by sixty-four would give the number of sixteen-candle lamps required to light the room. [*Mr. Preece:* At eight feet high.] The rate of incandescence at which we can burn an incandescent lamp distinctly affects what one might term the pleasurableness of the lighting. I quite agree with Mr. Preece upon this point. I have noticed that abroad, where the lamps are very much cheaper than they are here, owing to the non-existence of the incandescent lamp patents, the lamps are burned at a much brighter rate of incandescence, and the result of such lighting is far better than the burning of the lamps at such a rate of incandescence as to make them look something like red-hot hair-pins. Ground-glass is certainly a very inefficient method of shielding the light of incandescent lamps. Where you can have an incandescent lamp near the object to be lighted, and can place a shade between it and the eyes, so as to get the undivided light of the lamp upon the object, probably no better effect can be obtained; but, where lamps have to be suspended above the eyes, probably some efficient mode of cutting the glass is the best method of directing the rays of light away from the eyes without cutting off more of them than is absolutely necessary. I know that a great deal of consideration was given to this subject some time ago by Mr. Trotter, who devised a scientific system of cutting glass which achieved the desired object with the least absorption of light. A point that must have some weight with architects is the necessity, which was referred to by Mr. Preece, of having places which are lighted by electricity properly and efficiently wired up, as it is now termed. There is no doubt that a great many, if not all, of the failures that we have heard of have been due to inefficient wiring. If you could always employ thoroughly trustworthy firms, of whom there are now a considerable number, there would be no fear of work not being done satisfactorily and safely. But when, as is often the custom, tenders are obtained from those who like to send them in, and people with names you have never heard of before are those to whom the work is given, it is absolutely essential that they should be tendering to very detailed specifications, which shall prohibit anything but the best class of work being put in, and that

[1] Mr. Preece is undoubtedly correct in saying that from the point of view of pure economy an unshaded filament is far the cheapest way of obtaining light. But artistic effect is not always compatible with economy. A plain brick wall with square openings for windows is the cheapest form of house-front, but if you want artistic effect you must spend money in treating the front architecturally. If you have a plain thing, of course you must pay for enriching it. And in the same way, if you want an artistic effect from electric lamps, you must have a somewhat more expensive arrangement of screens or shades than if you have the plain filament only. — J. S.

rigid supervision should be maintained over them during the execution of the work. I am sorry not to see Mr. Heaphy here to-night, because he has had a larger experience than most of us as to the results of bad workmanship and the best means of overcoming it, and I am sure that he could have given us some valuable hints upon the subject. I heard something said as to the utilization of light by reflection. No doubt, this is a very admirable method of lighting a room, but I am afraid, in these times, which are supposed to be times of a "hard-up" kind, an electric-light bill to light a room with a reflected light costing four to six times as much as it might cost if the lamps were lighted direct would be looked at askance by those who consumed the electric-light.

Mr. R. E. Crompton.—Sir, Mr. Preece will forgive me if I do not thank him at length for his very interesting paper. I take it that you want to hear what we have to contribute on a point which is more interesting to you; namely, the best method of using this beautiful illuminant. I heartily agreed with the speaker when he stated that the only new thing in design has been the simple electrical single-light pendant. That is the way in which the distribution of the electric-light lends itself to the most economical use of the light in rooms, and I really think that the direction in which all artistic minds should be directed to this subject should be to the further development of pretty, elegant pendants, as far as possible consisting of single lights. I myself think that the heavy pendants with many lights are only suitable for large vestibules, halls, foyers of theatres and such places, and that the great chandeliers and lustres of the past should be relegated to their own object of centre-lights in the auditoriums of theatres. While I am on that subject, I may tell you that the great lustre of a theatre, when it is used for electric-light, should be of a quite different form from that which is used for gas or candles. Instead of being balloon-shaped, with the larger part downwards, it should be exactly the reverse; it should commence with the broad expanse of lighting at the top, coming down with graceful, concave curves, with a delicate pendant single-light in the centre. It is astonishing what beautiful and splendid effect the mere arrangement of the light in that form will give. I have tried it myself in several well-known theatres, and the result has been exceedingly pleasing. A few brass hoops and simple rods strung together to produce these successive diminishing rings of light are quite sufficient to produce an effect far surpassing the electroliers which have been used for such purposes. I used it in the Victoria Hall at Leeds, and you will find there the original temporary fittings which were made many years ago, and which surpass the more elaborate chandeliers or lustres which have been designed since. There is no doubt in my mind that Mr. Preece is making a mistake in one matter; he may be right, or I may be right, but I would point out to you that there is another view of the case than that which he has presented. He is a strong advocate of lighting from the ceiling. I myself am very greatly against lighting from the ceiling. I have seen it tried in many cases. I have seen the case of the Constitutional Club, which has been mentioned, and, in my opinion, the effect is bad. We do not light a room simply for the room itself; we also light it for the people who are in it, and no man or woman looks well if he or she has deep shadows thrown from top lights which make penthouses of their eyebrows. There is, however, one thing that English electrical engineers have succeeded in doing well, and that is in lighting dining-rooms. That is because we have nothing to do but to throw a strong light down onto the dining-room table, which is reflected from the white cloth onto the people's faces. The effect is that every woman at the table looks about five years younger. In dining-rooms that I have had anything to do with I have never allowed much light otherwise than on the dining-table, and reflected from the pictures on the walls. I have used lights of this kind to throw the light against the pictures, where they had them, and with just that light alone, and very little light indeed in the general atmosphere above, I have produced effects which everybody was pleased with. That points to the fact that we must have a certain number of wall-lights, and the question is how wall-lights, whether in brackets or at some distance from the walls, can be put into our rooms to the best advantage. What we want, and what we have not yet got, I regret to say, are long, graceful pendants coming out some distance from the wall, and yet not obtrusive in daylight. As I said before, what we want is a further improvement of the simple bracket and pendant, so that they shall not be so ugly as, perhaps, these very plain ones are in daylight, but that they shall give as good an effect as these do at night. No doubt, Mr. Preece is right with his rule as to the sixteen-candle lamps at the distance apart he has named as giving the most effective illumination. I think it is a trifle more than is necessary, but still I believe his rule is a very good one. But it is quite certain that if you put the whole of the lights higher up (he says eight feet, but I think the more common practice is nine feet from the floor), you will find that, unless people are standing up, as at an evening party, when the room is crowded, the effect will even then be that deep shadows will be thrown upon people's faces. The fact is that the lighting of the room when people are sitting down with a small company present is quite different from the lighting required for a ball-room or an evening party, when a room is crowded. In the latter case, men's faces are at least two or three feet higher than in the former, and the lighting is different. How do we meet it in practice? By having, as I say, lights from eight to nine feet high in single pendants disposed over the room, and also a certain number of standard lights, which can be moved for the ordinary work of lighting the room on days when you are at home by yourself in your own family. As regards the brackets, as I say, we have first to see what we want. I do not want to be critical; it is far easier to find fault than it is to create; but I am not satisfied with those brackets with scallop-shells. I do not think the light should be put in a scallop-shell, and, if I may be forgiven for saying so, I do not think a scallop-shell is intended to hold a light inside. In the same way, I think that the exceedingly pretty double bracket is on a wrong principle. If the lights were put on salient angles, the case would be very different. That is very taking at first sight, but it would not be taking when you paid your month's bill. A great deal has been said about lighting in theatres. I have had a good deal of experience of that kind, and I must say that I received the greatest assistance from Continental artists. If any of you, gentlemen, who travel will take the trouble to visit what is known as the Burg Theater, in Vienna, you will see some of the most perfect examples of fittings and artistic arrangements of electric-lighting. It is there that that extremely beautiful statue of a girl is to be seen, where the plant has grown up in the night over her head with the flowers opening, and she wakes and sees it. The statue is in the vestibule of that theatre, which has, perhaps, the most perfect electric fittings in the world. Many exquisitely lovely things are to be seen there. I had to supply the light, but I had very little to do with the artistic part of the work. In Austria, one finds everywhere men who work with a hammer, but who are still artists to the bone, as they used to be in the Middle Ages. It is there that was worked out for the first time the great problem of scene-lighting. Those effects which are shown in Siemens's small toy theatre at the Crystal Palace were carried out at Vienna on a magnificent scale eight years ago, and with perfect success. There we showed for the first time everything that was required; every natural phenomenon passing from the blue moonlight into rosy dawn, and then to the gradual orange and white light of day, and in the same way passing from daylight through the sunset to black night. You could see what never could be done in the days of gas: on one side of the stage the moonlight, and the other side of the stage all lighted with yellow light; not done with a jerk, as in the days of gas, but so gradually that it seemed to be perfectly natural. All that was done by means of electricity, and none of it has yet been seen in England, I regret to say. I think the Lyric is the best, but none of the English theatres that I have seen have anything approaching to the Burg Theater in Vienna. First comes Vienna, and, second, Berlin. Those two large opera-houses are simply splendid in their effects, and I think I am giving you good advice when I recommend you in your holidays to take the trouble to visit them and see the artistic lighting. The hammered-work, the brass-work, the copper-work to be seen at the Burg Theater in Vienna are unsurpassable, and, I think, almost among the wonders of the world.

Mr. A. Slatter.—Sir, with regard to obscured lamps, it has been said that only twenty-five per cent of the light is absorbed; but permit me to say with Mr. Preece and the other gentlemen that quite fifty per cent of the light is thus absorbed.

With regard to the hideous casing which one of the speakers alluded to, especially in this room, I think there is no better way of fitting up the electric-light than by running the casing on the surface of the walls. It is certainly attended with little or no risk, whereas by running the casing inside the walls one is very liable to meet with the greatest danger we electric engineers have to contend with, and that is short circuits by reason of dampness of the plaster reaching the wire. With reference to the Constitutional Club which has been referred to, a great deal of light is wasted by putting the lights so high up as they are in that club. The National Liberal Club was lighted in much the same way, but all the lights have now been brought down to the level of about twelve feet from the floor, thereby saving a vast amount of light, and decreasing the electric-lighting bill by a very large amount. As to the reflection of the light in the House of Commons, I carried out some very interesting experiments a few days ago at the Mansion House in lighting the windows of the Egyptian Hall by means of arc-lamps, so that the rays of light might show up the stained-glass windows by a light similar to daylight, and the effect was very good. I would only mention this as an illustration of the possibility of diffusing the light properly and of giving the same effect as daylight. In order to produce this effect, a sheet was thrown in front of the window, so that you got a perfectly diffused light. There is one important matter that I think it advisable to call your attention to, and that is, when architects are drawing up specifications for new houses, or the re-decoration of others, they should include in their details the arrangements for running the wire, and with a little care and attention to this matter the wires might be run in grooves made in the plaster, and run along the dado, the capping for them being made to suit the decorations, and thus the casing would be hidden from view. It seems to me that the architect and the electric engineer should combine together to draw up a specification which will meet the requirements of both professions, and save the after expense of providing means for running the wires, and to a certain extent preventing the risk of damaging the building and spoiling existing decorations.

Mr. W. H. Preece, F. R. S.—Sir, I must first express my deep thankfulness to the audience and to yourself for listening so attentively to the few remarks that I made, and receiving them so kindly. I am almost sorry that they did not meet with more criticism. I should like to have been attacked at all points; for nothing gives me more pleasure than to reply to attacks, particularly when they are wrong. Mr. Slater was good enough to throw back on me a point (and I must confess that he was perfectly justified in doing so) that while I object to ground-glass generally, I approve of ground-glass in the House of Commons. It is quite true that they have ground-glass in the ceiling of the House of Commons, and they have their light beautifully distributed; but then you have never seen the bill. I have, and I know what a frightful waste of gas there is in the House of Commons in lighting it up in this particular way. In point of fact, I am certain that there is quite six times as much energy wasted in lighting the House of Commons as there ought to be. However, the effect is pleasant, and our worthy Members are very well satisfied. They do not pay the bill, and the country does. The moral of nearly all that I said to-night in my paper was that we do not want to have the light in our eyes; and the problem which we have to solve is, how can the glare be avoided? You cannot do without shades. I do not think Mr. Crompton was quite right in saying that I am an advocate for ceiling lighting. I am only an advocate for ceiling lighting when you cannot put the lights anywhere else. I always want the lights put so that they shall distribute the light in every direction; so that my young friends shall not look five or ten years older than they really are, but so that you shall see all round them, and that they shall not turn to you the ugly side on one occasion and the pretty side on another. The light must be distributed upwards and downwards in every direction, and the problem for the engineer is to supply the energy, and the problem for the architect is to distribute that energy in the best way he possibly can, so as not only to decorate his rooms, but to bring out the beautiful objects which move about in those rooms as effectively as possible. I think Mr. Crompton referred to the scallop-shell as not being the right thing to put a lamp in. If you want a lamp *per se*, a scallop-shell is not the proper thing to put the lamp in, but a scallop-shell is a very beautiful object; it has been curved by nature in a very happy way, and the ancient Greeks evidently had something like it in their minds when they designed those pretty lamps in bronze and earthenware that we come across in museums. But supposing that we have a picture or some tapestry on the wall, what is nicer than those scallop-shells that you see there? See how the light is thrown upon that screen. I almost wish that there had been a portrait of your president there, so that we might have seen how those scallop-shells reflected the light on the spot where we want it. That is the secret — how to direct your light just to the spot where you want it. I think, although that light did glare in Mr. Slater's eyes, it glared in his eyes, first, because he was sitting in the wrong place, and secondly, because the lamp was only put here to-day, just as it was. Indeed, I only asked for it this morning at about eleven o'clock, and that is not the place that it would ordinarily be in; it would be somewhere about where your own lamps are fixed, about six feet higher than it is — and if it had been in its proper place, neither Mr. Slater nor anybody else would have had his eyes afflicted by this incandescence. There are some pretty things exhibited by Mr. Faraday which are well worth inspection afterwards when the whole of the lights are turned up. There is another thing that I should like to refer to, and that is a metallic mode of casing wires exhibited by Walter Glover & Co., of Salford, so that you can make them flexible and turn round mouldings and ornaments. In fact, I might have brought here a great many more things to show you, but the object of my paper has been, not to tell you all that I possibly could, but to induce you to think a little more about this subject; and by bringing some of these rules and regulations before you, you will be able to form rules for yourselves. My rule was based, as I said in the paper, on the present practice of using lamps requiring four watts per candle. If you applied the rule next year, when we can give three watts per candle, perhaps it will give you a little more light; but you may get over the difficulty by putting your lamps a little higher. But with lamps burning four watts per candle, you get an absolutely uniform distribution of light on your tables where you write and eat, by following the rule that I give you. As to this particular room, I am sorry that I had occasion to speak so disparagingly of it; but when one sees a thing badly done, one must express one's views. I contend that the use of ground-glass is absurd in a case of that kind, though I do not say that the use of ground-glass is always absurd. If you are obliged to have your light close to you, it is proper to have ground-glass; but when you have it so high that nobody can look at it unless they crick their necks, there is no necessity for ground-glass. More than that, taking the superficial area of this room, and applying to it my rule, I find that you have only, counting your thirty-two lamps as two, sixteen 16-candle lamps fixed at a height, I should think, of about fifteen feet. [*Mr. Aston Webb:* Four 32-candle lamps and eight 16-candle lamps.] If we take the simple rule of superficial area that I give you, you ought to have twenty-two 16-candle lamps fixed at eight feet high. But you have them fifteen feet high, so that to light your room efficiently you ought to have 32- to 36-candle lamps suspended as you have suspended these.

Gentlemen, I have already said that I am grateful to you for the attention that you have paid to me. I want to lead your thoughts in this direction. The engineer may do what his science teaches him to do, but the proper way after all of illuminating rooms is in the hands of the architect. He is the proper judge of the amount of illumination required in a room, and I am quite sure that he will find in the electrician a willing and obedient servant, who will always be prepared to apply to his own particular purposes the very best results of science.

THE ILLUSTRATIONS

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A CRUCIFORM church 93′ 6″ front and 108′ deep, exclusive of parish building to be erected on the rear. Built of buff and red stone combined, and with a tiled roof of rich, warm color. Galleries in the two transepts, large wheel windows in each arm of the cross, 21′ in diameter, stone tracery. Seating capacity, easily 1,250 in the permanent sittings.

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[Steel Engraving.]

PLANS AND SIDE ELEVATION OF THE SAME.

[Steel Engraving.]

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TRAVELLING-SCHOLARSHIPS.

HAVERHILL, MASS., June 4, 1892.

TO THE EDITORS OF THE AMERICAN ARCHITECT: —

Dear Sirs, — Will you please tell me through your paper what travelling-scholarships are open to me. I have been in the office of Perkins & Bancroft for the past eight or ten months, am a graduate of a high school, but have never attended an architectural school.

Yours respectfully, L. J. B.

[THERE is no scholarship open to one whose training has been as brief as has yours. Even the least restricted — the *American Architect's* — requires a two years' training in the office of some architect of standing. — EDS. AMERICAN ARCHITECT.]

BOOKS ON COLD-STORAGE BUILDINGS.

Victoria, B. C., May 30, 1892.

To the Editors of the American Architect: —

Dear Sirs, — Can you refer us to any works or papers on the planning and construction of cold-storage buildings? By doing so you would greatly oblige, Yours truly, Soule & Day.

NOTES AND CLIPPINGS

The Temple of Baal. — There rises a huge wall 70 feet high, inclosing a square court of which the side is 740 feet long. Part of the wall, having fallen into ruins, has been rebuilt from the ancient materials; but the whole of the north side, with its beautiful pilasters, remains perfect. As the visitors enter the court they stand still in astonishment at the extraordinary sight which meets their eyes; for here, crowded within those four high walls, is the native Village of Tadmor. It was natural enough for the Arabs to build their mud huts within these ready-made fortifications, but the impression produced by such a village in such a place is indescribably strange. The temple, so to speak, is eaten out at the core, and little but the shell remains. But here and there a fluted Corinthian column or group of columns, with entablature still perfect, rises in stately grace far over the wretched huts, the rich, creamy color of the limestone and the beautiful mouldings of the capitals contrasting with the clear blue of the cloudless sky. The best view of the whole is to be obtained from the roof of the *naos*, which, once beautiful and adorned with sculpture, is now all battered and defaced and has been metamorphosed into a squalid little mosque. To describe the view from that roof were indeed a hopeless task. High into the clear blue air and the golden sunshine rise the stately columns; crowded and jumbled and heaped together below, untouched by the gladdening sunbeams, unfreshened by the pure, free air, lies all the squalor and wretchedness of an Arab mud-hut village. — *Blackwood's Magazine.*

Uses of Resin. — There are many useful purposes to which resin can be applied outside of those of general practice. As a non-conductor of heat it is used in the protection of water-pipes, particularly in crossing bridges where the pipe is laid in the middle of a long box and the whole filled with melted resin. Resin is also used in supporting basement floors in machine shops, which may be laid over some dry material, as spent moulding sand, which is carefully levelled off, and the planking laid upon temporary supports separating it about 2 inches above the sand. Numerous holes, about 2 inches in diameter, being bored through these planks, melted resin is forced through them by means of funnels until the whole space is solidly filled, and then the upper flooring is laid upon these planks. In case the floor is subjected to shocks sufficient to break the resin it rapidly joins together again in much the same manner as the relegation of ice. Resin is also used to form waterproof paper for use in butcher's shops, fish markets and also for building purposes, and strange to say this improvement reduces the cost of the paper. All methods of applying resin in solution after the paper is finished adds heavily to its cost and also renders it very brittle; but if the resin is dissolved in potash and mixed with the pulp in the beating engine, and this alkali afterwards treated with alum, it becomes neutralized and washed away, leaving the finely diffused resin throughout the whole mass. It is also used for protecting the coarser manufactured products, such as agricultural implements, against rust by mixing it in a solution with benzine. This is applied as a varnish, and the benzine rapidly dries away leaving a coat which protects the material until it goes to the severe service of actual use. — *Engineering.*

A Right-of-Way may be Built Over. — Away back in 1832 John Cowman sold lots in the block between 16th and 17th Streets, Union Square and 5th Avenue, and across the rear of lots 1 and 2 reserved 15 feet as an alleyway "subject to a right of passage for horses, carriages and carts for the private convenience of the owners of lots 1, 2 and 3, . . . and at the entrance of each of said ways into the street a proper and suitable gate with lock and key is to be kept," etc. When Mr. W. Jennings Demorest bought one of these lots in 1890, he went ahead and extended the building on the front of the lot over and across this right-of-way, supporting the rear part on iron columns a foot in diameter, leaving an open space under the extension through its whole width 15 feet high and 15 feet 9 inches wide. The present owner of one of the adjoining lots tried to get an injunction against him to prevent this, but the Court of Common Pleas found that the building as erected by Mr. Demorest does not prevent or obstruct the plaintiff's use of the way underneath it or beyond it. This view has been sustained by the Court of Appeals. The latter holds that while the deed says that the passage is to be "kept open," that does not mean open to the sky, or to reserve light and air for the benefit of the several lots, but only for the passage of horses, carriages and carts. — *Record and Guide.*

St. Eustache in need of Repairs. — The church of St. Eustache in Paris is known to architects in all countries, for, apart from the impressiveness of the interior, it is interesting as an effort to produce all the effect of Gothic without the aid of pointed arches or Mediæval detail. It required more than a century to build (1532 to 1641) and it forms a sort of indication of the striving to excel their predecessors which characterized Renaissance architects. The exterior was never completed, but the interior appears to be sound, and ceremonies are conducted as effectually within it as in Nôtre Dame. But in spite of its appearance, the church is in a dangerous condition. Last year a large block of stone fell to the ground, and there is evidence that others are likely to follow it. An inquiry has been instituted, and it was ascertained that a sum of 200,000 francs will have to be expended to make the building safe, and a further sum of 230,000 francs to carry out a restoration of parts. But where is so much money to be obtained? Four years have elapsed since the Prefect of the Seine sent a requisition to the Municipal Council for 20,000 francs in order to execute the most urgent repairs, but the money remains ungranted. Will the Council be more disposed to grant a larger sum? The church is classed as an historic monument, and accordingly the State is expected to contribute towards the expense, but while general and local authorities are engaged in trying to evade payment, the building is becoming weakened. The parishioners are mainly the occupants of the Halles Centrales, a wealthy body of people, but, like most Parisians, indifferent to church fabrics. — *The Architect.*

Destruction of Neapolitan Churches. — During the extensive demolitions required by the "resanitation" of Naples, seventy-two old churches have to be pulled down; eleven have already disappeared. None of these has any importance as a work of architecture, and very few contain notable historic objects. — *New York Evening Post.*

A Rome correspondent says that a colossal project, already approved by many cardinals and high personages, has been submitted to the judgment of the Pope. It is no less than to build on Monte Janicolo a monumental church, with a cupola like that of St. Peter's, and all around it grand edifices for all the Roman Catholic Universities in the world. — *New York Evening Post.*

TRADE SURVEYS

The trouble in business is that more material and merchandise is made and offered for sale than is wanted; consequently, prices are kept very low; the danger of overproduction is always in sight. Failures continue to occur at the rate of ten thousand per year. Business men generally are complaining of dulness. The apparent remedy is in restriction and in adding less capacity, but no such remedy is susceptible of application. Speaking in a general way, it ought to be impossible to create more wealth than could be consumed, and, while this is true from an ethical standpoint, our system of distribution is such that it requires the closest care to prevent an unsettling of values and an artificial overproduction. The only limit that can be respected is that which is fixed by prices realized. When prices descend to the cost limit, work must stop until demand reasserts itself. The business of the country has been for months past pretty nearly in this condition. It would be difficult to name an industry wherein margins were such as to stimulate production or justify anticipation. Producers and managers, in their field, are giving more attention to avoiding disaster, losses and bankruptcy than to making money. Notwithstanding this fact, there has been a remarkable expansion in the industries, thousands of managers believing that the true path of safety lies in increasing output and lessening cost. There is an abiding faith in the American people, and it is this faith that has been carrying them through difficult times and through emergencies. There is an excellent organization of trade throughout the country, and the conditions of the markets are kept before the eyes of managers and manufacturers, and their conduct is in accordance with these conditions. The expected stimulus has not yet been imparted to business. This is shown in the abundance of money and the low rates of interest; also in the phenomenal growth of deposits at New York, which are one-half more than a year ago. The surplus reserve is large, and the banks throughout the country are reported as having sufficient money, and yet there is a sluggishness in the channels of trade. The increase of business for the past week was twelve per cent greater than for the same week last year. Railroad traffic continues heavy, and Lake traffic is enormous. The export trade has not fallen off materially, and imports continue up to the average. The distribution of merchandise throughout the South is quite satisfactory, and throughout the region west of the Mississippi River good reports are received. Merchants and manufacturers are carefully watching the markets, and are more carefully looking after credits, avoiding dangers as much as possible, and collecting more closely than usual. The Presidential year will interfere less than usual with business. No very serious political issues are likely to arise. The iron trade should be called active, but those in it call it sluggish, simply because the consumption of iron has temporarily fallen off about ten per cent. The trade is waiting upon a revival of railroad building, which will bring about higher prices and an urgent demand when it comes. There is a rapid growth of increase of tonnage on the Lakes, and the boat-building yards there are all crowded with work. Smaller industries throughout the West have every cause for complaint, particularly those engaged in the supply of equipments for agricultural purposes. No very serious damage will be done to trade by the recent floods. Jobbers throughout the West all predict a very active summer and fall distribution. Lumber manufacturers and those engaged in supplying planing-mill products are now extremely busy on orders received within a month. Nearly all the saw-mills throughout the South are doing fair work. The production of lumber is fully up to the needs of the country. Freight-rate reductions continue to be made here and there in raw material. The smaller industries throughout the East retain their activity. Paper-makers, boot and shoe makers, implement and tool makers and the manufacturers of light and heavy machinery are all employing as much labor as during the spring months. The textile manufacturers also report favorable conditions. Hosiery and knit-goods manufacturers report the accumulation of large stocks, but no lower prices. The industries throughout the country were never under better control. Labor agitations have almost ceased, there being but one strike of importance now on hand. The cost of living has declined, although rents remain about where they have been. The condition of wage-workers throughout the country is better than in years past, and there are prospects of continued quietness and the maintenance of friendly relations with employers. So far as the most careful minds can probe the future, there are no dangerous evils threatening the country's prosperity. A number of vital questions are certainly to be decided with the next year or two or three, but circumstances and developments will do more to settle them than mere discussion or legislation. The country is really growing faster than the people in it, and, if legislators will only keep "hands off," there will be very few questions to be settled.

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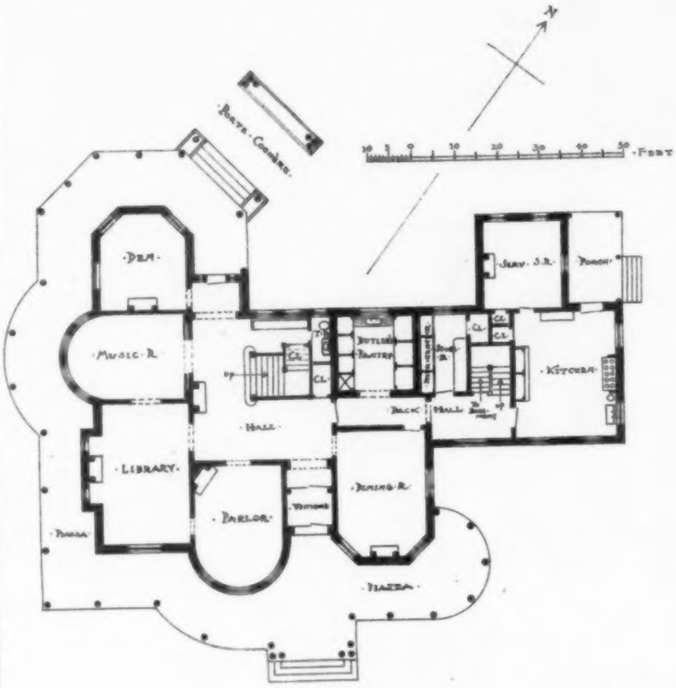

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